



LINGUISTIC PERSPECTIVES ON THE CONSTRUCTION OF MEANING AND KNOWLEDGE

EDITED BY BRIAN NOLAN AND ELKE DIEDRICHSEN

Linguistic Perspectives on the Construction of Meaning and Knowledge

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CHAPTER ONE

PERSPECTIVES ON THE CONSTRUCTION OF MEANING AND KNOWLEDGE

BRIAN NOLAN, ELKE DIEDRICHSEN

The **theme** of this book is the exploration of the dimensions of the construction and management of meaning in language, from several important topical perspectives that are of major interest to scholars today, in the realms of pragmatics, semantics, ontological knowledge engineering, and computational linguistics. This book brings together **researchers** from a variety of functional, cognitive, computational and knowledge engineering theoretical backgrounds who have worked on the nature of meaning in language, within one language or from a cross-linguistic perspective at the syntax–semantics–pragmatic, or computational–knowledge engineering interfaces. As such, the general **objective** is, through studying the pragmatics of language in interaction, semantics and syntax within the framework of functional, cognitive constructional, and computational approaches, to bring new focus and fresh perspectives that integrate many aspects of meaning construction to arrive at a yet better understanding of the cross linguistic behaviour of these dimensions. In this book an impressive **variety of languages** is represented, including Indo-European languages such as Irish, German, Spanish, Chilean Spanish, English, French, Russian, and also Pitjantjatjara, Yankunytjatjara and Ngaanyatjarra from Australia's Western Desert region, and Irish Sign Language.

The **purpose** of the book is therefore to draw a comprehensive, representative and detailed picture of the linguistic, pragmatic, ontological and computational dimensions of meaning, across a rich set of languages, in order to arrive at a better understanding of the nature and rich complexity of meaning. The **topics** that are discussed include: pragmatic approaches to meaning in the resolution of sentence meaning vs. utterance meaning; the ways in which context and situation play a role in meaning construction, and the role of core and emergent common ground in the management of meaning in language use.

The **questions** addressed across the book's chapters include:

1. How is context and common ground managed and constructed in human language-aware software?
2. What are the motivations and applications of Human Language Technology (avatars, digital corpora)?
3. What are the linguistically-motivated digital and computational strategies for constructing meaning?
4. How do different languages present different challenges for utterance meaning (written, spoken, sign languages, and Internet-based language use)—we live in a multilingual globalised world
5. How does emergence of meaning operate across Social Media, online political dialogue and online texts?
6. What are the critical issues in dealing with meaning in cyberbullying through linguistics and IT/text mining strategies?
7. How might insights from contemporary data analytics and statistical approaches complement linguistic strategies in construction of meaning?
8. How can Internet memes be described in terms of linguistic convention and change?
9. How do we address the challenges in identifying meaning at lexical, syntactic, pragmatic levels with insights from knowledge engineering and computational approaches to meaning?

The **aim of the book** is to provide a comprehensive exploration of the dimensions of meaning and knowledge representation within a number of important perspectives including linguistic, pragmatic, knowledge engineering and computational paradigms and analyses. Our **theoretical framework** is situated within modern functional-cognitive constructional-ontological and computational paradigms and our analyses are supported by authentic data (including corpus data) from the languages concerned. We find **evidence** that meaning construction manifests considerable variability in cross-linguistic comparisons in the construction of pragmatic common ground. Context and situation play an important but complex role in meaning elaboration. The role of context and situation is elusive and has proved difficult to elucidate with respect to meaning and knowledge representation. We find evidence on the nature of the, often rapid, emergence of meaning in the digital world of Semantic Web, Internet, Social Media, and Internet memes within a global multilingual world. In this era of global ubiquitous communications, where meaning seems to *mean what you want it to mean at a moment of time, whether facts are true or not*,

we deliver important insights into meaning in discourse across a number of domains, including for example, the political domain. Dependable definitions of what entities and propositions mean are essential for certain industries and domains. We provide core insights into meaning situated in digital ontologies across global domains, for example, the aerospace industry where rigorous definitions are critical for safe communications. The use of computational avatars and the rise of human language technologies, including massive digital corpora and big data, has made the construction of meaning and human language understanding essential to the work of linguists, cognitive scientists and computer scientists who are increasingly working together in collaborative teams to share insights.

The book is organised into **four sections** (with multiple chapters within each section) to address these topics in a cohesive and thematically coherent manner. These sections are as follows: A) Meaning in language in interaction—pragmatic challenges; B) Semantic challenges in deriving meaning; C) Computational approaches to meaning construction; D) Digital ontologies and their role in meaning.

The papers in section A: Meaning in language in interaction—pragmatic challenges, recognises that pragmatics is the study of language in meaningful interaction. Pragmatics is concerned with the use and meaning of an utterance rather than the sentence meaning. Pragmatics therefore helps us to understand the difference between ‘*what is said*’ and ‘*what is meant*’. In the retrieval of meaning from an utterance, one needs to consider the contribution of the situation in which the discourse interaction took place, the particular speech act and its felicity conditions for successful realisation, and context. All of these dimensions contribute to the discourse interlocutors’ shared knowledge in common ground in order to advance meaningful discourse.

In Chapter two, the first chapter in section A, Elke Diedrichsen in her paper ‘Challenges for knowledge representation: emergence in linguistic expressions and internet memes’, observes that, in modern approaches to linguistics, the relationship between signifier and signified is not believed to be something static, that is once and for all stored in the mental lexicon and shared by all speakers of a language. Rather, the concept of ‘emergence’ has entered the discussion of the way people create and understand linguistic items and utterances, and it seems to encompass all aspects of linguistic production and comprehension. Diedrichsen argues that, as a consequence, a dynamic approach to communicative interaction should be taken, considering that people belong to many smaller or greater peer groups at a time, and that the circumstances of life and the situational conditions of an interaction can change any time. This affects the way knowledge is shared

and applied in communicative encounters. Many scholars maintain that the “common ground”, which is the knowledge shared between speakers, may but need not be shared in advance of the interaction. Besides the a priori shared knowledge called “core common ground” there is also “emergent common ground”, which is knowledge that comes up as part of the interaction and is dynamically integrated by the interactants. In this chapter, Elke Diedrichsen discusses aspects of the emergence of linguistic structures, including the dynamicity and other-orientedness of communication, which entails the reference to and interactive recreation of common ground. To this end, Diedrichsen gives a short introduction to Google’s recent invention, the Duplex speech assistant, and evaluates the progress that has been made towards automating natural conversation with respect to its usability in communicative situations with more or less predictable background information. Diedrichsen also analyses examples of formal and functional variation in linguistic constructions, which have been described by the term ‘openness’. The term entails the aspect of variability that is given in complex linguistic structures. Using a German example, Diedrichsen shows that it also encompasses the establishment of hints towards subjectivity and speaker’s attitudes in a structure. In addition to linguistic structures, Diedrichsen discusses Internet memes and argues that Internet memes can be viewed as communicative units, as they establish conventions for form and meaning in a shared culture. The conventions are recognised and elaborated on by users in participatory digital media. Diedrichsen discusses two popular memes in order to demonstrate the emergence of form and meaning with them, and the background on which users operate in order to recognise, understand and procreate the formal realisation and the semantic essence of a meme, including the pragmatic function and the sentiments it carries.

Chapter three by Conor Pyle, entitled ‘Tracking of referents in the Western Desert languages of Australia’, provides a Role and Reference Grammar (RRG) analysis of how discourse referents are tracked in text in Pitjantjatjara, Yankunytjatjara and Ngaanyatjarra (PYN), from the Western Desert of Australia. Role versus reference has two functions in syntax signalling the role of arguments with respect to the clause and with reference to what was said in previous clauses. Cross-linguistically, new referents are generally introduced in absolutive (S or O) roles because the A role is usually the topic and is referenced by a pronoun in the narrative, whereas the O argument is often ephemeral. In PYN, characters are introduced on first mention, thereafter pronoun clitics are used, being cognitively lighter than full pronouns: a zero 3rd person default clitic and ellipsis extend this trend, a null pronoun being a zero anaphor retaining salience from a

previous clause. This leads to verb rich utterances, with verbs frequently in series. Thus, an argument is backgrounded once it has been established in discourse, which is part of 'information flow'. PYN also has switch reference particles and sub-clauses which obviate the need for overt expression of syntactic subject. This chapter also draws on the idea of 'Common Ground', which is mutual knowledge, beliefs and assumptions. As participants speak, they 'ground' what has been said in the conversation. There is a presupposition by the speaker of what is common ground. Thus, a sentence may be appropriate only in a particular situation. Core common ground (including common sense and cultural knowledge) is distinguished from emergent common ground which builds during a conversation. In small communities there is a high degree of local knowledge so there is no need to specify everything in conversation, and cognate verbs imply the existence of an undergoer that does not need to be overtly expressed. Centering theory refers to the centre of attention in a conversation and this affects the form that referring expressions take. Forward looking centres are discourse entities evoked by an utterance, while backward looking entities are similar to topics. As conversation progresses the topics under discussion develop and change. Centering theory seeks to address anaphora resolution. There is rich information in a first utterance, but memory of utterances fades rapidly which means unless referents are constantly refreshed, they may need to be explicitly stated again. PYN arguments thus do not need to be specified; though it leaves a sentence technically incomplete; and reference crucially depends on context. These may be accounted for by exophoric expressions deriving from the situation; endophoric ones referring to something already in the text or homophoric ones deriving their interpretation from cultural reference. This study characterises how this is accounted for in PYN.

In chapter Four, 'The dominant principle of meaning construction in mind and discourse', by Nikolay N. Boldyrev, it is argued that knowledge representation and meaning construction in mind and discourse is always situated and is a cooperative event. The relationship between knowledge about the world and language use is indirect and depends on how speakers of a language define it. For Boldyrev, this issue suffers from a lack of profound insight into the conceptual aspects of verbal interaction and needs thorough consideration of the core conceptual factors governing knowledge representation and construction of meanings in mind and discourse. In this chapter, Boldyrev argues that the fundamental principle that underlies cooperative communication is the Principle of Interpretation Interaction. This involves conceptual accommodation, interpretation and negotiation of meanings within contexts of collective and individual knowledge activated

in participants' minds in discourse. This idea is that there are many ways by which individuals can construct their world. The problem of knowledge representation and meaning construction is central to current theoretical and empirical research oriented towards the study of cognitive processes and their instantiation in language. Knowledge representation and meaning construction is argued to involve three functions of language, which are cognitive, communicative and interpretive. All three are important and significant. These three functions are intended to account for the three types of knowledge representation in language: lexical representation, grammatical representation and modus representation. Correspondingly, language as a system of knowledge representation manifests itself as a threefold unity of the representative, communicative, and interpretive aspects. A cognitive theory of language is intended to deliver significant insights into the structure of human consciousness, and into the interrelations between language and mind, by providing evidence on their interdependence. There is no doubt that language as a cognitive ability is an integral part of human cognition. Therefore, Boldyrev concludes that, to achieve access to cognitive structures and processes and an understanding of how humans communicate meanings, then a deep understanding of the conceptual basis of language structure and use is necessary. A related conclusion is that people have an unbounded ability to create numerous meanings as well as new linguistic forms to represent these meanings.

In chapter five, 'The forms, functions and pragmatics of Irish polar question-answer interactions', Brian Nolan examines the challenges of unpacking meaning and characterising knowledge in the speech act of requesting information in one of its manifestations, the polar yes-no question, for Irish. Irish does not have any exact words which directly correspond to English 'yes' or 'no' and so employs different strategies where a yes-no answer is required. Nolan characterises the expressive forms, functions, logical underpinnings and pragmatics of polar yes-no interrogatives as question-answer pairs, and the felicity conditions necessary for their successful realisation. In a question-answer interaction, information is assumed to be freely exchanged, under a Gricean presumption of cooperation. A polar yes-no question in Irish can be considered as advancing a hypothesis for confirmation and consequently, there are several strategies available for answering a polar yes-no question. In Irish, the answers to yes-no questions echo the verb of the question for both affirmative and negative answers, along with a negation marker for negative answers. These types of answers are referred to as verb-echo answers. Typically, In Irish, the verb form is used *without* explicit nominal arguments expressed within grammatical relations, though there are

exceptions. Additionally, in negative polarity answers, the negative particle is also used. When a synthetic verb form is used, a pronominal appears in the grammatical relation of nominative subject within the answer. In the case of analytic verb forms, the subject is always missing. A subject is used only when the speaker chooses an emphatic affirmation or denial. The verb within the answer is inflected for tense as well as subject agreement. As tense is a clausal operator, it locates the time of the event denoted by a clause in relation to the time of utterance. The presence of tense in the answer implies the presence of a clause. When it occurs, pronominal subject marking implies the presence of a subject, hence also the presence of a clause. Under certain circumstances, as the answer to a copula-question with an indefinite predicate, the copula-derived phrases *sea* (COP+3SG = 'be-it') and *ní hea* (= NEG.COP 3SG 'NEG be it'), function as logically equivalent to 'yes' and 'no'. This chapter argues towards several claims regarding polar yes-no questions of Irish. One claim is that the answers to polar yes-no questions of Irish contain instances of ellipsis and, as such, represent full clausal expressions with a complete semantics where the elided elements are from the question part of the question-answer pair. The propositional content is inferred from the context, specifically from the question with which the answer is paired. Another claim is that one of the functions of interrogatives is the maintenance of common ground via the update and exchange of information between the interlocutors. It also serves to reinforce social affiliation in a group through having access to shared knowledge and understanding. The fact that languages have clausal types for requesting information, and asking (polar yes-no) questions, shows clearly how important this activity is to human communication, and the construction and maintenance of common ground, and meaning.

Chapter six, 'Semantic Structure of the Sentence: Cognitive and Pragmatic Aspects, by Irina Ivanova-Mitsevich, starts by observing that communication may be considered as the central organizing activity in human life, and that language is the main means of communication which provides a mechanism that permits us to produce the necessary units that can transfer the information in discourse. This mechanism helps human beings to create different units each having its own function. The notion of unit is that used by stratificational grammar, and the function of the unit—a sentence—is to present information about a certain state of affairs to the speaker's discourse interlocutor. A sentence performs its function by representing the structure of some state of affairs or, in other words, a situation. Ivanova-Mitsevich argues that, usually, the sentence meaning is thought of as a replica of a situation, but that there are some logical and communicative difficulties which prevent such interpretation of the

meaning of sentences. This understanding of the meaning of a sentence can lead to the conclusion that there should be as many sentence structures as there are types of situations. However, sentence structures are not so numerous. Ivanova-Mitsevich argues that exchanging information is possible only if the participants of communication have common structures. However, a new type of situation has no structure for itself, and a structure for it should be invented by a speaker. How then might the listener interpret it since the listener does not possess the appropriate structure? Thus, the meaning of a sentence should be a result of correlation of at least two semantic structures. One of these is the structure of our knowledge about the state of affairs (“denotational field”) and the other is a structure of our logics (“signification”). These two structures have different origins and functions. The linguistic aim of this chapter is to find what in the sentence semantics gives speakers the possibility to present a situation in different ways, and to find out what mechanisms underlie the variable reflection of a situation in the sentence structure. Ivanova-Mitsevich investigates the process of creating the sentence meaning, and the coordination of the necessary structures. Use of the two terms, “situation” and “denotational field”, show that in the denotational sphere we have to differentiate between the cognitive structure, which is immune to syntactical structures and is a part of our cognition, i.e. the denotational field, and situation, which is a model of some denotational field that is created for communication and directly enters the semantics of the sentence. Consequently, a given denotational field might be reflected by a number of differently structured sentences, each of which presents a specific view upon the field that is its own situation. While perceiving and categorising a fragment of reality, a speaker forms a model of it, i.e. a denotational field. This model includes the most abstract ideas about the objects of the reflected fragment of reality and possible relations binding them. In the process of creating a sentence for transferring knowledge of the reflected fragment of reality to the communication interlocutors, the speaker selects a minimal number of denotational elements relevant for the communicative conditions and establishes relations among them by creating a definite point of view on the denotational field, and frames a situation. In order to present a situation in a linguistic form, the speaker has to qualify the relations existing among the components of the situation, as dynamic or static, and directed or non-directed. The speaker needs to construct an appropriate proposition to enable reflection of the situation in a sentence. In employing operations of positioning, the focus of the speaker’s interest and the center of empathy, the speaker makes a logical arrangement of the nominal components of the situation.

Chapter seven, 'Linking constructions into functional linguistics: On functional-semantic characteristics of lexical-modal discourse-text 'transitions' in modern English and French', by Sabina Nedbailik, considers a discourse-text to be a coherent system, functioning as a complete message, possessing its own content and organised by abstract models, characterised by some distinctive features within the particular language. The notion of 'content' of a text is different from the notions: 'sense' and 'meaning'. For Nedbailik, coherence and cohesion can be treated not only as semantic phenomena, being manifested simultaneously as structural, semantic and communicative integrity, 'interacting as form, content and function'. As such, every text presents a regular structure, informed by a definite set of categories. The communicative integrity of a text is expressed in the relations of succession between its forming components. Each sentence is supported communicatively by a preceding one which produces various theme-rhematic chains, structuring a statement informatively from a known fact to a new one. All sentences are interlinked not only by their thematic unity and the principle of communicative progression, but also by various external signals, indicating that components form together some structural complex. The linking elements can be pronouns, articles and auxiliary verb forms, particles. Discourse-texts of different styles can also be formed by means of special elements, in the linguistics theory of logical connectives. These linking words, also called 'transitions', contribute to text structuring and facilitate reading, translating, comprehension. The connectors can guide the meaningful understanding of a discourse.

In section B: Semantic challenges in deriving meaning, the papers examine issues relating to the compositionality of semantics and meaning in the lexicon. Semantics encodes meaning with lexemes in the lexicon and when these are associated in combination, sentence meaning emerges—the *what is said*. Semantic meaning, however, is not 'just' the association of a concept with a lexeme. The construction of meaning is richer than that and may involve metaphor, metonymy and various kinds of schemata that facilitate meaning extension. Metaphor and analogy, and metonymy are powerful cognitive tools for the construction of meaning within the individual. It may also be the case that culture influences how we construct meaning, for example, in identity. The rich nature of meaning and its representation as knowledge continues to present challenges to us as linguists and scientists.

Chapter eight, starts section B. In chapter eight, 'Figurative Framing of Big Data', Inna Skrynnikov argues that the term *big data* is pervasive yet its meaning is ambiguous and confusing. By tracking the evolution of the terms "data" and "big data" the chapter reveals the meanings attached to them by

different usage communities. Skrynnikov frames the analysis of news items about big data via excerpts from the business and technology press which shows the crucial role of metaphor in conceptualising processes and phenomena of today's digital world of information. The types of metaphors employed and inferences drawn reflect and influence the perception of big data. Skrynnikov shows that the semantics of the terms "data" and "big data" have changed as a result of what she calls a confluence of social, cultural, and linguistic factors, thus replacing old meanings with new ones. Big data is known to have specific characteristics and properties that imply both the challenges and advantages of dealing with digital information. The properties of big data were initially referred to as the 3 Vs: volume, variety and velocity. Now, however, this list has been expanded to 10 properties which cover the multifaceted nature of big data. By applying metaphor to describe intricacies of the digital world, one can resolve the ambiguity and confusing surrounding notions of big data. In this regard, the explanatory power of metaphors highlights certain aspects of an unfamiliar phenomenon while obscuring other ones, thus enhancing our understanding. The role and relevance of metaphors are crucial for making data and big data meaningful and in shaping the meanings of these phenomena. A question Skrynnikov addresses is whether the interpretation of (big) data, its meaning and inferences are context- and subject-dependent. Given the advantages of the embodied approach to metaphor, this chapter follows the line of embodied cognition research in general and Lakoffian conceptual metaphor theory (CMT) in particular as applied to framing analysis of (big) data. Cognitive metaphor studies lead to applications of conceptual metaphor theory to fields such as media studies, discourse analysis, communication studies, and political science. Metaphors in political discourse enable mass media professionals to rely on their interpretative power and construct salient narratives they wish to promote. Framing pressing societal issues in a certain way through employing a set of corresponding metaphors repetitively, which in their turn evoke intended inferences, ultimately forms stable neural connections in the minds of a target audience. The transition to the information era calls for a major shift in a set of preferable metaphors we employ to make sense of digital information. Skrynnikov argues that the most effective data-related metaphors should be rooted in our embodied experience as a fundamental part of the way we think and act in the world. Skrynnikov further argues that both data and big data function in discourse as contested and evolving terms, and metaphor is a powerful and relevant cognitive mechanism for making these complex phenomena meaningful and shaping the meanings of these phenomena. The metaphors we use reflect the ways in which we view and understand big data. The chapter finds that

media discourse about big data is highly figurative, signalling our need for familiar embodied concepts to characterise the digital world. This chapter substantiates the crucial role of metaphor in conceptualising processes and phenomena of the digital world. The major claim of Skrynnikov in the chapter is that the types of metaphors employed and inferences drawn reflect and influence the perception of big data providing implications of its current conceptualisations

Chapter nine, 'Over in radiotelephony communications' by Maria del Mar Robisco Martin recognises that, for over sixty years, aviation radiotelephony has been based on a standard phraseology designed to achieve the utmost clarity and brevity and to minimise failures in air-ground communication. It consists of codified and limited dialogues between air traffic controllers and flight crew members. The *International Civil Aviation Organization (ICAO)* created the *Proficiency Requirements in the Common English Study Group* and mandated that 1) English should be the universal medium for radiotelephony communications. 2) All pilots and controllers should pass an English language exam to achieve an ICAO operating level of competence. 3) All pilots and controllers should make global use and a correct application of the phraseology in these interactions. 4) It would be necessary to carry out studies to analyse the English language in these communications and to create teaching resources. Thus, following the ICAO's Requirements, Maria del Mar Robisco Martin, in this chapter, focuses on the language employed in radiotelephony communication, in particular, on the preposition *over*. This study is significant because the polysemy can affect the interpretation of a sentence and create misunderstandings. Prepositions are amongst the most polysemous words in English and the semantic network associated with any preposition in one language rarely overlaps with the meanings of any single linguistic form in another language and *over* is perhaps the most polysemous of the English prepositions. The aim of the chapter is to show the multiplicity and fuzziness of meaning in natural language, in contrast with the simplified view suggested by the standard phraseology. Therefore, this chapter deals with the polysemy and with the polysemous preposition *over* in particular. It is based on a corpus consisting of authentic cockpit voice recordings which have been processed using the AntConc software. The purpose is to demonstrate that, in the sampled cockpit voice recordings, *over* appears with more meanings than with the primary configuration, and to systematise the senses of *over* in this context. The findings suggest that *over* is used in eleven distinct senses and that they create a semantic network. Supporting this research, an electronic database consisting of cockpit voice recordings, belonging to an aviation accident database which includes all civil aviation

accidents of scheduled and non-scheduled passenger airliners worldwide, and which resulted in at least one fatality, was used to produce an electronic corpus of items. The recordings are taken from fatal aviation accidents which occurred between 1962 and 2002. The findings suggest that the Primary Sense is the only meaning of *over* proposed by the phraseology whereas an examination of aircraft communications shows that *over* is used in a range of other senses (the Primary Sense, the Covering Sense, the On-the-other-side Sense, the Transfer Sense, the Completion Sense, the More Sense, the Control Sense, the Examination Sense and the Repetition Sense) which create a semantic network.

Chapter ten, Linguistic and cognitive bases of differentiation of conceptual metaphors and metonymy, by the authors Svetlana V. Kiseleva, Nella A. Trofimova, and Irina B. Rubert, deals with the essence of metaphor and metonymy. Within cognitive science, which explores the processes of perception, categorisation and understanding of the world, metaphor and metonymy are considered as the manifestation of analogue capabilities of the human mind. The relevance of metaphor and metonymy in speech resides in the fact that these are ways to connect objective and subjective reality in order to convey to the listener not only the meaning of the statement, but also one's internal state and attitude to what was said. That is, metaphor and metonymy in speech are ways of combining our thinking with language, which allows people to communicate most effectively. These two different types of operations with signs—metaphor and metonymy—show that we need to study cognitive mechanisms. In this chapter, Kiseleva, Trofimova, and Rubert have as their goal to determine and to justify the linguistic and cognitive grounds of differentiation of conceptual metaphor and metonymy. The research reported on in this chapter consists of three main parts. The first is entitled “Metonymy in cognitive theories”, and offers a review of different approaches to the study of metonymy. The second part, “Metaphor in cognitive theories”, presents the theories of conceptual metaphor and the cognitive classification of metaphors, while the third part considers approaches to the distinction between conceptual metaphor and metonymy. In linguistics, metonymy is understood as a mechanism to expand the semantic range of a word. Cognitive linguistics expanded the interpretation of metonymy and separated cognitive metonymy, a mechanism for the conceptualisation of reality, from linguistic metonymy, a semantic mechanism for developing the meaning of a word. A metaphor in cognitive linguistics is understood as a mechanism, a process, and a result in a single and generalised form, a form of thinking. Specifically, if it is necessary to specify the meaning of the term *metaphor*, then the following terms are required: process, meaning, model, mechanism. The cognitive

theory of metaphor highlights its conceptual properties. It is the study of metaphor as a component of our conceptual system that determines the direction of research in modern metaphor theory. In this chapter, the authors consider metaphor in two aspects as static and dynamic, that is, as a result and as a process. Additionally, a third direction, metaphor and metonymy as two independent cognitive processes, is considered in virtue of the use of the cognitive-matrix method of research. The difference between metaphor and metonymy is seen in the fact that metaphors include a systematic projection of ontological, figurative-schematic and logical structures from the target area to the source area based on the relationship of similarity between the interacting areas. Metonymy includes the relationship of adjacency, expressed by various associative links, and leads to a referential shift. When considering the constructions of metaphorical and metonymic statements based on literal ones, the authors place emphasis on the basic action frame, because metonymic and metaphorical characteristics are associated with its certain parameters, and the action frames functioning within the matrices in metonymic and metaphorical processes are shown to have different origins.

In Chapter eleven, 'From walled off Europe to walled in identity', Natalia Iuzefovich reports on ongoing research about the "wall phenomenon" viewed as a marker of identity, at both national and individual levels. It is argued by Iuzefovich that our world has constant movement of people, not necessarily voluntarily, and people are losing the sense of identity that comes from being a member of a community. It is urgent therefore that linguists' study linguistic properties within political discourse which cause identity variation. In this chapter, Iuzefovich further argues that the most crucial changes of identities have been observed since the middle of the 20th century up to present times and these changes are revealed at large in the border wall issue. The "wall phenomenon" as seen as a marker of a human identity is very controversial and reflected mostly in political discourse. Iuzefovich argues that no study on the issue "wall and identity" can be fully integrated without a socio-cognitive perspective. The conceptual structure of "wall" is variable, dynamic, and it has been changing much due to political and socio-cultural context. Iuzefovich defends the claims that "wall off" implies an active role: we construct border walls with the intention to keep out others, 'them', strangers, enemies, etc. Being walled off makes us mentally 'walled in', we do not recognise other cultures appropriately. Limited or no communication with peoples of other cultures make US view THEM not just as 'others' but more like enemies, terrorists, and strangers. This chapter addresses several important questions: 1) What verbal means of representing the conceptual structure "wall" can be singled

out from political discourse, and how are they interrelated? 2) What promotes human identity variation? 3) What changes in intercultural and intracultural relations does the “wall phenomenon” cause?

Section C: Computational approaches to meaning construction, is concerned with the use of computational strategies for the representation of meaning in software for deployment in various language aware applications and, perhaps, over the internet within social media. Computational approaches to meaning construction need to be rigorously specific in delineating the interfaces between lexicon, semantics, morphosyntax in order to instruct the software to produce and understand grammatically correct, or even ungrammatical but acceptable, utterances. The computer scientist working with language aware software employs different strategies to natural language understanding and the extraction and construction of meaning. These often bring an NLP engineering approach to software rather than a linguist’s understanding. More frequently, computer scientists collaborate with linguists towards the common goal. The strategies that computer scientists and computational linguists bring may employ complex algorithmic strategies to defining the linking system across the interfaces of human language, such as between lexicon, semantics, morphosyntax. At other times, they may employ insights from data mining and data analytics to the derivation of meaning. Computer scientists and computational linguists often build digital corpora that are machine readable for use by linguists. When computer scientists and computational linguists collaborate on the diverse languages found in the world, they typically provide very significant benefits towards our understanding of meaning and its representation, in this instance in software. Today, with the rise of important human language and cognitive technologies (such as IBM’s Watson) in the second decade of the 21st century, contemporary challenges facing computer scientists and computational linguists include building software ‘bots’ that act as conversational agents. As language aware software, these human language technologies have enormous potential in our globalised worlds as working applications ranging from detection of cyberbullying in social media to language assistants for Deaf Sign Language users.

Aurelia Power, in chapter twelve, ‘The role of previous discourse in detecting public textual cyberbullying’, observes that previous work in the field of cyberbullying detection has focused solely on individual instances/posts taken in isolation, rather than part of the online conversation/dialogue. Consequently, the detection process typically considers only the information contained in the post itself, such as the presence of profane or violent words which may be indicative of cyberbullying. However, online discourse contains many instances that do

not comply with grammatical standards, or they provide insufficient information. For example, the instance *You clearly are* was labelled by annotators as cyberbullying in an authentic dataset, despite the fact that its content suggests no cyberbullying, and it was only when one considered the previous post uttered by a different user—*I am not pathetic*—that it was possible to identify one of the cyberbullying elements in the form of the offensive adjective *pathetic*. To address this limitation, Power investigates the role of previous instances/posts in identifying the missing cyberbullying elements, and she proposes a framework that relies on the definition of cyberbullying which divides information into discourse-old and discourse-new. Specifically, the focus of the chapter is on how discourse-old information is used to inform meaning, and infer some or all three necessary and sufficient cyberbullying elements: the personal marker, the dysphemistic element, and the link between them. First, Power analyses discourse-dependent instances of cyberbullying present in her dataset and proposes a taxonomy of their underlying constructions as follows: (1) fully inferable constructions, where all three cyberbullying elements, the personal marker, the dysphemistic element, and the link between them, are not explicitly present, but can be inferred from previous discourse, (2) personal marker and cyberbullying link inferable constructions where the dysphemistic element is explicitly present, but the personal marker and the link must be inferred from previous discourse, (3) dysphemistic element and cyberbullying link inferable constructions where the personal marker is explicitly present, but the dysphemistic element and the cyberbullying link are entities inferable from previous discourse, and (4) dysphemistic element inferable constructions where the personal marker and the link are explicitly present, but the dysphemistic element must be inferred from prior discourse. Power then develops resolution rules to identify the personal marker, the dysphemistic element, and/or the cyberbullying link, in other words, to transform such instances into instances that contain them explicitly, and, therefore, into instances that can be subjected to the detection rules discussed elsewhere. Importantly, these resolution rules are divided into separate sets that target: (1) polarity answers, (2) contradictory statements, (3) explicit ellipsis, (4) implicit affirmative answers, and (5) statements that use indefinite pronouns as placeholders for the dysphemistic element. Finally, algorithms are described to implement these resolution rules, using several types of information: grammatical and syntactic information, such as part of speech and dependency relations among sentential constituents, as well as pragmatic information, such as the previous posts and the user names.

Chapter thirteen, ‘Detection of cyberbullying using text mining’ by David Colton and Markus Hoffmann, also addresses the determination of meaning in a cyberbullying context. In this instance, it is achieved through strategies of text mining, as against lexical and linguistic means as we saw with the previous chapter. Colton and Hoffmann note that the Internet technology boom has led to a proliferation of tablets, laptops and smart phones with high-speed Internet access. This access, coupled with the advent of instant messaging, chat rooms and social media websites, has led to an Internet generation who think nothing of posting selfies, mood updates, their relationship status or anything about their life on-line. The traditional bully was the kid in school, or office worker, who got pleasure from watching their victims suffer as they verbally abused them or perhaps made fun of them or maybe even threatened them with physical violence. The bully has now moved on-line and a cyberbully now has 24-hour access to a potentially unlimited number of victims. The consequences of this cyberbullying activity are frequently read about in the newspapers, following another tragic teen suicide. To prevent this new form of bullying, it is important that technology is used to detect these cyberbullying posts. This chapter shows that the Python programming language, together with the application of text mining techniques in meaning resolution in cyberbullying detection, can be successfully applied in the automatic detection of cyberbullying text. As part of the contribution of this research, a new classified cyberbullying dataset, including detailed descriptions of the criteria used in its classification, and an in-depth analysis of several classifiers is undertaken. A novel way of determining the best overall classifier using the recall values of both the positive and negative class is suggested. Colton and Hoffmann provide an evaluation of the best models by simulating their evolution as new, previously unseen, samples are classified and then included as training data for subsequent iterations.

Irene Murtagh, in chapter fourteen, ‘Motivating the computational phonological parameters of an Irish Sign Language avatar’, provides an account of the computational phonological parameters of an Irish Sign Language (ISL) avatar, while motivating the phonological-morphological interface in ISL. Sign Languages like ISL are visual gestural in nature, and have no written or aural form. Therefore, in order to communicate an ISL utterance computationally, Murtagh implemented a humanoid avatar in software capable of movement within three-dimensional (3D) space. Murtagh uses the functional-cognitive RRG as the theoretical framework. Using RRG provides significant theoretical and technical challenges within both the RRG theory itself, and the software. Prior to preparing a linguistically motivated computational definition of lexicon entries to

represent ISL within the RRG lexicon, Murtagh defines the ISL phonological parameters in computational terms. In providing a definition of a linguistically motivated computational model for ISL it was necessary to refer to the various articulators (hands, fingers, eyes, eyebrows etc.), as these are what are used to articulate various phonemes, morphemes and lexemes of an utterance. Importantly, Murtagh proposes a new level of lexical representation, which describes the essential computational phonological parameters of an object as defined by the lexical item. The new level of lexical meaning proposed includes an articulatory structure level, which caters specifically for the computational linguistic phenomena of Sign Languages, such as ISL, enabling the representation of lexical items within the RRG lexicon.

Kulvinder Panesar in chapter fifteen, 'Motivating a linguistically orientated model for a conversational software agent', also uses RRG as the functional-cognitive linguistic model in her research. Specifically, Panesar proposes a linguistically orientated model of a conversational software agent (CSA) framework sensitive to natural language processing (NLP) concepts in a functional linguistic approach. She discusses the relationship between natural language processing and knowledge representation (KR), and connects this with the goals of the RRG linguistic theory in a computational implementation. Panesar proposes a design of a computational model of the RRG linking algorithm that utilises a speech act construction as a grammatical object with a sub-model of belief, desire and intention (BDI). This model has been successfully implemented in software using conceptual graphs and the resource description framework (RDF). Panesar highlights some important implementation issues that arise at the interface between language and meaningful knowledge representation.

Section D: Digital ontologies and their role in meaning, explores the development and population of digital ontologies and how meaning is defined and encoded within the ontology. This is a considerable challenge given that we live in a multi-lingual world and that, when digital ontologies are employed in software, getting the definition correct and unambiguous is crucially important. Digital ontologies therefore need to be able to make correspondences between meaningful concepts across different languages. Often, concepts have a scalar or graded nature, and the digital ontology must be able to encode the correct and appropriate level of granularity within a concept definition. Some concepts have a physical reference in the world whereas others are more ephemeral and abstract. Others are action-oriented and might be realised in language as a verb in one of its manifestations (verb, verbal noun, participle.). Often, because of the sheer size and complexity of the challenge involved in the creation of digital ontologies and capturing

meaning and representing meaning with them, domain specific ontologies are elaborated. Digital ontologies have a relationship with the lexicon and, once populated, they can be used to inform, provide interfaces to, or even generate, the lexicon of a language. A significant challenge for digital ontologies is word sense disambiguation on natural language processing. Another significant challenge for knowledge engineering with respect for digital ontologies is automatically and dynamically harvesting new knowledge from online digital sources on the Internet, and parsing the information and data found in various meaningful ways.

Chapter sixteen, ‘An experimental review on methods for Word Sense Disambiguation on Natural Language Processing’ by Fredy Núñez Torres, is concerned with digital ontologies and their role in meaning determination. The chapter presents a motivated proposal for reviewing and testing for the most relevant Word Sense Disambiguation (WSD) methods used nowadays on Natural Language Processing (NLP). This approach considers the development of experiments applied to a Chilean Spanish corpus that was designed based on the semantic representations available on the lexico-conceptual knowledge base FunGramKB. The chapter reports on computational procedures used for automatic WSD, such as machine learning; path-based metrics and overlapping glosses; and multinomial logistic regression. In the research reported here, a semi-automatic selection of potentially polysemous lexical units (nouns) was carried out to select instances (sentence context) for certain lexical units extracted from the written mass media corpus belonging to CODIDACH: Corpus Dinámico del Español de Chile (Dynamic Corpus of Chilean Spanish) and the selected lexical units were linked with specific concepts of the #ENTITY subontology of FunGramKB. The assembly and execution of all the experiments has been carried out using ‘Data Mining Encountered’ (DAMIEN), a computer environment to support linguistic research. DAMIEN integrates, in the same work environment, the different tools and techniques that can be applied in the analysis of linguistic corpora. These techniques come from different disciplines, such as corpus linguistics (e.g. frequency lists; XML processing and XSL; database administration and SQL; regular expressions; etc.), statistics (e.g. descriptive and inferential statistics; graphic representation of data; etc.), natural language processing (e.g. extraction of n-grams; derivation; morphological and syntactic analysis; POS tags; etc.), and text mining (e.g. classification and clustering).

Chapter seventeen, ‘Ontology enrichment: A case study on the plants domain’ by Eva M. Mestre-Mestre and Pedro Ureña Gómez-Moreno, notes that today’s information technology permits vast amounts of data to quickly circulate across the Internet. Now, there is so much information available to

Internet users, that it becomes difficult to access it. Access and retrieval of this information is challenging, and there exists a 'knowledge acquisition bottleneck' and a lack of digital systems able to extract meaningful patterns from huge volumes of data. Ontologies are a preferred approach to address this problem. Ontology learning is the application of Knowledge Engineering strategies and methods to create ontologies, using automatic or semi-automatic methods, whereby the ontologies are created or increased and improved with little, if any, human intervention. Ontologies can be built up using structured, semi-structured or unstructured data. Depending on the way in which information is organised, ontologies can be based on linguistics, logics, machine learning methods, statistics-based. Linguistic approaches use different strategies, such as POS (part of speech) based patterns, semantic lexicons, or seed words. This chapter builds on a method for ontology enrichment which aimed at enlarging an ontology based on the collocational information of the features which characterise a term. The underlying reasoning is that two similarly described subordinate concepts likely correspond to the same superordinate. This motivated a strategy to locate the corresponding superordinate node for each of the terms proposed for inclusion (subordinates). In this chapter, Eva M. Mestre-Mestre and Pedro Ureña Gómez-Moreno, present the results of this experimentation in the construction of meaning via an ontology, carried out using a specialised domain related to the plant kingdom. The particularity of this domain-specific corpus is that, due to the classification of plants, the basic working units were bigrams.

The book provides a coherent and integrated set of analyses and addresses issues concerning the construction and management of meaning, and knowledge, over a diverse collection of languages from across the world in the perspectives of functional, cognitive, constructional, knowledge engineering, ontological, and computational approaches, in a range of cross-linguistic treatments. As a result, this volume represents a timely and contemporary instance of cross-linguistic comparison of these important discourse and syntax-related phenomena. Further, this volume contributes towards providing a comprehensive overview of the construction of meaning in language, which is central to our understanding of how human languages function. This includes Internet communication which represents a new level of linguistic discussion for the digital online world. This scholarly work leverages new and advanced thinking from knowledge engineering, data analytics and computer science. The book considers the contribution of context and situation to utterance meaning within a speech act in discourse, semantic meaning including lexical and compositional meaning. It also discusses the contribution of metaphor and metonymy, and

computational linguistic approaches, to the construction of meaning. Issues of knowledge representation are addressed in language aware software applications (i.e., Avatars, Social Media, and Internet Communications) at the interfaces between lexicon-semantics-syntax, and concise definitions of concept meaning in multilingual digital ontologies that motivate a machine-readable lexicon for use within human language technologies. The chapters bring fresh and relevant insights to the rich and complex dimensions of meaning and knowledge representation. The research reported on here shows how linguistic and computational strategies concerned with meaning and knowledge representation contribute to our understanding of grammar and human language, and how we use language.

The work will be of interest to the community of researchers and scholars within functional linguistics, knowledge engineers, computer scientists, and postgraduate students internationally who work with pragmatics, linguistics, semantics, knowledge engineering, data analytics, computer science, natural language understanding, human language technologies, and digital corpora, at the interfaces between pragmatics, syntax, semantics and the lexicon.

SECTION A.

**MEANING IN LANGUAGE IN INTERACTION—
PRAGMATIC CHALLENGES**

CHAPTER TWO

CHALLENGES FOR KNOWLEDGE
REPRESENTATION:
EMERGENCE IN LINGUISTIC EXPRESSIONS
AND INTERNET MEMES

ELKE DIEDRICHSEN

1. Introduction

In modern approaches to linguistics, the relationship between signifier and signified is not believed to be something static, that is once and for all stored in the mental lexicon and shared by all speakers of a language. Rather, the concept of ‘emergence’ has entered the discussion of the way people create and understand linguistic items and utterances, and it seems to encompass all aspects of linguistic production and comprehension.

The term *emergence*, established in conversation analysis and pragmatics (Hopper 1987, 1998, 2011), expresses the view that the dynamic and interactive nature of language applies to all aspects of communicative interaction. This involves the grammar, the convention of meaning of the signs used, the application and reliability of shared knowledge, the shared culture and its influence on the exchange. Rules and conventions emerge in interaction, as they are interactively created and negotiated.

Knowledge bases and many theories of linguistics seem to assume that humans acquire their language, including their grammar, their ontology and all aspects of meaning conventions once and for all, and then live and communicate with this set of linguistic knowledge items for the entire time they spend in a culture. This rather static view, however, does not consider the dynamic nature of communicative interaction, where circumstances change, people get in and out of peer groups and belong to many smaller or greater cultures at a time. Furthermore, the concept of a ‘culture’ and the knowledge shared in it is dynamic as well. Kecskes and colleagues (2008, 2010, 2012, 2014, Kecskes and Zhang 2009) maintain that the “common

ground”, which is the knowledge shared between speakers in an interaction, may but need not be shared in advance of the conversation. There is also “emergent common ground”, which is knowledge that comes up as part of the interaction and is dynamically integrated by the interactants. As for culturally shared cognitive concepts that provide the basis for the behaviour in an interaction and the linguistic expressions used, Sharifian (2011, 2015, 2017) finds that these are emergent and negotiable as well. Also, modalities change, and this is especially true for today’s use of communication, which is potentially multimodal, global and immediate.

In this paper, I will discuss aspects of the emergence of linguistic structures, including the dynamicity and other-orientedness of communication, which entails the reference to and interactive recreation of common ground. I will also analyse examples of formal and functional variation in linguistic constructions, which have been described by the term ‘openness’ (Hopper 2004). The term comprises the aspect of variability, but also, as I will show, the establishment of hints towards subjectivity and speaker’s attitudes in the structures. I will proceed to extend these findings beyond linguistic items to include communicative resources found in modern online interaction, in particular image macro Internet memes.

The article will proceed as follows:

In the next section, I will outline some philosophers’ and researchers’ opinions about the dynamicity of communicative exchange, that holds across the board for all aspects of communication. I will hold this against the advances made with Google’s recent invention, the Duplex speech assistant, in section 3, where I will also provide a short evaluation of the progress that has been made towards automating natural conversation, and the difficulties that are still remaining.

In section 4, I will demonstrate what it means for a complex linguistic expression to be emergent and therefore ever formally and functionally open to changes: I will discuss two examples of constructions that show variations in form and function. One of them, a German quotative construction involving the position verb *sich hinstellen* (stand) conveys a speaker’s personal sentiment towards the quoted phrase and its producer. There is substantial variation with respect to the nature of this sentiment, as it can vary on a range between negative and positive, not excluding neutral.

In section 5, I will discuss one form of recently established communication, which is the creation and exchange of Internet memes on social media. I will show that memes can be treated as communicative units, which build on a shared culture. The sentiments motivating their creation are fleeting, semantics and references to shared knowledge are freely established in the moment of exchange, and the formal realization is

multimodal. At the same time, memes establish conventions for meaning and even develop grammatical features, which are recognised and elaborated on by subsequent users in freestyle interaction. I will discuss two popular memes in order to demonstrate the emergence of form and meaning with them, and the background on which users operate in order to recognize, understand and procreate the formal realisation and the semantic essence of a meme, including the pragmatic function and the sentiments it carries. Section 6 is the concluding section.

2. Signs, grammar and background knowledge are subject to *emergence*

The meaning of linguistic signs can be explained by the notion of convention. This insight has been expressed by Wittgenstein and his usage-based approach to meaning in the *Philosophical Investigations*.

Die Bedeutung eines Wortes ist sein Gebrauch in der Sprache.
 (The meaning of a word is its use in the language)
 (Wittgenstein 1960 §43 [Engl. 1963])

In order to find out about the meaning of a word, speakers have to find out about its use in the community that uses the word. The meaning is nothing that lies within the sign itself, and it is not a representation of things “in the world”. The meaning and use of a word are, however, learnable, and it is possible to use a word incorrectly (Keller 1995).

In his theory of semiotics, Umberto Eco maintains that the meaning of signs cannot be based on the existence of things in real life. Taking into account abstract terms and the usage of expressions for things that an individual has not personally seen or experienced, he concludes that all meanings are cultural units, mutually shared by members of a culture, and that this approach to meaning involves understanding language as a “social phenomenon” (Eco 1976: 68). People grow up in a community, and their social life develops on the basis of cultural units, not on things.

(...) things [are] only known through cultural units which the universe of communication put into circulation *in place of things*.
 (Eco 1976: 66, emphasis in original).

We may commonly speak of a thing called */Alpha Centauri/*, but we have never experienced it. An astronomer has occasionally experienced it with some strange apparatus. But we do not know this astronomer. We only know

a cultural unit communicated to us by means of words, drawings or other means.

(Eco 1976: 66, emphasis in original).

The expressions are not only delivered by the culture we live in. They are, furthermore, created and equipped with meaning within and through interpersonal interaction. The cultural basis of our usage and understanding of signs is not a static one, that is learned once and for all by growing up in a culture. It is, furthermore, an ever evolving process of creation, feedback, learning, and the emergence of new meanings, new means of expression, and new formal realisation of content (Feilke 1996, 1998, Linell 2006, Hopper 2004, 2011, Sharifian 2017).

In natural language, grammar and the forms of expression are *emergent*. This does not only mean that they get established through language use and then fossilize into grammatical forms. Rather, the utilization of new formal means of expression happens in live communicative interaction, where grammatical constructions develop and establish a meaning convention, but retain a certain openness with respect to alternative interpretations and formal extensions and changes (Hopper 2004, 2011). I will discuss two examples of this process in section 4.

The next section will deal with one attempt at providing a tool for automated communication with a natural feel: The Google Duplex assistant.

3. What makes communication natural? On common ground and recipient design, and the achievement of the Google Duplex assistant

Natural communication is generally other-oriented, that is oriented at the person or the group that is conceptualized as the audience (Grice 1975, Linell 2006). The producer of the utterance may or may not know their audience, and may have more or less insights about their knowledge, thoughts, and expectations. Recipient design is mostly oriented at a conceptualization of the other made up by the speaker herself (Deppermann and Blühdorn 2013, Deppermann and Schmidt 2016, Duranti 2008). Linguistic interactions are generally believed to be built on common ground, which is knowledge that is mutually believed to be shared prior to the interaction (Clark 1996, Enfield 2008, Tomasello 2008). However, common ground is not necessarily achieved by recipient design prior to the interaction, but also interactively accomplished during the exchange. Common ground is partly stable, but partly dynamic and highly flexible

(Kecskes 2008, 2010, 2012, 2014). Kecskes and Zhang (2009) therefore distinguish between core and emergent common ground.

Table 1 gives an overview of the differences between core and emergent common ground. It shows that core common ground is mostly based on knowledge mutually shared through exposure to the same cultural environment. Emergent common ground, on the other hand, is knowledge established and interactively achieved in ongoing communicative interaction.

Table 1. Core and emergent common ground (Based on Kecskes and Zhang 2009: 347–349, Diedrichsen to appear b.)

Core common ground	Emergent common ground
Common sense, culture sense, and formal sense (knowledge about the world, one's own culture, the language system used) Addition: Knowledge shared between the set of participants before taking part in a particular interaction	Shared sense, current sense (knowledge about personal experiences and perceptions <i>shared in the situation</i>)
static	dynamic
Common to a speech community Addition: This may be a small community, the language shared may not be any participants' native, and specialised code systems and rules may apply	Developed in the current interaction
Shared prior to the conversation	Established in the conversation
Variation occurs diachronically, or between individuals, contingent on life style, age, education, geography and other cultural factors	Variation can occur from situation to situation, the perception or attention in a situation or the recollection of memories may vary, so interactants have to reassure and co-construct shared knowledge

These things have to be taken into account for the explanation of natural dialogue. Linguistic interaction that feels natural is the aim of language aware software. One big step into that direction has been made with Google Duplex, a software assistant that is able to make natural-sounding phone calls. The naturalness of the interaction from the machine is achieved mainly by the insertion of pauses and speech disfluencies, like *umm...* and *er...*

The conversations with the Google Duplex system sound almost human like due to advances in *understanding, interacting, timing and speaking.*

Google Duplex can be used for defined tasks with a kind of exchange that has expectable turns, like booking a table in a restaurant for a certain time, or booking an appointment at the hairdresser's. These involve introducing the person for whom the booking is made, and some back-and-forth-talk about the time and day and any particulars of the booking. The system is trained on a corpus of phone conversation data.

The domains in which it operates are relatively restricted and the conversation revolves around predictable items. These items do not require extensive background knowledge, and there is generally no discussion or elaboration involved. The system, however, is also able to work around misunderstandings and interruptions in a natural manner. Duplex uses a recurrent neural network (RNN) that is able to use its internal memory to process sequences of inputs. It can perform unsegmented, connected speech recognition. It was built using TensorFlow Extended (TFX), which is a "TensorFlow-based general purpose machine learning platform implemented at Google"¹.

The developers use real-time supervised training for training the system on a new domain. That means that an experienced operator is present during the phone calls to correct the system in real time whenever needed. When the system is confident enough to manage the task, it is left on its own.²

¹ Tensorflow: <https://www.tensorflow.org/tfx/> (last accessed 5 March 2019).

² Google Duplex: Real Talk. <https://ai.googleblog.com/2018/05/duplex-ai-system-for-natural-conversation.html> (last accessed 5 March 2019).

Receptionist: "Hello, How can I help you?"

Google Assistant: "Hi!! I'm calling to book a women's haircut for a Client."

Ummm, I'm looking for something on May 3rd."

R: "Sure, give me one second."

GA: "mm..Hmm.."

R: "Sure, What time are you looking for around?"

GA: "At 12 PM."

R: "We do not have a 12 PM available, the closest we have to that is 1:15"

GA: "Do you have anything between 10 Am and, uhh, 12PM?"

R: "Depending on what service she would like. What service is she looking for?"

GA: "Just a women's haircut for now."

R: "Okay, we have a 10 o' Clock."

GA: "10 AM is fine."

R: "Okay, what's her first name?"

GA: "The first name is Lisa."

R: "Okay, perfect! So I'll see Lisa at 10 o' click on May 3rd."

GA: "Okay Great, Thanks!"

R: "Great. Have a Great day, bye."

Figure 1. Transcript of Google Duplex' call at the hairdresser's to book an appointment³

Spontaneous interaction in an engaged live conversation is not a trivial matter, because it takes large portions of shared knowledge and a mutual accord of interests, expectations, priorities and sentiments. These are generally not prepared in advance of the interaction, but in fact interactionally achieved and negotiated, such that the conversation itself continuously updates the knowledge resources that speaker and hearer have of each other and of the situation. If the initiator and leading part in the interaction is a machine, how come that the interaction is working out so smoothly, as in the Google Duplex applications?

The success of the Google Duplex interactions, I think, is achieved because the field of application is narrowly defined. The software is applied for use cases that have a clear structure, and predictable exchanges of information, which are essentially dates and times and the nomenclature of

³ Google Duplex: Real Talk. <https://ai.googleblog.com/2018/05/duplex-ai-system-for-natural-conversation.html> (last accessed 5 March 2019).

services that can be booked from the receiver's business. There is no discussion, no agitation, no expression of sentiments, and the use cases make it highly unlikely that figures of speech or irony will be used. Therefore, this type of communication is plannable to a high degree, and the contents of the turns are predictable.

4. The openness of constructions

While grammar is generally treated as a system of rules that have to be obeyed in the use of a language, it is necessary to remind oneself that grammar was not there before human interaction took place. Grammar is never fixed or written in stone, but it is an adaptive system, that undergoes changes as linguistic interaction goes along. This is not only true for long-term changes, which are generally described by theorists of grammaticalisation and construction grammar. Rather, the adaptive capacity of grammar is applied in any communicative interaction.

'Grammar' is an epiphenomenon of frequent combinations of constructions. Because grammar is a result of interactions rather than a prerequisite to them, it is not a fixed code but is caught up in a continual process of local adaptation (emergence). These adaptations are microscopic (...), and either go unnoticed or are dismissed as 'errors', but they provide the potential basis for future use and for the analogical spread of forms. (Hopper 2004: 1)

Linguistic researchers look at recurrent patterns in language and consider them as grammatical items, i.e. constructions, if they show a regular shape and a predictable communicative function or meaning. The identification of this regularity may not be straightforward, however, as the constructions, while recognizable and comparable, show variations in both shape and function. I will discuss two examples for this phenomenon. One is a complex English construction that has a recurrent function but occurs in a variety of formal realisations (Hopper 2004). The other one is from German. It is a quotative construction containing one element that introduces a speaker's sentiment towards the quoted content and its producer. With this construction, there is not only variation in the form, but also in the meaning, in that the sentiment conveyed may be on a scale between positive and negative, including neutral (see also Diedrichsen 2019b to appear b.)

4.1 Formal openness: *The take + NP+and construction* (Hopper 2004)

Hopper (2004) argues that the construction with the form [NP₁ + *take* + NP₂ + *and* + VERB + PRON₂ + AdvComp] is a grammatical unit.

The following example is regarded as typical for the general formal and functional feature combination of this construction (after Hopper 2004, his example 22):

- (1) This test, part of what this test will do, I think, will take national standards and move them down into the classroom (CSPAЕ¹).

This is mostly corroborated by the finding that in spoken language corpora, this sequence appears frequently with a recurrent function in which generally the following can be observed:

1. NP₂ and PRON₂ are coreferential.
2. *Take* and the lexical verb of the conjunct clause are coreferential. They do not refer to distinct actions. In that sense, *take* does not appear in its full verb semantics, but rather represents a case of a “pro-verb” (Hopper 2004: 12) that has only a grammatical function. The cognitive function of the construction is to allow the distribution of two salient and highly informative lexical arguments over two simple clauses.

Given the faded semantics and merely grammatical, supportive function of the verb *take*, this construction resembles constructions found in serial verb languages, and there is therefore good reason to view it as a construction in the sense of a complex unit of form and meaning, as described in the theoretical field of Construction Grammar (Fillmore et al. 1988, Goldberg 1995, Langacker 1987).

The following attested examples work in favour of this analysis. Note how in (2), the subject of *take* is not agentive, supporting the view that *take* only appears as a support for the whole construction and not in its full verb semantics:

- (2) bacteria contained in the nodules can take atmospheric nitrogen and convert it.

¹ CSPAЕ: *Corpus of Spoken Professional American English*, by Michael Barlow, available from Athelstan <<http://www.athel.com/cspa.html>>

- (3) Other times I'd maybe take half the class and assess them at one task and the other half on a different task later on.

There are examples of this construction, however, that deviate from the form-meaning described, and raise the question if this combination should indeed be viewed as a construction. The following aberrations occur, among others (see Hopper 2004 for a full discussion. The italics in all examples are adopted from Hopper's paper):

- (4) The second subject is not elided (Hopper's example 36):
so sometimes we take three or four characters and *we make them into one*.
- (5) *and* is replaced by *but* (Hopper's example 38):
And he could take the most complex story—he himself was a very complex man—*but tell it in the most, not simplistic, but simple manner*; very direct.
- (6) There are multiple *take* clauses (Hopper's example 46):
My hope is that *we can take that energy and take that anger and take that that unrest that people are feeling* and do something with it to really make some differences in public policy.
- (7) The second NP is *not* coreferential with the first (Hopper's example 52):
The process is a bit like taking *a hammer* and smashing *a clock* to find out what makes it tick.
- (8) The second clause may not have any connection with the first (Hopper's example 58):
Go backwards though. *Take a classroom where there is free and open access now* and suddenly give a test where there isn't free and open access. And what's the message to the teacher?

The emergence of the construction, alongside with its occurring incompleteness, may be explained on the basis of its functionality, according to Hopper (2004: 18). The monoclausal use of *take* with a direct object NP has the function of introducing an "exemplary referent" into the discourse. It is possible, but not necessary, to follow the introduction of the referent in the *take* clause with a coordinative clause including an anaphoric or semantic co-referent or matching transitive verb. This has the cognitive-pragmatic function of introducing a number of prominent lexical items in a biclausal unit. This unit has the advantage of handling prominent, lexical material in a way that does not overwhelm cognition, but is still relatively short and

recognizable.⁴ Therefore, variations of this construction can be found repeatedly in discourse, and their connectedness can be described in terms of family resemblance, rather than a strictly defined, stable unit of invariable form and function.

4.2 Openness and subjectivity: The German assessment of statement construction with *sich hinstellen*

It is quite common for communicative interaction to include “less-than-literal uses of language” which comprise not only tropes like metaphors, but also “more trivial” everyday inaccuracy and vagueness in speech (Andersen 2000:20). The concept that is encoded in the linguistic expression and the one that is actually on the speaker’s mind may not match, but this is not a problem for the interaction, because the inferential capabilities of speakers, along with common ground knowledge, enable them to arrive at the intended interpretation without delay in online interaction. It is also the case that certain markers used in spontaneous spoken language act as indicators for such a mismatch, such that the listening party is “warned” that some of the utterance is not to be taken literally. According to Andersen (2000), *like* can act as such a marker, for example (see also Carston 1996).

There can be non-explicit markers of sentiment, as well. Suzuki (2000) analyses the use of the particle *da* in Japanese. *Da* functions as a copula to express an equative relationship, and it is also used as a quotation marker that separates a quote from the rest of the sentence. It therefore acts as a “framing device” and distances the speaker from the quote. According to Suzuki (2000: 243–248), *da* implies the speaker’s surprise with respect to the content of the quote, and generally a negative attitude towards it, while the attitude conveyed may also be neutral. Sperber and Wilson (1986: 240) report that the attitude expressed in a quote can range from “outright acceptance and approval to outright rejection and disapproval”.

In this section, I want to discuss a German construction for quotations that covers exactly that range. In informal German, there is a way of providing quotations, using either actual or imagined statements introduced by a verbum dicendi in a clause that begins with the formula ‘*sich hinstellen* [stand] und [and]...’ The general form of this construction is

⁴ See also Du Bois 1985, Du Bois et al. 2003 for syntactic strategies to introduce complex lexical material into a discourse.

(9)

[NP₁ sich hinstellen₁ und VERBUM_DICENDI₁ LIT.QUOTATION].⁵

The subscript *I* indicates that the NP is the subject of both *sich hinstellen* and the verbum dicendi.

I have called this construction *assessment of statement* construction because it provides a way for speakers to express a personal sentiment towards said statement, that is in itself sufficiently vague. The *assessment* hints at the fact that the speaker feels *something* towards the statement in question, but the evaluation in terms of either positive admiration of a courageous statement or rather negative validation of an utterance that is considered too bold or impolite, is generally only accessible from the common ground, as it may not be clear from the utterance itself (Diedrichsen 2019b to appear b).

Sich hinstellen ‘stand’ has a literal sense that does not apply in the construction discussed here, but it may serve as a source concept of a metaphor used in that construction. *Sich hinstellen* is an intransitive reflexive achievement verb. *Hinstellen* exists in a transitive variant as well, where it means ‘put something upright’. *Hinstellen* is a combination of *stellen* ‘put upright’ with the separable prefix *hin* that adds a locative component. The reflexive verb *sich hinstellen* in its literal sense expresses the position a person can assume herself. It can mean ‘stand’ in terms of ‘stand in a position’ or ‘stand upright’. It is an achievement verb in that the standing position in a location is a result of the process of getting up or moving somewhere and stand there. It would be translated into English by the simple word ‘stand’, but with German *sich hinstellen*, the achievement sense is always part of the meaning. The attested examples used in this paper have been found in a random Google search. They are discussed and analysed for a German speaking audience in Diedrichsen (2019b).

The following attested example (10) shows the use of the reflexive position verb *sich hinstellen* (Google search 8 April 2014, 12:25 IST, third page of search results) in the literal ‘self positioning’ sense described above.

⁵ In Diedrichsen (to appear b), I give a more elaborate analysis of this construction, in which more formal variation, like the occurrence with a variety of verb types, is considered. For the current discussion, the general form in (9) is sufficient to showcase the potential openness of this construction.

- (10) Einer der Beteiligten sagte zu den Polizisten, er sei der Bürgermeister, und er könne sich hinstellen, wo er wolle.⁶
 One of the people involved said to the policemen that he was the mayor and he could stand wherever he wanted.

This is a story about people standing on the street at night, talking and drinking, who were told to leave by the police.

4.3 *Sich hinstellen* and *verbum dicendi*: The assessment of statement construction

Apart from the literal sense describing the posture of a person, *sich hinstellen* is used in an additional sense that has generally nothing to do with the physical position of the subject referent. Rather, it occurs in connection with a *verbum dicendi* like *sagen* ('say'). It gives an assessment of the statement that is announced by the *verbum dicendi* and quoted in the utterance. With this assessment, the speaker expresses her attitude towards the statement, which in a very general sense evaluates the statement to be 'brave', as it may be unexpected and break up the harmony in the situation on hand. Thus, the assessment of statement construction with *sich hinstellen* may be used to express respect for the courageous statement. It may also be used in situations where the person reporting the statement is very upset about it ('how dare this person say this') and does not agree with it at all.

The literal sense of *sich hinstellen* is not at issue in this use of the verb. The person making the reported statement can be in any position. It is, however, possible, that the 'stand up upright' sense of the reflexive position verb is used here to add an ingressive aspect to the statement: Ingressive verbs mark the onset of an activity (see e.g. Heinold 2015: 27), and this is used by the reporting person here to emphasize the courage and unexpectedness of the statement. The upright posture that is part of the literal meaning of *sich hinstellen* may also be a metaphor for the courage that is associated with the use of this verb in the quotative construction.⁷

⁶ http://www.kreis-anzeiger.de/lokales/wetteraukreis/nidda/ein-buergermeister-kann-sich-hinstellen-wo-er-will_13851499.htm, last accessed 8 April 2014

⁷ A straight posture is used as a source concept for 'courage in a number of expressions, for example the English *stand up for your rights*, and various constructions in German, like *dafür geradestehen* (lit. 'stand up straight for it'—take responsibility for it), *Rückgrat haben* (lit. 'have a spine'—be brave, resilient, responsible), *aufrecht gehen* (lit. 'walk upright'—walk with pride).

A variety of uses of this construction will be demonstrated with attested examples below. (Google search ‘stellt sich hin’, 8 April 2014 14:05 IST, first results page).

- (11) Lisa stellt sich jetzt auch mal hin und sagt “Nein”⁸
Now Lisa sometimes stands and says ‘No’

The ingressive sense associated with the verb *hinstellen* is here used to emphasize the fact that the shy child Lisa managed to raise her voice in the kindergarten she is attending. It may well be that the use here goes along with actually standing up.

In the negative assessment of statement sense of *hinstellen*, the verb is used similarly as in (11), but the content of the statement that is quoted is rather assessed as negative by the speaker herself. A typical example would be (12).

- (12) Und dann stellt der sich hin und sagt ...
And then he stands and says ...

If the speaker uses *hinstellen* in a construction like (12), they want to express that the content of the quoted utterance is appalling, humiliating, or in any other way inappropriate. It also adds to an accusation implication that the utterance can have, as the speaker makes the quoted person fully responsible for the utterance and the harm/embarrassment that it causes. The speaker assumes that the person quoted is fully aware of the consequences of his or her utterance.

This interpretation of the construction is exemplified in the following statement from a speech for the Austrian parliament:

- (13) Oder er stellt sich hier vor das Parlament hin und sagt im vollen
Bewusstsein die Unwahrheit.⁹
Or he stands here in front of the parliament and consciously speaks
the untruth.

⁸ <http://www.esslingerzeitung.de/lokal/esslingen/esslingen/Artikel72850.cfm>, last accessed 8 April 2014

⁹ http://www.parlament.gv.at/pd/stvorwww/XXV/NRSITZ/NRSITZ_00016/A_-17_26_00_Abgeordneter_Dr_Rainer_Hable_NEOS_.pdf, last accessed 8 April 2014

(14-18) show more uses of the construction, where the assessment of the speaker towards the quoted utterance is expressed. The *verbum dicendi* ‘sagen’ was included in the search (search for ‘der stellt sich hin und sagt’, ‘die stellen sich hin und sagen’, ‘hat sich hingestellt und gesagt’, 8 April 2014, 14:55 IST).

- (14) Wir sitzen nicht hier, **wir stellen uns nicht hin** und sagen einfach: mehr Geld!¹⁰
We do not sit here, **we do not stand** and simply say: more money!

Example (14) is interesting in that it involves two position verbs: *sitzen* (‘sit’) und *sich hinstellen* (‘stand’). The adverb *einfach* (‘simply’) implies that asking for more money would be inappropriate.

- (15) Interview with Steffen Bockhahn (*Die Linke*):
Fakt für mich ist, **dass Herr Pofalla sich gestern hingestellt hat und gesagt hat**, das ist hier alles beendet, das ist alles vorbei, weil er ein Schriftstück der NSA in den Händen hält, das allerdings nicht den Gehalt hat, wie Herr Pofalla das gerne deutlich machen möchte.¹¹

For me it is a fact, **that Herr Pofalla has stood** yesterday and said that this is all finished here, this is all over, because he holds a paper from the NSA in his hands, which, however, does not have the content that Herr Pofalla makes us believe.

In (15), Steffen Bockhahn uses the construction in order to express that the statement made by his political opponent Pofalla is not acceptable for him. Bockhahn is of the opinion that the paper Pofalla uses to substantiate his own claim says something different than what Pofalla interprets from it.

¹⁰ <http://de.bab.la/woerterbuch/deutsch-italienisch/nicht-hin>, last accessed 8 April 2014

¹¹ http://www.deutschlandfunk.de/bockhahn-anti-spionage-abkommen-ist-ein-ganz-grosser-witz.694.de.html?dram:article_id=257650, last accessed 8 April 2014

- (16) Lutz Saling: Ich tue mich mit Prognosen schwer. Vor zehn Jahren **haben sich Vertreter bestimmter Buchhandlungen hingestellt und gesagt**: eine Buchhandlung unter 1.000 qm hat gar keine Chance. Heute **stellen sich dieselben Buchhandlungen hin und sagen**: über 1.000 geht gar nichts. Ich stimme zu, dass es in jedem Fall eine Konsolidierung geben wird.¹²

I find it hard to make prognoses. Ten years ago, representatives of certain bookstores **have stood and said**: a book store under 1000 square metres has no chance. Now **the same bookstores stand and say**: above 1000 nothing goes. I agree, that in any event there will be a consolidation.

(16) is from an interview about the future of independent bookshops. The interviewed person Saling says that in the past it was said that bookshops smaller than 1000 square metres would have no chance, while nowadays they say the opposite. It is not easy to tell from this quote if Saling uses the construction in order to express his own disagreement/dissatisfaction with either of these statements, or the contradiction that is expressed in them. He may also be implying that both of these statements were courageous and unexpected at their time. This might therefore be a case of a neutral use of the construction, but we would need more background knowledge, for example about this speaker's general stance with respect to the size of bookstores.

- (17) Weshalb **stellen sich unsere Politiker nicht hin** und sagen ganz einfach wie es ist?¹³
Why **do our politicians not stand** and simply say it as it is?

(17) does not express a negative attitude towards the reported statement. What the speaker expresses is rather the wish that politicians would “get up” and tell the truth. Here, the notion of ‘standing up’ induces an idea of courage and responsibility. The speaker of the desired statement would be

¹² <http://www.buchmarkt.de/content/57713-clemens-birk-lutz-saling-hat-der-indie-buchhandel-noch-eine-chance-auf-langfristiges-ueberleben.htm>, last accessed 8 April 2014

¹³ <http://www.stern.de/noch-fragen/weshalb-stellen-sich-unsere-politiker-nicht-hin-und-sagen-ganz-einfach-wie-es-ist-niemand-in-einer-deutschen-regierung-egal-welche-koalition-hat-den-geringsten-einfluss-darauf-w-1000632792.html>, last accessed 8 April 2014

seen as someone who is fully aware of potentially uncomfortable consequences, but is willing to accept them for the good of everybody.

(18) Reader comment:

Das ist mal eine richtige Ansage. Und nicht so ein Wischi Waschi wie bei Dynamo Dresden. Wo immer sofort die Schuld bei den Anderen gesucht wird. Habe noch nie gehört, **dass sich der Herr Ritter von Dynamo hingestellt und gesagt hat**: Jetzt ist Schluss! Wer sich nicht an die Regeln hält, der fliegt aus dem Stadion! Egal ob zu Hause oder Auswärts!¹⁴

This is finally a proper statement. And not such wishy-washy like with Dynamo Dresden. Where the blame is always placed on the others. Have never heard **that Herr Ritter of Dynamo has stood and said**: Now this is it! People who do not follow the rules, will be thrown out of the stadium! No matter if at home or abroad! (...)

The commenter in (18) applauds the policy introduced by the football team Union Berlin, to ban football fans who show bad behaviour in the stadium. He expresses the desire that the president of his own favoured team, Dynamo Dresden, Ritter, would also show such courageous behaviour and tell football hooligans off.

We see that the use of the *sich hinstellen* construction appears with a variety of possible subject referents across persons and numbers. The verbum dicendi is generally *say*, but other verbs are possible. The construction itself can be broken up by an adverbial like *yesterday*, as in example (15). The construction is also attested in perfect tense and in negative modality, as shown in the examples.

The construction therefore proves to provide a certain openness with respect to its components and realisations, but its general format is still recognisable. What is interesting as well is that the interpretation of the construction allows for openness too: Both positive and negative attitudes can be expressed in it, and sometimes, as in (16), it is difficult to determine what the speaker's actual position towards the statement is. The semantics of the construction revolves around a notion of boldness and courage, and the actual positive or negative attitude an observer has towards the quoted statement and situation can, but need not be expressed by him or herself.

¹⁴ http://www.mdr.de/sport/fussball_bl/union-nachklapp100.html, last accessed 8 April 2014

The general function of this construction is therefore, I argue, to report a statement in a situation that is remarkable for its boldness. The coordination of the quoted statement with a clause that precedes the quotation and includes an inflected form of *sich hinstellen* delivers a personal judgement from the speaker, but it allows a graduation of the expression of the judgement on a scale between positive judgement in terms of courage and negative judgement in terms of infamy. It even allows for a middle ground where only the boldness is acknowledged without giving a personal opinion about it.

Table 2 shows the formal and functional features of the assessment of statement construction with *sich hinstellen*. The description takes into account the state of emergence that the construction is in, as it includes aspects of motivation and development, and the functional variation observed.

Table 2: Convention, background and motivation for the emergence of the German *sich hinstellen* construction

Form (Formal convention)	[NP ₁ <i>sich hinstellen</i> ₁ and VERBUM DICENDI ₁ LIT.QUOTATION].
Formal development (Grammaticalisation, Diedrichsen submitted)	Metaphor: Verb denoting the assumption of an upright position marks ‘boldness of statement’
Meaning (Meaning convention)	Ascribing boldness to a statement
Common Ground (The <i>background</i>)	Culturally established usage of the construction: Delivering a personal attitude about a statement, but the attitude has to be retrieved from common ground (situation, co-text, shared knowledge)
Shared Sentiment (The <i>motivation</i>)	Scalar: Agreement, respect for courage → Disagreement, offense
Pragmatics (The <i>action</i>)	Scalar: Paying respect for courage → Complaining about infamy

In the day and age of global online communication, the emergence of categories and meanings reaches a new dimension. The other-orientedness of communicative content is difficult to determine for mass media contributions in general, because producers cannot know who and how many their audience will be. This does not discourage people from using the Internet for the creation of public statements and other globally shared content. Quite the opposite, it seems that there is great motivation with Internet users globally to share communicative content of all sorts and through all available channels, be they textual, graphic, or audio-visual. I will look at one type of Internet content in particular, the image macro Internet meme, and show how the emergence of categories and meaning, and the functioning of global communication is achieved with these.

5. Memes and Signs

The term „Meme“ originates from Dawkins (1976), who describes them as the cultural equivalent of biological genes: A meme is a unit of human culture. It is comparable to a gene in that cultural units are passed on to other members of the culture. Dawkin’s examples of memes comprise pieces of music, linguistic theories, fashion trends, religious beliefs and ceremonies and the like. I have argued elsewhere (Diedrichsen 2013a, 2013b) that this term is useful for the description of signs in human communication, as it opens up the explanation of the communicative potential of signs beyond the limiting boundary of the concept of a ‘word’, and in fact beyond the realm of mere written forms of linguistic structures. It makes it possible to include intonation, gestures, sign language with all its dimensions, but also contributions of media channels to communication, which is important for the description of Internet communication.

5.1 Internet memes

The term “meme” has been used for popular content spread via the World Wide Web, which mostly takes the form of pictures with or without text captions.

Some memes reach worldwide fame in a matter of hours, and they stay popular for years. The site www.knowyourmeme.com informs about the lifespan of a meme, its conventions and about its peak in popularity.

In order to hold the attention of users and attract more and more variations, memes develop a life of their own, and they become recognisable and applicable to a particular realm of personal experience. One can say that memes have meaning, which is interactively established by the users who

spread and manipulate them (Shifman 2014, Katz and Shifman 2017: 828, see also Nissenbaum and Shifman 2015, Miltner 2014, Diedrichsen to appear a, 2018, 2019a).

According to Shifman (2014: 41), one meme is:

- a) A group of digital items which share common characteristics of content, form, and/or stance
- b) These items were created with the intention to make them interact with and react to each other
- c) The items are circulated, imitated, and/or transformed via the Internet by many users.

As for their semantics, memes are informed by the following aspects:

- a) Culture in general
- b) Internet Culture in general
- c) Participating users' knowledge (cultural knowledge) and salient aspects of same (interests relating to age group, pop culture, country and culture of origin, familiarity with technology and internet, relation to sentiments shared by users, like the love of cats or the appreciation of certain films and their characters).

The most popular form of memes is an image macro composed of a stock image with a caption in bold white capital letters. The caption generally appears both on top and bottom of the image.

5.2 Emergent conventions for form and function in Internet memes

In this section, I will show attested occurrences of meme variations and point out their relevance for the discussion of the emergence of grammatical categories. I will also discuss the background knowledge and user motivation that puts these memes “to work”.

5.3 Scumbag Steve

The photo displayed in the meme shows a young man with a brown cap worn sideways, a golden chain around his neck and an open brown coat with a furry hood, who stands in a doorframe. The text shown in the meme characterises this person as someone who shows mean, antisocial behaviour. In the course of the usage of this meme, variations occur that explain different situations where someone has shown antisocial behaviour.

Interestingly, some variations also alter the composition of the picture in that one element is singled out to carry the ‘scumbag’ semantics to alternative situations. It turns out that the element that is interpreted as the carrier of the ‘scumbag’ semantics is the hat, and it may be placed elsewhere, for example on objects, in order to express that these are malfunctioning. The process of reinterpreting the whole meme in such a way that the hat becomes the main carrier of the ‘scumbag’ semantics is a double metonymic expansion as described by Ruiz de Mendoza and Galera (2014: 119–123): The hat stands for the wearer, and, in terms of the AGENT FOR ACTION metonymy, for the behaviour of the wearer. As there is no existing convention for a brown cap to signify mean behaviour, the new interpretation of this feature can be said to have emerged through usage. This development shows similarities with grammaticalisation processes (see Diedrichsen 2018).



Figure 2. Scumbag Steve iPod stolen

<https://goo.gl/images/7GHrn5>

Last accessed 5 March 2019

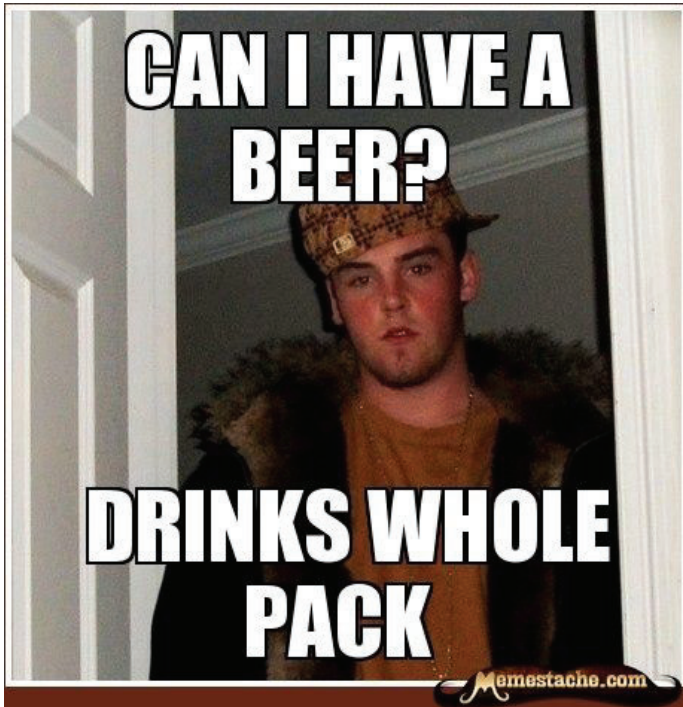


Figure 3. Scumbag Steve beer
<https://goo.gl/images/tK5ebR>
Last accessed 23 January 2018

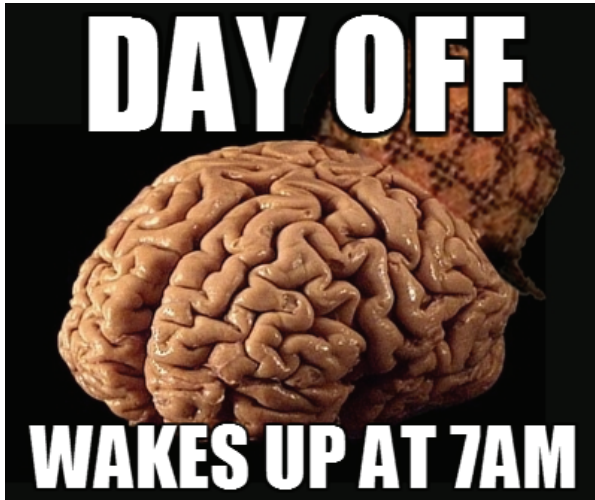


Figure 4. Scumbag Brain
<https://goo.gl/images/SJtdH5>
Last accessed 5 March 2019

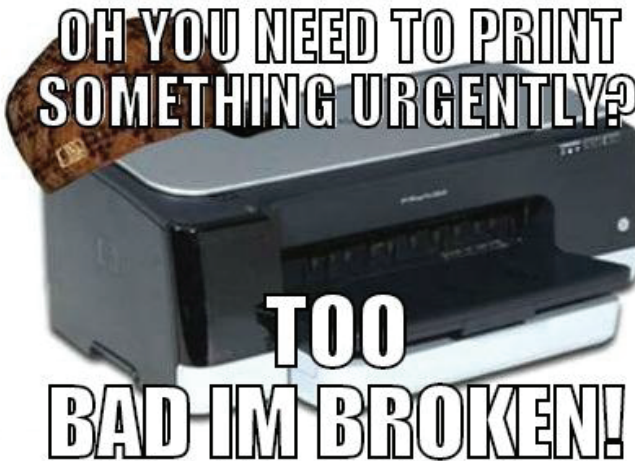


Figure 5. Scumbag Printer
<https://goo.gl/images/eB683t>
Last accessed 5 March 2019

Table 3 explains the formal and functional feature of the meme combination Scumbag Steve / Scumbag Hat.

Table 3: Convention, background and motivation for the emergence of the meme *Scumbag Steve/Scumbag Hat*

Form (Formal convention)	Scumbag Steve: Young man with a furry coat, a golden necklace and a brown cap standing in a doorway. Scumbag Hat: Scumbag Steve's cap on an object.
Formal development (Grammaticalisation, Diedrichsen submitted)	Scumbag hat serves as a metonymy for the content of the Scumbag Steve meme ('pars pro toto'), as it recombines and transfers semantic content to new pictorial representations. Grammatically, it behaves like a morpheme.
Meaning (Meaning convention)	Scumbag Steve: Person behaving mean and egoistic, antisocial. Scumbag Hat: Malfunctioning objects.
Common Ground (The <i>background</i>)	Scumbag Steve: Youth and party culture and its conducts of behaviour, other instances of the meme. Scumbag Hat: Scumbag Steve meme.
Shared Sentiment (The <i>motivation</i>)	Scumbag Steve: Greed and antisocial behaviour are an annoyance. Scumbag Hat: Malfunctioning objects are an annoyance.
Pragmatics (The <i>action</i>)	Scumbag Steve: Complaint. Scumbag Hat: Complaint.

5.4 Three Billboards

The 2017 drama film "Three billboards outside Ebbing, Missouri" by Martin McDonagh portrays the struggles of a mother who mourns the rape and murder of her daughter, and who rages against the police force for not

finding the culprit. She rents three billboards outside her hometown and puts the following sentences on red ground¹⁵

(19)

- a) Billboard (1): *RAPED WHILE DYING*
- b) Billboard (2): *AND STILL NO ARRESTS?*
- c) Billboard (3): *HOW COME, CHIEF WILLOUGHBY?*



Figure 6: Three billboards from the movie *Three billboards outside Ebbing, Missouri*¹⁶

The intention of the three-billboard set is to accuse and publicly shame the sheriff for not making sufficient progress in resolving and avenging the crime.

The quality of the movie and its popularity, but also the novel idea of expressing personal rage at authorities in the format of the three red billboards has struck a chord with meme producers. The Three-Billboard memes are generally not created just for fun, but in order to make a strong statement in political discourse.

Figure 7 shows three billboards put up in front of Senator Marco Rubio's office in Miami, Florida. They are addressing the shooting with young victims at Marjory Stoneman Douglas High School. The creators demand gun control as a consequence of the shooting. Like the original three billboards from the movie, the billboards form a sequence in which an intolerable situation is stated as a fact, then there is a request for a particular

¹⁵ https://en.wikipedia.org/wiki/Three_Billboards_Outside_Ebbing_Missouri, last accessed 5 March 2019.

¹⁶ <http://i0.kym-cdn.com/photos/images/original/001/345/110/61e.jpg>, last accessed 5 March 2019.

consequence in the form of a rhetorical y/n question of the form *And still no...?* The last billboard asks casually *How come, ...?*, addressing the person by name that is assumed to be in charge, thereby publicly shaming this person for not acting up to their responsibility. The billboards read as follows:

(20)

- a) Billboard (1): *SLAUGHTERED IN SCHOOL*
- b) Billboard (2): *AND STILL NO GUN CONTROL?*
- c) Billboard (3): *HOW COME, MARCO RUBIO?*



Figure 7: Three billboards demanding gun control after Florida school shooting.¹⁷

The Three Billboards meme is a good example of the speed with which new ideas for sign use across the Internet are replicated and shared. Three Billboards is a complex sign whose semiotic effect includes iconic, symbolic and indexical parts. All of these need to be fulfilled in order for the sign to achieve the impact that it has for political discourse (see Diedrichsen 2019a). Three Billboard inspired memes are iconic in a visual sense, as they replicate the image of the three billboards with text on them. They are also iconic in that their pragmatics follow the example of the movie reference, as the sequence of speech acts from the original is imitated.

¹⁷ <https://www.independent.ie/style/celebrity/celebrity-news/three-billboards-protest-for-gun-control-after-florida-school-shooting-36613233.html>, last accessed 5 March 2019.

The meme is also indexical, as the reference to the movie acts as a pointer, that calls up knowledge about the movie and the three-billboard motive with its particular use of language. The background knowledge of the movie enhances the communicative effect. The Three-Billboard meme certainly also has symbolic aspects, as speakers of English know about the use of words and speech acts in English by convention.

Table 4 informs about the formal and functional features and the development of this meme.

Table 4: Convention, background and motivation for the emergence of the meme *Three Billboards*

Form (Formal convention)	Picture, designed after still from movie. Text black on red, three billboards for three sentences.
Meaning (Meaning convention)	There is a perceived delay in dealing with a grievance, that should be sorted by authorities.
Common Ground (The <i>background</i>)	General knowledge of the movie and the three billboard motif including the billboards' contents, current news, knowledge of the meme.
Shared Sentiment (The <i>motivation</i>)	Public or individual rage at lack of action from authorities.
Pragmatics (The <i>action</i>)	Overall communicative function: Public shaming. Recurrent sequence of speech acts: 1. Stating a fact that is perceived as a grievance 2. Indirect Accusation for lack of progress 3. Direct accusation with name.

6. Conclusion

This paper has highlighted the issue of emergence in language, which is a phenomenon that has been discussed since the 1960s, but is generally not considered in its entirety in linguistic research, where meaning and categories are mostly considered as given. In philosophical, usage based

approaches to semiotics, it has been widely noticed that the meaning of a sign cannot be characterised on the basis of the outside world or some ready-made, available lexicon. It is, rather, a cultural unit that is perceived, learned and used within a culture of speakers, and that is also created and established within that culture. Any form and meaning a sign may have is subject to conditions of the culture the speakers live in, but it is also a dynamic entity, whose usage and understanding is up for negotiation in every new communicative situation, subject to speakers' shared interest, knowledge, sentiments and priorities, and their mutual awareness of these shared portions of cognition at the time of the encounter. Constructions are therefore *open*, which means that they have a basic shape and function that make them recognisable, but there are aspects of their form and meaning that are not completely stable. I have used two examples to demonstrate this. The English biclausal construction involving *take* in a proverb function and another verb, discussed by Hopper (2004), allows variations of formal realisations. The German *sich hinstellen* + verbum dicendi construction, discussed also by Diedrichsen (to appear a, 2019b to appear b) is also formally open to a certain degree and expresses a range of sentiments on a positive-negative spectrum. Both constructions discussed still have a recognisable form-function correlation, in spite of their openness in realisation and interpretation.

In order to account for the naturalness of communication, this openness needs to be considered: While many approaches to language assume that the knowledge bases on which interactants operate are once and for all stored in the lexicon, modern sociolinguistic theories find that the knowledge base, the common ground, is to a certain degree interactively achieved. In order to sound natural, the use of language needs to build up on shared knowledge, cognitive and situational issues and make lexical and behavioural choices based on that. The Google personal assistant software Duplex has come a long way in achieving natural sounding language in very tightly defined use cases, like phone calls for restaurant and hairdresser bookings. The use of hesitation and disfluency markers mimics the speech pattern of a real user. However, I have argued that the natural results are mainly due to the fact that developers were able to control all aspects of shared knowledge in the use cases defined: The system deals with dates and a list of possible services, but there is no involvement of peer group knowledge, no irony or figures of speech, and no exchange of personal opinions.

In any natural communication, however, the appeal to shared knowledge, sentiments and interests is vital for understanding, and this interactively shared basis can also be the ground and motivation of the interaction altogether. I have demonstrated this with a relatively recent form of

communication, that takes place online. Internet memes are complex signs shared globally, with content that can be funny or serious. Even though there is no supervision and no strict rules for the use of memes, it appears that conventions for form and meaning emerge in the interaction with memes, and that part of the fun that users have with memes is the participation in this global discourse, following unwritten rules that only the in-group understands. I have argued that Internet memes have a recognisable, but open set of usage conventions, and that the main motivation of their use is the expression and global interchange of shared sentiments in important areas of life, like school and family life, dating and friendships, party and work, pop culture and politics.

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Knowyourmeme: www.knowyourmeme.com

Tensorflow: <https://www.tensorflow.org/tfx/>

CHAPTER THREE

TRACKING OF REFERENTS IN THE WESTERN DESERT LANGUAGES OF AUSTRALIA

CONOR PYLE

1. Introduction

In this chapter we apply a Role and Reference Grammar (RRG) analysis to the study of how referents are kept track of in Pitjantjatjara, Yankunytjatjara and Ngaanyatjarra (PYN) texts. As well as RRG, we draw on other frameworks, including common ground and centering theory. We investigate how arguments are distinguished within a clause, brought forward from previous clauses and introduced as new participants. RRG posits a completeness constraint whereby syntactic expression links to semantic representation, and in this study we characterise how this manifests in PYN.

Pitjantjatjara, Yankunytjatjara and Ngaanyatjarra are closely related dialects of Australia's Western Desert language group. They are part of the suffixing Pama-Nyungan family which contains most languages outside the Top End of Australia. The dialects have neighbouring territories, with Pitjantjatjara and Yankunytjatjara being spoken in South Australia and Ngaanyatjarra across the state border in Western Australia. Pitjantjatjara and Yankunytjatjara are similar enough to share dictionaries and grammars (Goddard 1993, 1996); the name 'Pitjantjatjara' has been used to describe the dialect spoken in Ernabella, South Australia; but also to refer to a group of dialects including Ngaanyatjarra that share the verb root *pitja* 'come' (Bowe 1990: 1).

2. Role and Reference Grammar

RRG is a theory that represents syntactic structure through the meaning and function of words, combining a semantic and communicative approach (Nolan 2012: 2). Similar semantic categories occur in all languages; but are

expressed differently in syntax. Van Valin & LaPolla (1997: 25) posit the universal semantic distinctions in (1) and (2).

- (1) Predicating versus non-predicating elements.
- (2) Noun phrases and adpositional phrases that are arguments of the predicate versus those that are not arguments.

These are shown in the syntactic categories of nucleus, core and periphery in the layered structure of the clause (Nolan 2012: 5), shown in Figure 1. The core contains the predicate and usually the arguments. The nature of the predicate determines how many arguments are required. The non-arguments in the periphery are typically adverbial information such as time and location.

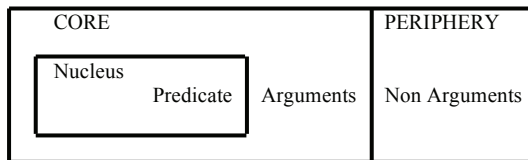


Figure 1: Layered Structure of the Clause

Multiple levels of syntactic representation are not required in RRG (Van Valin & LaPolla 1997: 21): there is a single level from the syntactic to the semantic representation via a linking algorithm. This is shown in Figure 2. Semantics is linked to syntax for the speaker's perspective and syntax to semantics for the addressee's processing.

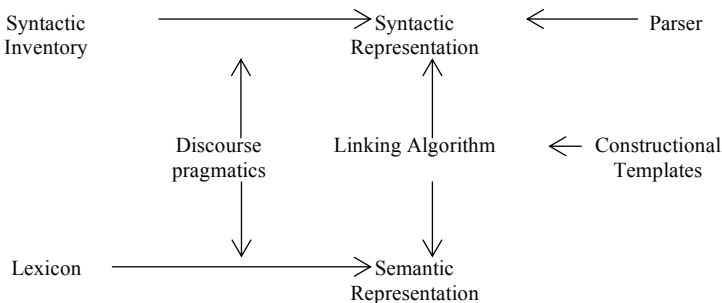


Figure 2: Linking algorithm

This close relationship between syntax and semantics means that according to the completeness constraint there should be syntactic expression of anything in the semantic representation. In the present study, we look at the syntactic forms that arguments take as they are semantically tracked in narrative.

2.1 Lexical decomposition

Propositions are decomposed into the logical structure of predicates and arguments. Predicates are grouped into classes based on *Aktionsarten*, including static, change of state, dynamic, telic (inherent endpoint), and punctual. The basic two classes are state and activity; other classes build on this depending on the nature of the action. The English examples in (3) and (4) reflect inherent semantic argument requirements.

- (3) State
shattered' (window)
see' (John, picture)
- (4) Activity
do' (wheel, [**squeak'** (wheel)])
do' (John, [**eat'** (John, fish)])

Semantic roles such as agent, patient or theme are grouped up into two macroroles, the actor and the undergoer. Importantly, these must be referential and not general. RRG distinguishes semantic valence, syntactic S-transitivity and macrorole M-transitivity. An M-transitive event with a referential undergoer is thus distinguished from a general activity without one.

2.2 Grammatical relations

'Subject' and 'object' are traditional terms in syntax, but they may not be useful concepts in all languages. As an alternative, three sentence syntactic relations are posited by Dixon (1994: 6-8), shown in (5) to (7):

- (5) S, the single argument of an intransitive verb
- (6) A, the more likely instigator with a transitive
- (7) O, the 'other' argument of a transitive

A further syntactic relation is E, the extension to the core. Common examples of this are the stimulus of an intransitive emotion verb, or the recipient of a verb of giving. Thus, per Hopper & Thomson (1980), transitivity is a spectrum. A semantic argument may thus not be a syntactic one.

How these roles are aligned gives the typological distinction between syntactic ergativity (S and O) and accusativity (S and A). ‘Subject’ groups S with A in an active clause and with O in a passive one.

In RRG, the Privileged Syntactic Argument (PSA) is posited as the only grammatical relation. This is the restricted neutralisation of semantic roles and pragmatic functions for syntactic purposes (Nolan 2012:14). The PSA controls verb agreement and pivots, where these are relevant.

2.3 Selection hierarchy

The assigning of macrorole and PSA is according to a hierarchy, shown in Figure 3. The actor is the argument furthest to the left, the undergoer furthest to the right. In accusative languages the most actor-like is the PSA; in ergative languages the most undergoer-like (Van Valin 2007).

Argument of DO > 1st argument of **do'** (x, ...) > 1st argument of **predicate'** (x, y) > 2nd argument of **predicate'** (x, y) > Single argument of state **predicate'** (x)

Figure 3: Selection hierarchy

3. PYN grammar

3.1 Verbs

PYN verbs fall into S-transitive and S-intransitive divisions (apart from a small number of ambitransitives) and verbs are not used interchangeably between these divisions. This means the syntactic template remains intact: a missing argument is implicit. There is no argument marking on verbs, which in some languages facilitates pronoun dropping. There are four verb classes, distinguished by endings which combine tense and aspect. There are productive verb deriving processes, which are on a causative-inchoative spectrum.

3.2 Nouns

Nouns in PYN have an ergative-absolutive case marking system, with slightly different forms between names and non-names, shown in Table 1. It is claimed that this serves to distinguish the vocative from the absolutive with names (D. Rose 1996).

Table 1: Core case marking for PYN nouns

	Non-names	Names
Absolutive (S, O)	-Ø (-pa)	-nya/-nga
Ergative (A)	-ngku (-tju, -tu)/-lu (N)	-lu

3.3 Pronouns

PYN pronouns work on a nominative-accusative basis; the forms are in Table 2. As with nouns, there is no gender distinction (Goddard 1993: 19, Glass 2006: 50). Unlike nouns, pronouns have singular, dual and plural number (Bowe 1990: 11, Goddard 1993: 19-20, Goddard 1996: xi, Glass 2006: 50, Platt 1969). This scenario of pronouns having greater number is predicted by Greenberg (1963) and Silverstein (1976: 119). PYN pronouns combine person, number and grammatical function in one form.

Table 2: PYN pronoun case marking

Singular	Subject (A and S)		Object (O)	
	Full	Clitic	Full	Clitic
1st Person	<i>ngayulu</i>	=na/=rna	<i>ngayunya</i>	=ni/=rni
2nd Person	<i>nyuntu/nyuntulu</i>	=n	<i>nyuntunya</i>	=nta
3rd Person	<i>paluru</i> (P/Y)	=Ø	<i>palunya</i> (P/Y)	=Ø/=lu (N)
Dual				
1st Person	<i>ngali</i> (P/Y)	=li/=lin (N)	<i>ngalinya</i> (P/Y)	=linya
1st Person excl		=liju (N)		=linyatu (N)
2nd Person	<i>nyupali</i> (P/Y)	=pula /=pulan (N)	<i>nyupalinya</i> (P/Y)	=pulananya (N)
3rd Person	<i>pula</i> (P/Y)	=pula (N)	<i>pulanya</i> (P/Y)	=pulanya (N)
Plural				
1st Person	<i>nganana</i> (P/Y)	=la	<i>nganananya</i> (P/Y)	=lanya
1st Person excl		=latju (N)		=lananyatu (N)
2nd Person	<i>nyura</i> (P/Y)	=ya/=yan (N)	<i>nyuranya</i> (P/Y)	=tjananyanta (N)
3rd Person	<i>tjana</i> (P/Y)	=ya	<i>tjananya</i> (P/Y)	=tjananya (N)

3.4 Pronoun clitics

Ngaanyatjarra only has full form 1st and 2nd person singular pronouns; the other persons and number pronouns are clitics. Only the most common P/Y pronouns have clitic forms (Glass & Hackett 2003: 9, Glass 2006: 63, Goddard 1996: xi). Ngaanyatjarra rarely uses its full forms except in emphasis or contrast (Glass 2006: 63). P/Y pronominal clitics often occur in lieu of or alongside the full forms.

PYN clitic pronouns bind to the first constituent in the clause (Blake 1987: 103, Goddard 1996: xii). As clitics, the suffixing occurs regardless of the host word category (Blake 1987: 17-18), so this is not verbal inflection (Zwicky & Pullum 1983) or head marking (O'Grady & Laughren 1997). Capell (1956: 13-16) claims that the pronominal 'suffixes' attach to the verb root, but this is only if no other element is present in a clause.

There is debate on the nature of clitics as arguments. Baker & Mushin (2008: 13-14) claim that clitic pronouns are not counted as independent referential devices but that their person and number marking help identify a referent. Nordlinger (1998: 37-41) asks in relation to overt nominals whether the bound pronouns are the arguments and nominals coreferential.

If there is a verb with a missing core argument in PYN, the 3rd person singular is implied unless the context suggests otherwise (J. Hobson p.c., Bowe 1990: 24). Another way of putting this is that the 3rd person singular nominative clitic pronoun is =Ø (Glass 2006: 159). We take this analysis because while P/Y has the full forms *paluru/palunya*, in all the dialects there is a gap in the clitic paradigm for 3rd person singular, making it Ø. In P/Y, the zero clitic extends to 3rd person singular accusative; this is usually the case for Ngaanyatjarra too, though the clitic =*lu* is attested with *nyaku* 'see', *watjalku* 'tell' (Douglas 1957: 48) and *kutikatiku* 'take' (Glass & Hackett 1979: 34).

3.5 Demonstratives as pronouns

Douglas (1957: 35, 45-50) gives a series of four 3rd person pronouns, distinguished by the distance of the referent from the speaker, as shown in Table 3. These have an ergative system and Glass & Hackett (1970: 50) claim they are not 3rd person pronouns but rather demonstratives. Dixon (2011: 356ff) says that many Australian languages lack 3rd person pronouns but that these may develop from demonstratives and this appears to be the case in Douglas's scheme.

Table 3: Ngaanyatjarra demonstratives

	A		S		O	
Singular	Full	Clitic	Full	Clitic	Full	Clitic
near	<i>nga:lu</i>	=Ø	<i>nga:nya</i>	=Ø	<i>nga:nya</i>	=Ø/=lu
mid distant	<i>palalu</i>		<i>palanya</i>		<i>palanya</i>	
distant	<i>nyaralu</i>		<i>nyaranya</i>		<i>nyaranya</i>	
not visible	<i>palunyalu</i>		<i>palunyanya</i>		<i>palunyanya</i>	
Plural						
near	<i>nga:luya</i>	=ya/ =tjana	<i>nga:nyaya</i>	=ya/ =tjana	<i>nga:nyaya</i>	=tjananya
mid distant	<i>palaluya</i>		<i>palanyaya</i>		<i>palanyaya</i>	
distant	<i>nyaraluya/ nyaratjintu</i>		<i>nyaranyaya</i>		<i>nyaranyaya</i>	
not visible	<i>palunyahuya</i>		<i>palunyanayaya</i>		<i>palunyanayaya</i>	

P/Y keeps demonstratives and pronouns separate. In Pitjantjatjara, *palu* is the 3rd person personal pronoun (Platt 1969); *pala* is the demonstrative ‘that one near’.

3.6 Determiners

P/Y *paluru* ‘he/she/it’ also translates as definite determiner ‘the’, and serves as an anaphor with nouns and the dual and plural pronouns *pulu* and *tjana* (Goddard 1996: 122). While pronouns are arguments, determiners may be either deictic operators (Van Valin & LaPolla 1997: 56-57), members of a NP or full arguments.

The term *alatji* ‘that’s it’ is a Pitjantjatjara verbal affirmation referring more directly to the content of the previous discussion (Lieberman 1982: 43). Similarly *paluru* and *palunya* are marks of approval, indicating ‘that one’ in P/Y (ibid.). These are usually thought of as 3rd person singular pronouns. All these terms have a role in clarifying the identity of a referent.

4. Animacy hierarchy

As discussed, PYN has split case marking, with ergative nouns and accusative pronouns. In analysing split case marking, Silverstein (1976) describes a hierarchy of ‘inherent lexical content’ of NPs: not all referring expressions are the same. This reflects the naturalness of the NP being the agent of a true transitive verb. This is claimed by Rose (2001) to be an

important explanatory factor in case marking. The following nominal hierarchy is based on Blake (1987: 20-21) and Dixon (2011: 289):

- (8) Non-singular 1st and 2nd person pronouns
- (9) Singular 1st and 2nd person pronouns
- (10) 3rd person pronouns
- (11) Personal names, kin terms, proper nouns
- (12) Human
- (13) Animate
- (14) Inanimate

While it has received some criticism (such as Blake 1987: 165), the Silverstein hierarchy has features such as animacy, control and propensity to be the topic of a clause indicating a higher position. If both case marking systems are present then they meet at some point in the hierarchy. Elements at the top of the hierarchy are more likely to have accusative marking; those at the bottom ergative. The more natural role arguments take unmarked nominative and absolutive.

There is a division between 1st and 2nd person on the one hand and 3rd person on the other (Silverstein 1976). 1st and 2nd person pronouns refer to the speaker and addressee (Van Valin 2001: 6) in a speech event. 3rd person pronouns are anaphora with antecedents, nouns which usually need to be introduced at the outset. As is typical for Australian languages (Dixon 2011: 285-291), PYN has accusative up to 2nd person pronouns. Ngaanyatjarra 3rd person independent pronouns are effectively demonstratives with ergative marking; P/Y has separate pronominals that have accusative marking. These are therefore on the border as regards animacy between 2nd person and common nouns. The pattern of non-overt cases partially applies in PYN. Absolutive is \emptyset in non-names; however some pronouns have an overt nominative. Personal names have different markings to non-names in certain case markings, including an overt absolutive. PYN is one of several varieties of Western Desert reported as having absolutive suffixes on personal names (Blake 1987: 30): on the Silverstein hierarchy personal names are adjacent to pronouns. The lexical content of NPs also affects case, for example through animacy (Van Valin 2005: 108).

Aissen (2003: 437) distinguishes an animacy scale in (15) and a definiteness scale in (16), influencing how instigators and others are marked.

(15) human > animate > inanimate

(16) personal pronoun > proper name > definite NP > indefinite specific NP > non-specific NP

A possible factor in split systems is the influence of animacy or psychological processes during language production (Branigan, Pickering and Tanaka 2008). Animacy correlates to conceptual accessibility. Animate entities are retrieved more easily, with easily accessed information being processed first. Split systems may have split intransitivity or split ergativity, depending on semantics, pragmatics, agentivity and volition (Payne 1997: 144-146). The last two are relevant to animacy.

5. Keeping track of referents

Role versus reference has two functions in syntax (N. Enfield p.c.), signalling the role of arguments with respect to the clause and with reference to what has been said in previous clauses. A referent is an entity in the scene to which a linguistic expression relates. In a text, we need to track and distinguish the entities in a parsimonious but meaningful manner. Possible means of doing this are suggested in (17) to (22):

(17) Names, with individual reference

(18) Nouns

(19) Pronouns, which may have gender and/or number

(20) Head marking, of information relating to the arguments

(21) Switch reference between two protagonists

(22) Ellipsis, where reference is obvious so there is no need for overt expression

Reference is derived from the different levels at which expressions operate (D. Rose p.c.):

(23) exophoric expressions derive their reference from the situation, such as demonstratives and pronouns

(24) endophoric ones refer to something already in the text, pointing backwards as anaphors or forwards as cataphors

(25) homophoric ones derive their interpretation from cultural reference

Tracking referents thus extends beyond syntax: data may be accounted for by a pragmatic theory of inference rather than by innate categories controlling referents (N. Enfield p.c.).

6. Topic and comment

Blake (1987: 154-156) contrasts the topic (what is talked about), comment (what is said about the topic) and focus (the crucial part of the comment, which is the most resistant to ellipsis). 'Topic and comment' is similar to unmarked predicate focus (Van Valin 2005). Most frequently, the topic comes first and the comment about it comes after (Van Valin & LaPolla 1997: 199). Other related concepts include:

(26) subject-predicate

(27) presupposition-focus

(28) given-new

Cross-linguistically, new referents are generally introduced in absolutive (S or O) roles (Du Bois 1987: 827, N. Enfield p.c.), because the A role is usually the topic, whereas the O argument is often ephemeral. The A is thus often referenced by a pronoun in the narrative.

7. Serial verbs

The serial verb form describes actions occurring simultaneously or sequentially (Goddard 1993: 26-27, Glass 2006: 91). Sequential actions follow closely in time with the actions frequently having entailment or one being a necessary consequence of another. The structure is of a series of verbs, all but one of which carry a non-finite ending termed the 'serial participle' (Goddard 1993: 26) or 'prior action' (Glass 2006: 91-92). The exception is one verb that is inflected as finite and typically appears at the end of the series. The verbs in the series share at least the 'subject' (S or A); other words, including objects, can intervene.

Where the serial verbs do not describe one action, they are similar to the topic chains discussed by Van Valin (2005: 103), where a subject is followed by a series of verbs, describing a sequence of actions undertaken.

Objects can belong to one of the verbs. An example is the recipient *tjananya* in (29).

Pitjantjatjara (Goddard 1996: 199)

- (29) *Munu pau-ra tjana-nya u-ngu*
 And.SS roast-SER 3PL-ACC give-PST
 ‘And (he) roasted (it) and gave them (some)’

8. Switch reference particles

Clauses in PYN are typically introduced by particles that indicate whether the S/A ‘subject’ is the same or different to that of the previous passage. These are conjunctions that conflate with participants (Rose 2001). *Munu/palyunya* and *ka* remove the need for an overt argument; the particles are pronoun-like without being specific as to number or person. *Munu/palyunya* acts as an anaphor with a same subject antecedent. *Ka* is the opposite; we might expect that it requires either a new referent, or the refreshing of an established referent. *Ka* may also indicate a switch in episode rather than identity (D. Rose p.c.). Other particles are also used, such as Ngaanyatjarra *palunyangka* (DS) and *palunyatjanu* (SS) (Glass 2006: 109). The difference between *munu* and *ka* is illustrated in (30) and (31).

P/Y (Goddard 1993: 25)

- (30) *Wati-ngku papa pu-ngu munu mira-ngu*
 Man-ERG dog.ABS hit-PST and.SS cry.out-PST
 ‘The man_i hit the dog and he_i cried out’
do’ (wati_i, **hit’** (wati_i, papa_j)) \wedge **do’** (**cry’** (3SG_i))
- (31) *Wati-ngku papa pu-ngu ka mira-ngu*
 Man-ERG dog.ABS hit-PST and.DS cry.out-PST
 ‘The man hit the dog_i and it_i cried out’
do’ (wati_i, **hit’** (wati_i, papa_j)) \wedge **do’** (**cry’** (3SG_j))

Since *munu* already carries the connotation of same subject from the previous sentence, in (32) *=ya* is extraneous. However, it is very common in practice to add these clitics, perhaps for recapitulation or emphasis.

Pitjantjatjara (Goddard 1996: 142)

- (32) *Munu=ya kunyu kuka pulka kati-ra u-ngkupai*
 And.SS=3PL.NOM REP meat.ABS much bring-SER give-CHAR
minyma, tjitji tjuta ngura-ngka.
 woman, child PL camp-LOC
 ‘They would bring back a lot of meat and give it to the women and children in camp.’

In (33), *ka* indicates a switch to different subject so *pungu* has the protagonist as the agent and a different person, the patient of *pungu*, is the sole argument of *ilungu*. No nominals are present so 3rd person is understood with both of the verbs. The English free translation uses the passive to allow a control structure.

There is no passive in PYN: the agent and patient are always implied in a transitive clause. PYN uses switch-reference instead and there is no change in verb form. S in the second clause is a different individual to A; the criterion is comparing S and A, indicating syntactic accusativity. By semantic plausibility we understand S in the second clause to be O in the first, but this is not specified syntactically.

P/Y (Goddard 1996: 19)

- (33) *Pu-ngu ka ilu-ngu.*
 Hit-PST and.DS lose.consciousness-PST
 ‘(He)_A hit (him)_O and (he)_S lost consciousness.’
 ‘He_i hit him_j and he_j lost consciousness’
 = ‘He was hit and knocked out.’
 [**do**’ (3SG_{ACT}, **hit**’ (3SG_{ACT}, 3SG_{UND}))]]
 CAUSE [**unconscious**’ (3SG_{UND})]]

The text in (34) is composed almost exclusively of verbs, with switch-reference through *ka*. This reflects a difference in emphasis in the dialects: Ngaanyatjarra frequently lacks overt arguments while this is regarded as unusual in P/Y, which has the 3rd person singular full forms *paluru* and *palunya*.

Ngaanyatjarra (Glass & Hackett 1979: 21)

(34) *Ka katu-rrri-ngkula*
 And.DS up-INCH-SER
 And (it) was getting up
 BECOME **up'** (3SG_{UND})]

ka pitja-yintja wana-rnu nya-ngu paalyukati-ngu
 and.DS come-EXT follow-PST see-PST fall.down-PST
 And (he) came, followed and saw (it) had fallen down.

ngarri-rranyangka pitja-ngu pu-ngkukitja-lu
 lie-ANT.DS come-PST hit-INTEN-ERG
 while (it) was lying there (he) came to kill it,

maparntju-rayirnu puru wanka-ra wana-rnu
 work.sorcery.on-PST.EXT again make.alive-PA follow-PST
 but worked sorcery on (it), revived (it), and followed (it) again.

Overt arguments are also missing in (35). The verbs are separated by *puru* 'again'; the first is transitive and the second intransitive. The interpretation of the missing pronouns is determined from the previous sentence where a man is chasing a kangaroo, and it falls and gets up. While there is a switch of subject, *puru* is not a switch-reference particle and there are no overt pronouns, so interpretation is through context and semantic plausibility rather than syntactic control. Here, O from the first clause is S in the second.

Ngaanyatjarra (Glass & Hackett 1979: 21)

(35) *Wana-rnu puru paalyukati-ngu*
 Follow-PST again fall.down-PST
 '(He) followed (it) (and) (it) again fell'
 [**do'** (3SG_{ACT}, **follow'** (3SG_{ACT}, 3SG_{UND}))] AND **fall'** (3SG_{UND})

Where there is an S/O or S/A pivot in coordinated clauses, the common argument in the second clause may be elided in coreferential omission (Dixon 2002: 86). However most languages both in Australia and worldwide do not have syntactic pivots (Dixon 2002: 520-521). Any pair of clauses may be linked with repeated NPs omitted; the main criterion for which one is omitted is pragmatic plausibility rather than syntax, so this is a pragmatic pivot. The topic is present in consecutive clauses: 'pivot' is a grammatically specified topic (Dixon 2002: 520-521), a definition integrating semantic, syntactic and discourse factors (Dixon & Aikhenvald

2000: 16). Other means of distinguishing participants, such as English gendered pronouns, are not available in PYN.

Thus, while PYN nouns have ergative case marking, the dialects are syntactically accusative. This makes sense as pronouns have accusative case marking.

9. Switch reference dependent verbs

The pivot can be altered: PYN has non-finite, dependent verb forms that indicate whether the subject (A or S) is the same as that of the main clause (Bowe 1990: 119). The forms are shown in Table 4. These generally indicate the purpose or circumstance of the main clause.

Overt subjects are not required with the dependent verb. The forms are apparently based on the nominalised verb with *-nytja* and different endings: *-ku* for purposive (DS); *-kitja* for intent (SS); locative *-ngka/-la* for anterior DS (Goddard 1993: 30) and *-tjanu* for anterior SS. The inclusion of ‘anterior SS’ is based on Bowe’s (1990) Pitjantjatjara analysis: published work on Ngaanyatjarra usually regards the *-tjanu* suffix as appending to noun-like constituents and meaning ‘after’ (Glass 2006: 82-83, Glass & Hackett 2003: 421).

Table 4: Dependent verb forms in Pitjantjatjara and Yankunytjatjara

	(0)	(l)	(ng)	(n)
	(‘zero’ class)	(la-class)	(wa-class)	(ra-class)
	‘talk’	‘bite’	‘hit’	‘put’
Purposive DS	<i>wangka-ntjaku</i>	<i>patja-ntjaku</i>	<i>pu-ngkuntjaku</i>	<i>tju-nkuntjaku</i>
Purposive SS	<i>wangka-ntjikitja</i>	<i>patja-ntjikitja</i>	<i>pu-ngkuntjikitja</i>	<i>tju-nkuntjikitja</i>
Anterior DS	<i>wangka-nyangka</i> <i>wangka-nytjala</i>	<i>patja-nnyangka</i> <i>patja-ntjala</i>	<i>pu-ngkunyangka</i> <i>pu-ngkuntytjala</i>	<i>tju-nkunyangka</i> <i>tju-nkuntytjala</i>
Anterior SS	<i>wangka-ntjatjanu</i>	<i>patja-ntjatjanu</i>	<i>pu-ngkuntjatjanu</i>	<i>tju-nkuntjatjanu</i>

Missing elements in the dependent clause are thus controlled by the subject in the main clause; switch-reference controlling the pivot. There is a constraint on the use of tensed sentences as complements of tensed verbs in Pitjantjatjara (Bowe 1990: 69); these non-tensed subordinate forms act as complements or modifiers. Examples are found in (36)-(39).

Pitjantjatjara (Goddard 1993: 33)

- (36) *Punu palya-ni mani u-ngkunyjtaku.*
 Artefact.ABS make-PRES money.ABS give-PURP
 ‘(She) is making an artefact, so (they) will give (her) money’
do’ (3SG, [**make’** (punu)])
 PURP **do’** (3PL, Ø) CAUSE [BECOME **have’** (3SG, mani)]

P/Y (Goddard 1996: 83)

- (37) *Ngayu-lu muni-ni, palya nya-kunyjtikitja-ngku.*
 1SG-NOM clean-PRES, good see-INTEN-ERG
 ‘I’m cleaning (it), (so I) can see (it) properly (stripping bark off a
spear shaft).’
do’ (1SG, **clean’** (1SG, 3SG)) PURP **see’** (1SG, 3SG)

Yankunytjatjara (Goddard 1996: 9)

- (38) *Ngayu-lu anta-anta-ningi, nyuntu ya-nkunyjtala*
 1SG-NOM protect-PST.CONT 2SG.NOM go-ANT.DS
 ‘I was minding (it), while you were gone’
while’ ([**gone’** (2SG)], [**do’** (1SG_{ACT}, **mind’** (1SG_{ACT}, 3SG_{UND}))])

Ngaanyatjarra (Glass & Hackett 2003: 421)

- (39) *Mirrka nya-kunyjtjanu kuti-pitja-ngu*
 Food.ABS see-ANT.SS out-go-PST
 ‘After seeing the food (he) went’
after’ ([**do’** (3SG, **see’** (3SG_{ACT}, mirrka))], [**do’** (3SG, **go’** (3SG))])

10. Ellipsis

Since RRG does not posit null elements in syntax (Van Valin 2014), the ‘completeness constraint’ expects all elements in the semantic representation to be in the syntax and vice versa (Van Valin & LaPolla 1997: 325). However in practice, an argument is not always expressed. Such ellipsis is deemed to be grammatical (Broad 2013): the syntactic omission of obligatory elements from a sentence leaves the semantic message unchanged. Importantly, the elided elements must be unambiguously specifiable (Broad 2013: 64). In speech almost anything may be omitted if the utterance can be understood, so the elided element may be described as being present but not overt.

Core arguments are by definition required elements of a clause: the predicate determines the number of arguments. An elided element could be included in careful speech or if the utterance were needed to be repeated due

to misunderstanding. For our purposes, ellipsis is not relevant to modifiers such as adjectives and adverbs as these are optional in any event.

How might an elided argument be understood by the listener? An argument can be seen as ‘given’ in discourse if it has been mentioned previously, or is actually visible. A ‘new’ argument is more likely to take the form of a full NP rather than a pronoun or being elided. There is cross-linguistic variation in these factors. In Chinese, a topic can be dropped (Behrens 2007: 206) once established in discourse and does not need to be used again until the topic changes. Such sentences are complete and understandable from the preceding discourse; ellipsis is a referential device in this situation. However this is not the case in English (Halliday 2006: 354-355).

There are different circumstances in which arguments may be omitted. Complements have been described as having degrees of obligatoriness (Herbst & Götz-Votteler 2007: v) and Matthews (2007) suggests that complements are optional only under ellipsis. Hopper & Thompson’s (1980) spectrum of transitivity is relevant because certain verbs have a stronger requirement for overt arguments. Cognate objects for example can easily be dropped; these lexically specific verbs tend to have more ellipsis of arguments as meaning is already encoded in the verb (Behrens 2007: 202). The head in such cases implies its elided complements (McShane 2005: 19).

In PYN, the situation is complicated by the 3rd person zero pronoun. This means that there is a very strong tendency for a non-overt argument to be interpreted as 3rd person, and this overrides interpretations of the given arguments. Van Valin (2005: 174) claims that dropped referents are part of presupposition due to the preceding context. This zero is the form of a referent that is the most likely topic; an indefinite NP is the most likely focus as shown in Figure 4 (Van Valin & LaPolla 1997: 321).

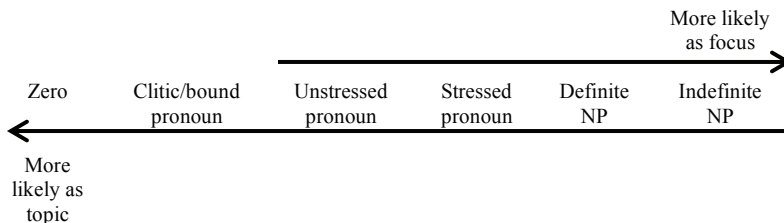


Figure 4: Pragmatic status hierarchy of NP expression

A presupposition can then be not expressed with an assertion (Shimojo 2008). An RRG macrorole can be included in the presupposition, if it has

definite reference. While zero is the default topic in PYN, it is accepted by default that this is 3rd person singular.

11. Common ground

‘Common Ground’ is mutual knowledge, beliefs and assumptions (Clark & Brennan 1991) and this may obviate the need for overt reference. As participants speak, they ‘ground’ what has been said in the conversation. There is a presupposition by the speaker of what is common ground (Stalnaker 2002). Thus a sentence may be appropriate only in a particular situation. Core common ground (including common sense and cultural knowledge) is distinguished from emergent common ground (Kecskes & Zhang 2009) which builds during a conversation.

11.1 Cultural common ground

In small communities there is a high degree of local knowledge, so no need to specify everything in conversation (Baker & Mushin 2008: 13-14). The nature of core common ground is culture specific: cognate verbs imply the existence of a particular undergoer that does not need to be overtly expressed in the clause. These are the homophoric expressions referred to by D. Rose (p.c.). Douglas (1957: 53) claims that certain Ngaanyatjarra verbs have expected arguments which may not need to be specified, such as the imperative *tjikila!* ‘drink! (water)’. Interpretation of the referent is through context and culture rather than via antecedents in the sentence or immediate text. Bowe (1990) says that some Pitjantjatjara consultants deem such sentences incomplete. The difference may reflect the fact that Pitjantjatjara has the full forms *paluru/palunya* available. Another example is the imperative of the S-transitive verb in (40); the unexpressed cognate object with this verb is probably a kangaroo.

Ngaanyatjarra (Douglas 1957: 21)

- (40) *Kultu-la*
 Spear-IMP
 ‘(you) spear (it)
 do’ (2SG, spear’ (2SG, 3SG))

11.2 Emergent common ground

With emergent common ground, PYN conjunctions indicate how many protagonists are involved as subjects: *munu/palunya* if one, *ka* if two, with

action back and forth. If there are more than two protagonists, there is a need to specify identity if there is a risk of ambiguity. This is reflected at the level of the clause, sentence and discourse. These are exophoric expressions deriving from the situation or endophoric ones referring to something already mentioned (D. Rose p.c.).

12. Centering theory

Centering theory refers to the centre of attention in a conversation and this affects the form that referring expressions take (Thomason 2003, Walker, Joshi & Prince 1998: 1). Forward-looking centres are discourse entities evoked by an utterance while backward looking entities are similar to topics (Walker, Joshi & Prince 1998: 3). As conversation progresses, the topics under discussion develop and change. Centering theory seeks to address anaphora resolution. There is a presupposition of there being rich information in the first utterance. Participants' memory of utterances fades rapidly (Roberts 1998: 359-361) which means that referents need to be refreshed by being explicitly stated again. There is local coherence among utterances in a segment, and global coherence with other segments in a discourse (Grosz, Joshi & Weinstein 1995).

In relation to forward-looking centres, Cote (1998: 59-61) notes that English has certain verb classes that may have null objects. These differ as to whether a salient antecedent is required. For example, 'eat' can appear with or without a direct object. Without an object, the gap is not anaphoric but general. Payne (1997: 48, 171) uses the example of object omission in (41). Here 'ate' has a semantic valence of two but a grammatical valence of one. This is distinguished from ellipsis, where a referent is left unexpressed because it is known.

(41) George already ate.

Unrealised arguments cannot be interpreted as discourse referents in English (Van Valin & LaPolla 1997: 122), so in (42) the reply is not acceptable if it doesn't have a referent. This confirms that 'Bill is eating' refers to nothing in particular so is not an appropriate response to the question. O is dropped, and this zero is not interpreted as an anaphor.

(42) 'Where is my sandwich?'
 ?'Bill is eating.'
 'Bill is eating it.'

This contrasts to PYN where zero is anaphoric. The PYN verb *ngalkuni/ngalku* ‘eat’ is always S-transitive and semantically divalent. In (43), *ngalku* as well as *mantjilku* ‘get’ occur without any overt O argument. However in the sub-clause, the ergative case marker on *mama ngunytyju* indicates the transitivity of *mantji* and *ninti* ‘give’. Thus in PYN objects can be elided, unlike the situation in English. With PYN verbs if an argument is not present, the referent is understood in context, taking into account the 3rd person singular zero clitic.

Ngaanyatjarra (Glass & Hackett 1979: 54)

- (43) *ngara-ku ngula tangka-rri-ngkunyaangka*
 stay-COND later firm-INCH-ANT.DS
pitja-ku mantji-lku nga-lku
 come-COND get-COND eat-COND
mama ngunytyju-lu=pula mantji-lku ninti-nnyangka
 father mother-ERG=3DU.NOM get-COND give-ANT.DS
 ‘They would stay and later when (the food) had been cooked, (they) would come and get (the food) and eat (it), mother and father having given (it).’

13. Discourse

This is part of a larger means of interpreting incomplete utterances. Discourse involves keeping track of categories in human experience (Halliday 2006: 354). In context sentence fragments become meaningful. This can be through the discourse topic which aids in interpretation, or through background knowledge which is shared by different communities. In the management of discourse, arguments may refer back to the previous clause where they are salient. Discourse builds on this and introduces new topics as it progresses. Halliday (2006: 348) refers to discourse in terms of a continuous flow of information which needs to maintain coherence. Understanding in communication generally involves inferences which may or may not be noticed (Clark 2009). Pragmatics is contextually inferred meaning that is distinguished from linguistically encoded meaning; so a syntactically incomplete sentence may be acceptable if it leads to the ability to make salient inferences about the topic.

Discourse Representation Theory acts in terms of reference and proposition (Van Valin 2005: 171-174) in the pragmatic tracking of referents that occurs in discourse (*ibid.*). Discourse representation structure represents common ground, with information in discourse being added to common ground (Roberts 1998: 362-363). The theory informs RRG’s

representations of pragmatic assertion and presupposition (Van Valin 2005: 171). The semantic representation is linked to the discourse representation with the arguments realised in zero form being properly represented even if they are missing in the clause structure (Van Valin 2005: 174, Shimojo 2008: 293), satisfying the completeness constraint of RRG.

Shimojo (2008) integrates discourse representation structure and RRG with respect to missing nouns as well as verbs. Example (44) illustrates ellipsis in Japanese and shows the role of presupposition in retrieving elided clausal elements.

Japanese (Van Valin 2014)

- (44) *Ringo-o ni-ko da*
 Apple-ACC 2-CL be.PRES
 '(Taro got/will eat etc.) two apples'

Presupposition provides the context to the utterance. In (44) there is an overt accusative undergoer in focus and the actor is understood by presupposition. The verb is recoverable too: *da* 'be' is a copula making the sentence finite. This example stretches the completeness constraint; discourse elements satisfy it. The apples are in focus and have to be expressed as they are not in the presupposition. This is shown in Figure 5 (Van Valin 2014).

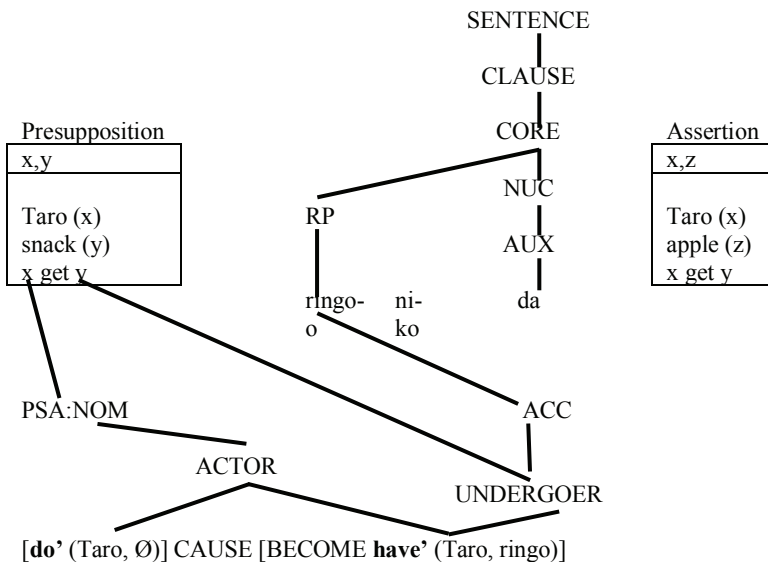


Figure 5: Semantics to syntax linking with presupposition

Like nouns, missing verbs may be salient by the preceding context (explicitly mentioned in the previous sentence); predictable from the preceding context (verb recovered from one's knowledge); part of shared knowledge without preceding context (for example online classified advertisements with no need for explicitness); or unidentifiable.

While non-verbal sentences are rare in Ngaanyatjarra narratives (Glass 1979: 32), ellipsis may extend to the clause in Pitjantjatjara (Rose 2001: 371, 380, 405). Brevity of expression is preferred where the speakers are familiar with the context or setting of the discussion (Douglas 1957: 75). Clarification can be sought where required as in the exchange, where both verb and undergoer are elided.

Notice in each reply in (45) the sole NP has ergative marking even though there is no verb or object: this takes its cue from the elided transitive verb *kultulku*.

Ngaanyatjarra (Douglas 1957: 75)

(45) *malu pulkanya kultu-nu.*
 roo big.ABS spear-PST
 '(He) speared a big kangaroo.'

ngana-lu?
 who-ERG
 'Who (did)?'

wati maliki-lu.
 man stranger-ERG
 'The stranger-man (did).'

maliki wirmira-lu?
 stranger tall-ERG
 'The tall stranger?'

wiya . Litji-ku kamuru-lu.
 NEG Litji-GEN uncle-ERG
 'No. Litji's uncle.'

Switch-reference particles are also used in reported speech to track the referents in a dialogue. In (46), the particle *ka* refers to each brother in turn as the conversation switches between the speakers. The verb *wangkanyi* 'said' and its arguments are elided as they are understood: there are only two brothers so in the switch it is clear who is being referenced.

P/Y (Klapproth 2004: 230)

- (46) *ka kunyu*
 ‘and.DS REP
 ‘and reportedly’
 ‘and (the younger brother said)’ / ‘and (the older brother said)’

14. Generic reference

While zero is by default the 3rd person singular in PYN, in some cases it can have an impersonal interpretation. In (47), *rungkara* ‘grind’ is followed by *ulupunganyi* ‘grind to powder’ with the object *mai palunya* ‘the food (from plants)’ intervening; both verbs are transitive.

- Yankunytjatjara (Kalotas et al. 2002: 86)
- (47) *Munu palulanguru runka-ra mai palu-nya ulupu-nganyi*
 And.SS after.that grind-SER food DEM-ABS grind.to.powder-
 PRES
 ‘After that (one) grinds the food up into flour’
 [do’ (Ø, grind’ (Ø, mai palunya))]
 CAUSE [BECOME **flour**’ (mai palunya)]

A solitary PYN verb with the characteristic ending *-pai/-payi* could have its non overt arguments interpreted as ‘you’/‘one’, as in (48). This is how something is done, with no specific 3rd person in mind.

- Yankunytjatjara (Kalotas et al. 2002: 41)
- (48) *Puyu-tju-ra manara-nkupai, wiya-lpai.*
 Smoke-put-SER go.numb-CHAR, NEG-CHAR
 ‘(One) gives a smoke treatment to make (it) go numb, to kill the pain.’

A possible factor is that direct reference to people is avoided (D. Rose p.c.). Liberman (1982: 36ff) states that a lot of discourse in Pitjantjatjara has an anonymous character and is spoken in an impersonal manner, with personal interests being de-emphasised.

However a transitive verb always carries the implication of an agent. There is no PYN passive form, so to remove an implied agent a verb must become inchoative. This removes the agent completely and makes the action appear spontaneous.

15. PYN narrative

Characters in PYN narratives are usually presented at the outset (Klapproth 2004: 246-247, Glass & Hackett 1979); thereafter pronoun clitics are used. If the story is told in the 3rd person singular, there is no requirement for overt arguments, because of the zero clitics. Pronoun clitics are cognitively lighter than full pronouns: the zero 3rd person default clitic and ellipsis extend this trend. This leads to verb rich utterances, with verbs frequently in series. PYN arguments do not need to be specified; though not expressing them leaves a sentence technically incomplete and reference crucially depends on context, or retaining salience from a previous clause. This backgrounding of an argument, once established in discourse, is part of ‘information flow’ (Mithun 1999, Velázquez-Castillo 1995).

PYN also has switch reference particles and sub-clauses which obviate the need for overt expression of a syntactic subject. Inter-clause switch-reference facilitates the omission of an overt subject. *Munu/palyunyalu* and *ka* bring in a non-overt subject (A or S), which is recoverable by reference to that of the previous clause. Nevertheless, the switch-reference particles frequently have non-zero clitics suffixed if the referent is not 3rd person singular.

Narrative sentences are long in Ngaanyatjarra, with an initial subject followed by a series of verbs or object-verb expressions (Douglas 1957: 103). Similarly, in Pitjantjatjara there are numerous verb only clauses in the corpus (Bowe 1990: 122). The oral stories in Glass & Hackett (1979) typically commence with an introductory setting of the scene. In the opening passage of a narrative shown in (49), the characters of the story (*wati* and *kurrirarra*) are introduced. (50) begins with different subject conjunction *ka*, so only one of the two characters is now subject.

There is no separate overt subject; one of the two original characters (the wife in the free translation) is an elided object of transitive *wantirra* ‘leave’. A new object *marlu* ‘kangaroo’ is introduced and thereafter elided too.

Ngaanyatjarra (Glass & Hackett 1979: 20)

(49) *Wati=pula kurrirarra nyina-rranytja*
 Man=3DU.NOM man.wife live-PST.CONT
 ‘There was a man and his wife.’

- (50) *Ka nyina-tju-ra wanti-rra wana-rnu marlu*
 And.DS stay-put-PA leave-PA follow-PST kangaroo.ABS
wana-rnu-wana-rnu parrawana-rnu-parrawana-rnu parrawana-rnu
 follow-PST(x2) follow.around-PST(x3)
 ‘And leaving (his wife), (the man) followed a kangaroo around and around.’

Ka is however not always used. The text in (51) introduces two brothers; (52) contains only a series of overt verbs.

- Ngaanyatjarra (Glass & Hackett 1979: 1)
- (51) *Wati=pula kutjarra kurtarra nyina-rranytja waru-maalpa*
 Man=3DU.NOM two two.brothers sit-PST.CONT fire-without
 ‘Two men who were brothers had no fire.’
- (52) *Nyina-ngu-nyina-ngu wanti-rra kuti-pitja-ngu*
 Stay-PST(x2) leave-PA out-go-PST
 ‘And (one) got up and went away.’

The sentence (53) is introduced by *munu*. The adverb *tjukarurungku* is in ergative case with the S-transitive verb *katinyi*: the thing led is elided.

P/Y (Klapproth 2004: 224)

- (53) *munu kunyu tjukaruru-ngku kati-ngi*
 and.SS REP straight-ERG lead-PST.CONT
 ‘and (he) was leading (it) straight.’

In this way, switch-reference facilitates ellipsis (Dixon 2011: 465-466). Where switch-reference morphemes indicate same subject, there is no need to overtly specify the thematically continuing argument (Weisser 2012). If the subject is switched through *ka*, both protagonists need to be known to the interlocutors through context or else specified overtly.

Despite this, cliticised pronouns tend to be used with these particles. *Ka=ya* ‘and they’ is a form of backgrounding (D. Rose p.c.); restating the arguments in full is then foregrounding, giving prominence. It might be thought that accusative clitics are more likely to occur since *munu* and *ka* refer to the S or A (nominative) argument. However this is not the case: for example in Glass & Hackett (1979), *kaya* is very common; accusative clitics are comparatively rare.

The zero clitic could be a different person or number if this is implied in the narrative (J. Hobson p.c.), but this is unlikely (S. Lewis via R. Defina). An example of non-3rd person singular is in (54), where *kutikatiku* ‘take’ is S-transitive and the sole overt argument *wikarru* ‘messenger’ is ergative.

The translators have suggested ‘them’ as the missing argument because the previous clause introduces =*ya* ‘they’, but without a switch-reference particle. Examples (55) to (57) further show the use of pronoun clitics in keeping the referents clear after a switch of reference with *ka*.

Ngaanyatjarra (Glass & Hackett 1979: 50-51)

(54) *pitja-yilku*=*ya* *kapi-ngka nyina-yilku*
 come-COND=3PL.NOM water-LOC stay-COND

nya-ku pitja-ku wati waalkarra-ntja wikarru
 see-COND come-COND man appear-NOML messenger.ABS
 ‘They would come and stay at that water hole and might see a messenger come into view’

Pitja-ku waalkarra-ra wikarru-lu kutikati-ku
 Come-COND appear-PA messenger-ERG take- COND

kutjupa kapi-ku
 another water.hole-PURP

‘The messenger would come and take (them) to another water hole’
 P/Y (Goddard 1996: 199)

(55) *Palya, mai pala ungkuliya-la*
 OK, food.ABS DEM send.off-IMP

ka=la mala kutjupa payamila-la
 and.DS=1PL.NOM later other.ABS buy-IMP
 ‘OK, just send off that food there, and we’ll buy some later’

Ngaanyatjarra (Glass & Hackett 1979: 15-19)

(56) *ngarri-ngu=latju tjirntu-rri-ngu*
 lie.down-PST=1PL.EX.NOM day-INCH-PST

katu-rri-ngu=latju
 up-INCH-PST=1PL.EX.NOM

mapitja-ngu Winpuly-tja tju-nu nyina-ngu=latju
 go-PST [place name]-LOC put-PST stay-PST=1PL.EX.NOM
 ‘We lay down and next day got up, went and set down (our things) at Winpuly and stayed there.’

Ka=ya kutitja-ngu minyma pirni-lu=ya
 and.DS=3PL.NOM go-PST woman many-ERG=3PL.NOM

raapita=ya tjulya-rnu kati-nytja kati-ngu
 rabbit.ABS=3PL.NOM catch-PST bring.back-NOML bring.back-
 PST

‘And many women went and caught rabbits and brought them back.’

Ngaanyatjarra (Kavanagh 1990: 58-59)

(57) *Ka=nyu wati-lu mawatja-lku, “Munta yapu tjii-
 ngka.”*

And.DS=REP man-ERG tell-COND EXCLM mountain DEM-
 LOC

‘Oh, I mean that mountain over there,’ the man said.

Ka=pula=nyu watja-lku,
 And.DS=3DU.NOM=REP say-COND

“Wiya, ya-nku=litju kuka pu-ngku kati-ku.
 NEG go-FUT=1DU.EX.NOM meat.ABS kill-FUT take-FUT

Nyangka ngurra-ngka nyina-ma.”
 And.DS camp-LOC stay-IMP

‘Then the two men replied, “Why we’ll go and kill some meat and
 bring it back. You stay home.”’

16. Summary and conclusions

We have outlined the means by which semantic participants are tracked in PYN as narrative proceeds. A striking thing in PYN narratives is the verb-rich nature of sentences, with few overt arguments being present. A clause typically describes a series of actions conducted by a protagonist. This is driven by the 3rd person default, switch reference particles and serial verbs, with ambiguity avoided by pronoun clitics or full forms for emphasis. As regards O arguments, the zero 3rd person and ellipsis are on a gradient with specific reference at one end, to generalised activities with no undergoer at the other.

The PSA has limited use as a concept in PYN. While the dialects use ‘subject’ switch reference to fill in gaps in succeeding clauses, verb endings relate to tense and aspect only. Verb agreement with arguments is not a feature.

With single clauses, the form taken by dependent verbs indicates reference but this does not extend beyond the clause. Referential tracking of

the participants involves tracking within a sentence, as part of the narrative, but informed by semantic plausibility and cultural context.

Our investigation finds that the predicate-argument relationship extends beyond what are considered sentences and must take into account the whole text. When referents are present they are accessible beyond the core, into the clause, sentence and text. This allows us to account for non-expression of arguments, switch-reference particles, and switch-reference verb endings. Different genres have slightly different biases in this regard: narratives permit freer dropping of arguments, while official communications have a fuller overt expression of arguments.

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18. Abbreviations

1, 2, 3 first, second and third persons	DU Dual	NOML Nominalised
ABS Absolutive	ERG Ergative	PA Prior action
ACC Accusative	EX Exclusive	PL Plural
ACT Actor	EXCLM Exclamation	PRES Present
ALL Allative	EXT Extensive	PST Past
ANAPH Anaphoric demonstrative	FUT Future	PURP Purposive
ANT Anterior	GEN Genitive	REP Reported
CHAR Characteristic	IMP Imperative	SER Serial participle
CL Classifier	INCH Inchoative	SG Singular
COND Conditional	INTEN Intensive	SS Same subject
CONT Continuous	LOC Locative	U Undergoer
DEM Demonstrative	NEG Negative	= Clitic (Word boundary)
DS Different subject	NOM Nominative	- Morpheme boundary

CHAPTER FOUR

THE DOMINANT PRINCIPLE OF MEANING CONSTRUCTION IN MIND AND DISCOURSE¹

NIKOLAY N. BOLDYREV

Introduction

In the focus of this chapter are the following issues: 1) the theoretical framework which grounds the research and The Interpretive Commitment of Cognitive Semantics; 2) the main ideas of Linguistic Interpretation Theory and the way it develops Cognitive Semantics; 3) knowledge representation and meaning construction from the perspective of Linguistic Interpretation; 4) the conceptual cooperation among participants of verbal communication as the basis for meaning construction; 5) cognitive schemas of linguistic interpretation that underlie language acquisition, its usage and meaning construction in various aspects of verbal communication.

Knowledge representation and meaning construction in mind and discourse is always situated and presents a cooperative event. The relationship between knowledge about the world and language use is indirect and depends on how language speakers define it (van Dijk 2009). Obvious as it may seem, this issue still lacks profound insight into the conceptual aspects of verbal interaction and needs thorough consideration of the *dominant conceptual factors governing knowledge representation and construction of meanings in mind and discourse*. The approach to communication based on the importance of factors that affect a communication event has so far remained limited. It has been suggested that in the process of verbal interaction participants rely on certain assumptions that govern conversations in everyday life. In their most widely known form, these assumptions have been expressed as four maxims by H.P. Grice

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(Grice 1989). They jointly specify the so-called “cooperative principle of conversation” within which instances of miscommunication can be analyzed.

In this paper, we argue that the fundamental principle that underlies cooperative communication is the **Interpretation Interaction Principle** which involves conceptual accommodation, interpretation and negotiation of meanings within contexts of collective and individual knowledge activated in participants’ minds in discourse. This principle is based on the concept that there are many workable ways by which individuals can construct their world (Kelly 1963) and that, as D. Dennett put it:

all varieties of perception — indeed, all varieties of thought or mental activity — are accomplished in the brain by parallel, multitrack processes of interpretation and elaboration of sensory inputs. Information entering the nervous system is under continuous “editorial revision... We don't directly experience what happens on our retinas, in our ears, on the surface of our skin. What we actually experience is a product of many processes of interpretation... Contents arise, get revised, contribute to the interpretation of other contents or to the modulation of behavior (verbal and otherwise). (Dennett 1991, 111–12, 135).

The Interpretation Interaction Principle also derives on the main assumptions of **The Linguistic Interpretation Theory** that were previously outlined in Boldyrev (2011; 2016) and later expanded in Boldyrev (2018). These assumptions need to be clarified in the first place below.

Meaning Construction from the Perspective of Linguistic Interpretation

The problem of knowledge representation and meaning construction is in the mainstream of current theoretical and empirical research oriented towards the study of cognitive processes and how they are instantiated in language. Various approaches, within which the problem has been addressed, have revealed numerous theoretical frameworks for understanding the crucial role of language in the above mentioned processes. These theoretical frameworks based on linguistic, behavioral and psychological evidence, however profound, call for some discussion and need to be modified in view of a large body of data demonstrating that knowledge representation and meaning construction involve three functions of language, rather than two as has traditionally been held before: that of cognitive, communicative and *interpretive*, the latter being no less significant than the former two.

These three functions are meant to account for the three types of knowledge representation in language: lexical representation, grammatical representation and modus representation. Correspondingly, language as a system of knowledge representation manifests itself as a threefold unity of the representative, communicative, and interpretive aspects. The interplay and conformity of the three aspects of language make the core idea of the Linguistic Interpretation Theory which aims to explain how knowledge is represented in language and how it grounds meaning construction.

The given aspects, correlating with the three functions of language and with the three systems of linguistic conceptualization and linguistic categorization, all merge into the integral whole of the linguistic representation system. Primary representation of knowledge about the world (conceptualization and categorization of events / objects, etc.) is maintained by interpretation of the world as a broad variety of objects. It is shared by the speech community and is oriented towards principles of verbal communication. The latter, in turn, is involved in semiotic processes of meaning construction, which are also inherently interpretive. Secondary representation (secondary conceptualization and secondary categorization) takes place when speakers classify, evaluate and re-interpret knowledge about the world to construct individual meanings in discourse. Thus, the integrative unity of language as a functional system for operating with knowledge is based upon the inalienable links between conceptualization and categorization and is supported by their interpretative nature, as well as by the causal relation between linguistic and conceptual structures in verbal communication. It also comes from the need for language to simultaneously perform different functions.

All the aspects affect the process of meaning construction in their own way, and the role of each aspect cannot be underestimated. With these arguments in view we inevitably come to the conclusion that the existing frameworks for analyzing meaning construction should be complemented and enhanced with relevant methods, procedures and analytical techniques sufficient for analyzing language as a threefold unity with the interpretive aspect as its integral part.

The Interpretive Commitment places linguistic issues in the broader perspective of human cognition and conceptual organization by analyzing linguistic interpretation as a cognitive process. This provides deeper insights into the structure of the mind and conformity of linguistic and cognitive structures. Certain structural and conceptual correlations between language and mind can be traced by exploration of the cognitive schemas of linguistic interpretation, see for details Boldyrev (2016). Various studies of language use, of language structure and its categories within the framework of

cognitive semantics give much evidence that language as a cognitive ability can have great impact on the content and functioning of the mind. Our claim is that the exploration of problems of language-and-mind interplay needs to be accounted for not only from a cognitive but also from an interpretive perspective. This approach to language as an important interpretive factor in the structure of mind is what is referred to in the paper as the ***Interpretive Commitment of Cognitive Semantics***, in accord with what G. Lakoff called the Primary Commitments of Cognitive Linguistics:

... cognitive linguistics is defined by two primary commitments, what I will call the Generalization Commitment and the Cognitive Commitment. The generalization commitment is a commitment to characterizing the general principles governing all aspects of human language... The cognitive commitment is a commitment to make one's account of human language accord with what is generally known about the mind and the brain, from other disciplines as well as our own (Lakoff 1990, 40).

The claimed approach is based on the ***Theory of Linguistic Interpretation*** (Boldyrev 2011) as part and further development of the Theory of Cognitive Semantics. Its main assumptions are: 1) that cognition and use of language are highly interpretive processes; 2) therefore language performs three main functions: cognitive, communicative, and interpretive; 3) linguistic structures, categories, and forms play a significant role as cognitive schemas mediating processes of perception and structuring consciousness, as well as meaning construction.

Among the most frequent cognitive schemas underlying language use and structuring consciousness are the three types of linguistic categories: lexical, grammatical, and modus (or interpretive); different types of concepts and conceptual structures: spatial, temporal, quantitative, modus, and evaluative; propositional models, various syntactic and idiomatic structures, speech patterns (Boldyrev 2016). These schemas help the human cognitive system adopt and function properly in the surrounding world as well as extend and enrich itself through acquiring both linguistic and non-linguistic experience.

For example, human beings construe spatial concepts to map the world of people, objects, and ideas as being in close relation or belonging to the speaker (egocentric spaces: *my institute*), or to some other person (non-egocentric spaces: *your institute*), or as having no such cognitive center at all (non-centered spaces: *institute*); as physical or conceptual spaces (*warehouse-theory*), professional or social communities (*faculty-club*); bounded or unbounded (*in the city-in the sky*), permanent or temporary professional or social spaces (*editorial board-organizing committee of the*

conference); filled or empty containers (*to take things from the suitcase—to pack things into the suitcase*). In doing so, speakers aim at constructing and conveying various kinds of meanings in discourse bearing in mind these conceptual peculiarities. It becomes evident from the comparison of meanings of pairs of sentences below. If the meaning of the sentences indexed (a) refer to the long-term positions and feel quite normal, the meaning of the (b) sentences referring to the short-term positions is not as clear because they do not observe the above-mentioned differences in conceptualizations:

- (a) *He/she is a retired chair of the department.*
He/she applied for the position of the leader of the research project.
- (b) ? *He/she is a retired chair of the conference.*
 ? *He/she applied for the position of the leader of the delegation.*

Meaning construction in mind derives on the cognitive processes of conceptualization and categorization of the outer world. E. Rosch argued that the vertical three-level conceptualization and categorization of natural objects give rise to **basic, super-ordinate, and subordinate categories** (Rosch 1978). As a rule, they are lexically accessed within logically constrained systems of organization as variants or invariants. Their reference points involve names of categories proper. For example, *tree* is defined as “a perennial woody plant having a main trunk and usually a distinct crown”; *oak* as “any of numerous deciduous or evergreen **trees** or shrubs, bearing acorns as fruit [the freedictionary.com]. Prototype theory holds that basic categories of natural objects build on the prototype principle (*dog, cat, cow, etc.*); super-ordinate categories as logical constructs are the invariant-variant structures (*mammals*); subordinate level categories can also be characterized by prototype effects: various species of dogs, cats, or cows. Abstracted from the particular properties of objects, actions, and states names of categories thus function as **intra-linguistic points of reference** for meaning construction, or as **the prototype-based means of knowledge representation in language**:

*a sparrow is a small brownish-grey **bird**; palm is a **tree** growing in warm climates, with no branches and a mass of large wide leaves at the top; salmon—large **fish**, valued for food.*

Particular-meaning construction in discourse aligns with part-of-speech categorization as well as **functional categorization** of the linguistic units chosen to express this meaning. The analytical procedure related to the process of functional meaning construction is referred to in this chapter as

the **functional semiotic approach**. It reveals three main principles: **actualization** of the systemic meaning of the word (*She counted the audience*), **word re-categorization** (referring it to some other category which entails change of its meaning: *Your opinion counts*), and **poly-categorization** (associating the word with two different categories which allow to convey two meanings simultaneously: *She counted down the expenses—'counted' + 'reduced'*).

The **interpretive aspect of language** relates to linguistic interpretation of collective knowledge about the world within individual conceptual systems. D. Dennett puts it in the following way:

Comparing our brains with bird brains or dolphin brains is almost beside the point, because our brains are in effect joined together into a single cognitive system that dwarfs all others. They are joined by one of the innovations that has invaded our brains and no others: language. I am not making the foolish claim that all our brains are knit together by language into one gigantic mind, thinking its transnational thoughts, but rather that each individual human brain, thanks to its communicative links, is the beneficiary of the cognitive labors of the others... (Dennett 1994).

From this perspective, there can be distinguished **two main types of linguistic interpretation**: primary and secondary. The first (primary interpretation) pictures the world as a variety of events or objects and results in lexical concepts, categories and lexical units as names of species, types, and sorts: *robin, sparrow, crow, raven, swallow, goose, swan, blackbird, nightingale, ostrich, parrot, peacock, hawk, eagle*, etc. Secondary interpretation involves secondary conceptualization and secondary categorization of conventionalized knowledge as it is represented in language. It results in grammatical (different grammatical representations of subject–predicate, theme–rheme, topic–comment relations, choice of syntactic structures, etc.), and evaluative (modus) conceptualization and categorization, often metaphorical when names of objects from one domain are applied to characterize elements of other cognitive domains (*the hawk of a man*).

These types are represented by **three models of linguistic interpretation**: a model of linguistic interpretation of the physical world, that of the human society, and a model of linguistic interpretation of the acquired knowledge about the physical world and society. Each model employs its own schemas of linguistic interpretation: propositional, spatial, temporal, metaphoric, or metonymic. All three models call upon corresponding contexts of knowledge and values of overall and socio-cultural nature in which the interpretive power of linguistic units and categories comes to light.

Interpretation is deeply ingrained in knowledge representation and verbal communication. There is much linguistic evidence that the cognitive activity of every human being is intentionally biased: the environment, the territory, the social status, the level of education, etc., influence the structure and content of human conceptual systems. Interpretation as a process is based on and deeply embedded in schemata that are represented by language as a tool for collective thinking.

The interrelation of the semiotic and the interpretative aspects of language, argued by researchers in cognitive psychology (Barsalou 2012), is clearly demonstrated by a variety of language units that represent individual knowledge dependent upon the speaker's background, e.g.: *conference, session, meeting, congress, sitting of the council, get-together, party*, etc. The interrelation of interpretation, representation and communication is objectified by **selection, classification and evaluation** as basic cognitive processes activated in cognition and discourse construction.

Selective interpretation accounts for the choice speakers make when they construe the world, profile an idea or favour some language units over others. While contexts of collective knowledge comprise overall knowledge about the world and the system of collective values, contexts of individual knowledge reflect the “modification” of the collective knowledge that is influenced by sociocultural parameters, such as the territory the speaker occupies, the education and the sociocultural knowledge the speaker acquires from the outer world, the speaker's age, occupation, gender, individual values, way and standard of living, etc. The word *university*, for instance, represents the following **contexts of collective knowledge**:

an institution of higher learning with teaching and research facilities typically including a graduate school and professional schools that award master's degrees and doctorates and undergraduate division that awards bachelor's degrees;

the buildings and grounds of such an institution;

the body of students and faculty of such an institution [The Free Dictionary].

In the process of language use, however, this word refers to **the individual experience of a particular speaker in different cultures**:

for the driver it refers to ‘a particular point in space’ (*Can I park at the University?*);

for the architect—‘a piece of art’ (*The University is in Gothic style*);

for common citizens—‘a building, grounds, place of work or meeting point’ (*The University Campus / Library. We'll meet at the University main building*),

for the child –‘extra activities’ (*I take drama classes at the University*), etc.

Selective interpretation manifests itself in the subjectivity in discourse construction that, in turn, clarifies the reasons for differences in discourses due to speakers’ occupation, culture, background knowledge: a football player, a fan, a reporter, or a first-comer will differently profile and use different constructions and lexical words for the description of one and the same football match. We call the speaker’s choice as to what to say and how to say it the **subjective principle** of discourse construction. It is constrained by the context of the speaker’s overall, socio-cultural and linguistic knowledge, i.e. by his/her conceptual system and linguistic image of the world (see also Boldyrev and Dubrovskaya 2016). This context is evoked and structured by the **meta-concepts** ROLE, NORM, VALUE, SOCIAL STATUS, TIME, PLACE, LANGUAGE EXPERIENCE, etc. which constitute the meta-discourse (extra) information operating in parallel to the main content of the discourse and making the latter situated by characterizing the speaker’s background knowledge and the relative choice of topic and words. It can be explicated by virtue of a specially devised method of cognitive-discourse interpretant [see opt. cit.].

Classification is a cognitive process of categorical identification and interpretation of objects and events (their secondary conceptualization and secondary categorization), i.e. their secondary representation by nature. It results in abstract notions relative to all sorts of taxonomies, as well as in names of categories (*humans, animals, birds, fish, plants*), and in words describing mental conditions, feelings and emotions (*love, hate, respect, worship, despise*). It accounts for the speaker’s system of values and norms, attitudes, feelings, emotions, beliefs that are constitutive of their worldview. The interrelation of classification and the semiotic aspect of language manifests itself in the grammatical system of language as grammatical interpretation of the overall knowledge about the world (all events are interpreted in language as actions, processes, states, etc.). Complex and semi-complex sentences can classify and present a string of events as a conceptual unity imposing different relations between them so that one event presented in the main clause (given in bold letters in the sentence below) becomes more salient while the rest (those in the subordinate clauses or participial constructions) serve as its conceptual background adding up to the overall meaning of the sentence by specifying the salient event:

*Crossing the river by way of the Sonnet Bridge ... **Adrian slapped each stone ball** that marched along that noble structure’s span **in frustration*** (Fry 2004, 204).

Evaluative interpretation is reflected in the inherently human ability to employ language for activating appraisal / assessment schemata. Language, in this case, manifests what norms, standards, values speakers have acquired as representatives of societies and cultures and how they adapt their worldviews to contexts of discourse construction. Processes of evaluative conceptualization and evaluative categorization are an integral part of human cognition. **Evaluative concepts and categories** share all modus specific features: they are secondary in knowledge representation, relative to particular contexts, inherit the structure and content of the evaluated entities. Linguistic evaluative categories include not only typical lexical units meant for the evaluation of objects (*nice, beautiful, ugly, plain*), but also grammatical constructions and inherently neutral words in their secondary evaluative or metaphoric meanings (*How clever of you to have lied to me, it is*).

The conceptual structures underlying evaluative language serve as cognitive schemas of linguistic interpretation. These collective and individual evaluative schemas representing "pre-structured background knowledge", in terms suggested by Fauconnier (1994), play an important role in the perception of the world and in structuring minds: *good–bad, useful–harmful, healthy–unhealthy, decent–indecent, polite–rude*, etc., when especially used in the linguistic form of phraseology, idiomatic units, all kinds of speech clichés, in advertising:

first come–better served; Vegetarian diets can be healthy and may even lower the risk of heart disease, Type 2 diabetes, and cancer ...

Bearing in mind that meaning construction and interpretation are highly dependent on contexts of knowledge (relatively static systems) that speakers possess as representatives of particular societies and cultures, the participants of communication need to conceptually cooperate in the dynamic process of meaning construction in discourse to get better understanding of each other and avoid failures in communication due to misinterpretation.

Meaning construction as a problem of conceptual cooperation

As conceptual systems of individuals reflect patterns of their behavior, ways of living and are influenced by their social status, occupation, age, gender, level of education and culture, they encompass various contexts of knowledge related to the individual cognitive experience. These contexts

are specified within thematically-structured conceptual domains: HUMANS, ANIMALS, PLANTS, NATURE, ARTEFACTS, TIME, SPACE, etc., static by nature. The outcomes of verbal communication largely depend upon dynamic mutual “*conceptual cooperation*” or adaption of the conceptual systems of all the participants aimed at evoking similar contexts of knowledge. Specifically, this cooperation presupposes the conformity of 1) structure and content of speakers’ individual conceptual systems (world image), 2) their language-usage experience, 3) the adequate estimation of the interlocutor's scope of knowledge, 4) matching of evaluations, and 5) the choice of meaning-construction mechanisms (construal operations) and relative contexts, both cognitive and linguistic. T. Givón pointed out that:

... the context that is relevant to the pragmatics of sociality and communication is a highly specific mental operation - the mental modeling of the interlocutor's current, rapidly shifting belief-and-intention states. The construed context of social interaction and communications is thus a mental representation of other minds. (Givón 2005, 91 and fl.).

Within this view, the problems of meaning construction and language use should be discussed in terms of:

- a) how the conceptual systems of different participants of the communication are structured and correspond culturally;
- b) what constitutes the content of their conceptual systems and if the cognitive contexts (contexts of knowledge) evoked in communication align;
- c) whether mutual estimation of their conceptual systems by the interlocutors and their evaluations of the content of communication match;
- d) to what degree their linguistic competence and linguistic performance equal each other;
- e) what mechanisms and cognitive construals that underlie language use are employed for meaning construction and comprehension (for details see also Boldyrev 2017).

Hence **the main research problem** is to identify variables of conceptual factors that affect language use and meaning construction in mind and discourse. At this point of our discussion, it also seems but reasonable to quote H.P. Grice’s paper on the cooperative principle:

Our talk exchanges do not normally consist of a succession of disconnected remarks, and would not be rational if they did. They are characteristically, to some degree at least, cooperative efforts; and each participant recognizes in them, to some extent, a common purpose or set of purposes, or at least a mutually accepted direction. This purpose or direction may be fixed from the start ... or it may evolve during the exchange; it may be fairly definite, or it may be so indefinite... But at each stage, SOME possible conversational moves would be excluded as conversationally unsuitable. We might then formulate a rough general principle which participants will be expected (*ceteris paribus*) to observe... One might label this the COOPERATIVE PRINCIPLE (Grice 1975, 45).

Solid empirical evidence drawn from everyday conversations, SMS-messages, blogs, newspaper reports, contemporary fiction and films prove that it is the above-mentioned conceptual aspects of meaning construction that underlie the cooperative efforts and the relative conversational moves H.P. Grice wrote about. If observed by the participants, they provide for mutual conceptual cooperation in discourse and ensure cooperative communication, and if ignored, they lead to misunderstanding and communicative failures. Some examples below serve to illustrate this argument at large.

Structural and cultural correspondences in interlocutors' conceptual systems

The following episode (Boarding aircraft) from the American film "Meet the Parents" illustrates the conceptual and verbal conflict between the boarding assistant doing her best to observe the instructions and the passenger's common sense behavior as the only passenger on the line:

Passenger (produces the ticket).
 Assistant (takes the ticket with a ready-made smile): *Hello!*
 (examines the ticket) *Oh, I am sorry. We're only boarding rows 9 above right now. You have to wait.*
 Passenger: *I mean row 8.*
 Assistant: *Please, step aside.*
 Passenger: *It's just one row, may be you let me in...*
 Assistant: *We'll call your row generally.*
 Passenger (looking around and seeing no other passengers in the waiting area, doesn't move, looking at her intently, perplexed).
 Assistant (sternly): *Step aside, sir.*
 Passenger steps aside, waits, sending the assistant malignant glances.

Assistant (in half a minute, with a forced smile, into the microphone):
Thank you for waiting. We'd like to continue boarding aircraft now. We're now boarding all rows, please, all remaining rows.

Passenger looks around to see no one except himself, comes up with a stern face and a withering look, produces the ticket.

Assistant (smiling artificially): *Hello.*

(looks at the ticket shortly) *Ahu, enjoy your flight.*

Passenger (takes the ticket with a malignant glance, proceeds silently).

Another example is to illustrate cross-cultural misunderstanding due to the lack of specific cultural knowledge. The mass media in Russia in their official release announced that famous opera singer Anna Netrebko had been awarded the honorary title Austrian chamber singer, rendering it in its literal translation into Russian (*Avstrijskaya kamernaya pevitsa*) which normally stands for 'a singer who performs songs to the accompaniment of the piano'. As a result, the singer got offended and had to clarify that **Kammersängerin** in Austria is one of the highest honorary ranks that equals to People's Artist in Russia.

Jen Psaki became famous by her statements as the representative of the US State Department. Thus, she spoke about the transportation of Russian gas "*via a gas pipeline from Western Europe through Ukraine to Russia*", mentioned the "*shores*" of Belarus (which actually has no sea borders), to which the 6th US fleet will be immediately transferred if Belarus invaded Ukraine, commented on the photos of the Donetsk volunteers, claiming:

*In the pictures we see that these people, **judging by their outer appearance**, are clearly related to Russia.*

The given examples obviously show that the cultural aspect of meaning construction (including the cross-cultural specificity) requires language to be seen from a larger perspective of our mind communicating with other minds:

It [language] opens an access to knowledge, feelings, and thoughts that exist "out there" in the community of minds we call culture. This cultural universe of knowledge, feelings, and thoughts is the world of *meaning*. The aspect of language we refer to as *semantics* thus concerns the meaningful exchanges between the individual speaker and hearer and a given community of language speakers surrounding the individual with equally meaningful *discourse*. In individual minds meaning emerges as "chunks" or "portions" of thought... (Brandt 2016, 393, 408).

The alignment of cognitive contexts

Similar language structures, as it has already been mentioned, can evoke different individual contexts of knowledge. In 2017, the Adidas Company after the 121st Boston Marathon (which takes place annually since 1897) sent out a letter to the participants with the theme “*Congratulations, you survived the Boston Marathon!*”. The letter raised a vigorous negative reaction from the customers. For some reason, the organizers did not take into account that 4 years ago during this marathon a major terrorist attack took place. The explosion of two bombs in the crowd killed 3 and injured 264 people. After that incident, the company had to apologize saying that they had hardly thought that these words could offend anyone [Congrats from the Adidas Company 2017].

Here are some more (innocent) examples of mismatching cognitive contexts:

Anna: *Can you, please, explain to me why you call me “Sir”?*

King: *Women do not stand in the presence of His Excellency (“Anna and the King”).*

- *What’s marriage? A ring? A contract? Fighting? Compromising? It can be more than that.*

- *Marriage is not a contest. Never keep score. God has put the two of you together on the same team to win! (“The mirror has two faces”).*

Man: *Does your dog bite?*

Woman: *No.* (The man reaches down to the pet dog. The dog bites the man’s hand).

Man: *Ouch! Hey! You said your dog doesn’t bite.*

Woman: *He doesn’t. But that is not my dog?*

Observation of one’s interlocutor’s conceptual system

Conceptual cooperation aimed at ensuring effective communication presumes the speaker’s estimation of the hearer’s system of knowledge and evoking matching cognitive contexts, as in the below quoted episode from the interview of an applicant with the manager of the shop selling expensive cars:

Manager: *I’ve read your CV. It suits me perfectly. You’re highly experienced. I think you are the right man for the job.*

Applicant: *I haven’t yet mentioned in my CV that I can also speak English, German, French, Japanese, Swahili.*

Manager: *I don't think you will need it here. The main thing is to find a way to the customer.*

Applicant: *I quite agree with you.*

There comes the customer.

Customer: *Hi, guys! Can you help me? I need a car that flashes and makes various sounds when it starts and stops, especially at night, greeting other cars, when also I push different buttons (demonstrates sounds).*

Manager (to the applicant): *Go ahead!*

Applicant: *Yes, we have an astonishing car that makes various sounds when you open the boot, when you break or stop (voices sounds).*

Customer: *And what about buttons?*

Applicant: *Oh, it has plenty of push-buttons to signal the other cars (imitates signals).*

Customer: *Oh, great! I like it very much, that's what I need, I think. I will take it (without asking to have a look at the car).*

Applicant: *Ok, let me show you to the cashier's desk.*

Manager (to the applicant): *The job is yours. Get down to work right now.*

It is common knowledge that people rarely trust anyone's opinion but try and check everything by themselves: if the door is really closed or there is no one in the office, that the car wouldn't start or the telephone isn't really working. It is apparently observed by the authors of such like notifications:

It is forbidden to cross the bridge here. The bridge is closed. There is no bridge at this place anymore!!

Differences in evaluations

Depending upon the situation, evaluative language and the cognitive schemas that underlie it may activate different cognitive contexts, as for the word *culture* in the following example:

Resistance to culture is evident among people whose capacity to appreciate it is limited, for example, to poster or folk art, pop music, primitive dance, and pulp fiction. Such resistance to culture frequently is associated with an incapacity for refinement—in manners, speech, and general conduct (Bartlett 2011, 198).

Possible differences in evaluations that should be observed by speakers and hearers is also a significant factor in conceptual cooperation. They rest on the differences in personal cultural experience gained by individuals during the life and related to their age, sex, occupation, social status, etc.

These differences develop personal attitudes and values that evince collective and individual evaluations:

The Department of Slavic Languages and Literatures offers innovative approaches to learning about Slavic peoples and their cultures... As a faculty, we are quite diverse in our training, age, area of specialization, and theoretical orientation, but we share a commitment to interdisciplinary study. [The Harvard Slavic Department Website 2018].

A University education should be broad and general. But these students are being trained, not educated. They are being stuffed as Strasbourg geese. Pappy mush is forced into them, just so that one part of their brains can be fattened. Their whole minds are being ignored for the sake of that part of them which is marketable. (Fry 2004, 233).

Some individual evaluations are emotionally expressed and marked by personal manner of speech:

Mike Pompeo is doing a great job. I am very proud of him. His predecessor, Rex Tillerson, didn't have the mental capacity needed. He was dumb as a rock and I couldn't get rid of him fast enough. He was lazy as hell. Now it is a whole new ballgame, great spirit at State! (D. Trump).

Individual evaluations very often turn up in contradictory statements or in the expression of different points of view (sometimes humorous or ironic) on the same subject or some of its aspects, e.g.:

Russian Fans at the Olympics Are Loud, Proud and Angry. They blame the IOC and western culprits for trying to intimidate Russia. The state-sponsored program to provide athletes with performance enhancing drugs is an invention by Russia's enemies. (Hans B. Skaset).

- *Sioma, it's always fine there where we can't be present at the moment, isn't it?*

- *No, Fima, it's bad that we can't be there where it's fine at the moment.* (Odessa humour).

The girl of 5 is told to keep to her room and is not allowed to watch TV in a way of punishment:

- *Mom, are you sure this is the right way to punish me?*

- *Yes. What's wrong with it?*

- *Just see for yourself. Here I am sitting alone in my room and thinking ill of my parents. Is it really what you expect me to do?*

Linguistic competence

Linguistic competence is part of cultural knowledge that largely affect the conceptual cooperation in communication because the ideas incorrectly represented cannot be correctly perceived, otherwise the participants are aware of possible errors. Hilary Clinton, the then US State Secretary, presented to Sergey Lavrov, the Russian Minister of Foreign Affairs, a symbolic push-button that read *peregruzka* ('overload') instead of *perezagruzka* ('reset') [Vesti.ru 2009].

US President Donald Trump wrote *unpresided* instead of *unprecedented* in his official Twitter microblog commenting on the incident with the seizure by the Chinese Navy of an American underwater unmanned vehicle in the international waters of the South China Sea. [Trump 2016].

French President Emmanuel Macron in his speech in English in Sydney called Lucy Turnbull, wife of Prime Minister of Australia Malcolm Turnbull, *delicious*. Apparently, he used this word as a direct loan from French *delicieux* that can be referred to humans as well, not mainly to meal as in English [Ria.ru 2018].

The door tags asking either to clean the room or not to disturb at one of the hotels in Russia read in English: ***Please remove the room; Please do not worry***. Very likely, the phrases present automatic Google-made translations that disregard different meanings of the Russian variants and their forms: *ubrat* ('remove', 'clean') and *bespokoit*/'*bespokoit'sa* ('disturb', 'worry').

It is also extremely popular nowadays in Russia to give English, transliterated or combined Russian-English names to the shops, cafes, or service centers, obviously to attract more customers by unconscious reference to a better quality of the service. One of such rather confusing names read ***Barbershop Cutheads***.

Linguistic Mechanisms and cognitive construals

The information we can extract from the sentence goes way beyond the lexical meaning of the words it contains. But we can only extract it if we are in possession of grammatical and other linguistic tools—knowledge sources stored in our brain that are usually called cognitive and linguistic mechanisms of meaning construction. Among them are various models of word building, paradigmatic and syntagmatic rules, syntactic patterns. In contemporary American English there appeared a new word combination ***Trump-years*** that defines the human experience of aging one full human year for every one month that Trump is in office:

My God, I've gone grey in just these three+ months, but of course, I am aging in Trump-years. By the time we get him out in 2020 I will be over one hundred Trump-years-old! [Urban Dictionary].

To comprehend the meaning of this sentence one also needs to know that it is an inverse analogue to *dog-years*, in which a dog is said to age seven years for every human year.

The conceptual cooperation underlying effective communication requires that the hearer can recognize cognitive and linguistic mechanisms used by the speaker and is aware of his/her alike capability. It is especially important in translation as a type of cross-cultural communication. British Defense Secretary Gavin Williamson at his briefing on Scripals' case said that Russia should go away and should shut up. Russian mass media translated **shut up** as **get gagged** that sounds much ruder in Russian than *shut up* in English.

Austrian reporter A. Wolf asked V. Putin in his interview about his topless photos (*Fotos mit nacktem Oberkörper-photos with bare trunk*), while the interpreter translated it as *v polugolom vide* ('in a half-naked form') which in Russian sounds rather familiar when especially addressed to the President.

Conclusion

Any cognitive theory of language is meant to give deeper insights into the structure of human consciousness and into the interrelations between language and mind by providing evidence on their interdependence. There is no doubt that language as a cognitive ability is an integral part of human cognition and is deeply ingrained in it. Therefore, there is no better access to cognitive structures and processes and no better way to understanding how the humans communicate meanings, than through research of the conceptual basis of language structure and use.

Another conclusion of no less significance is that language rests on the unbounded ability of human beings to create numerous meanings as well as new linguistic forms to represent these meanings. The interrelation of linguistic and cognitive processes as well as correlation and interplay of verbal and non-verbal knowledge highlights the vital role of language not only in the process of cognition itself, but also in structuring the human system of knowledge and shaping its cognitive dominants. These dominants, making up the individual conceptual system of a particular speaker, as well as an individual way of meaning construction, are unique in many ways. They govern knowledge representation and meaning construction in mind and discourse. Therefore, speakers and hearers need to

conceptually cooperate in the process of verbal communication observing the following factors:

- 1) how the interlocutors' conceptual systems are structured and if their dominants correspond culturally;
- 2) if the cognitive contexts (contexts of knowledge) evoked in communication align;
- 3) whether participants observe the scope of knowledge of each other and their evaluations of the content of communication match;
- 4) to what degree their linguistic competence and linguistic performance equal each other;
- 5) if cognitive and linguistic mechanisms employed by the hearer for comprehension accord with those used by the speaker for meaning construction.

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CHAPTER FIVE

THE FORMS, FUNCTIONS AND PRAGMATICS OF IRISH POLAR QUESTIONS AND ANSWERS

BRIAN NOLAN

1. Introduction

Natural discourse is full of acts of questioning and the canonical function of the interrogative is to seek information. Languages have sentences with special structural forms that act as cues to signal that these are for asking questions. This kind of communication using questions and answers is central within dialogue (Coulthard 1992, Dayal 2018, Hamblin 1973, Dryer 2005, Holmberg 2015).

This chapter examines the question–answer interactions in Irish and the associated challenges of unpacking meaning, and characterising knowledge, in the speech act of requesting information in one of its manifestations, the polar yes-no question. An interesting feature of Irish is that it does not have any exact words which directly correspond to English ‘yes’ or ‘no’ and so the language employs different strategies where a yes-no answer is required.

In our analysis, we characterise the expressive forms, functions, logical underpinnings and pragmatics of polar yes-no interrogatives as question–answer pairs, and the felicity conditions necessary for their successful realisation. In a question-answer interaction, information is assumed to be freely exchanged, under a Gricean presumption of cooperation (Grice 1957, 1969, 1986).

Syntactically, Irish uses question particles in the formation of its various question forms. From Dryer (2005: 470), we know that question particles are more common in the world's languages as a cue in the syntactic structure of interrogatives. We examine the features of these in their morphosyntactic context. Other elements of the grammar of Irish have been reported on in Nolan (2008, 2012, 2013, 2014, 2017, 2019).

We argue towards several related claims regarding polar yes-no questions of Irish.

- Claim-1 The answers to polar yes-no questions of Irish contain instances of ellipsis and, as such, represent full clausal expressions with a complete semantics where the elided elements are from the question part of the question-answer pair.
- Claim-2 The propositional content is inferred from the context, specifically from the question with which the answer is paired.
- Claim-3 One of the functions of interrogatives is the maintenance of common ground via the update and exchange of information between the interlocutors.

The maintenance of common ground serves to reinforce social affiliation in a group through having access to shared knowledge and understanding. The fact that languages have clausal types for requesting information, and asking (polar yes-no) questions, shows clearly how important this activity is to everyday human communication. The construction and maintenance of common ground is crucial to retrieving meaning. We examine the polar question, and its answer, in the context of some particular situation and find that the answers to questions populated different parts of common ground and elaborate disparate dimensions of a situation.

The chapter has the following organisation.

In section 2, we examine the importance of context in providing meaning saturation to an underspecified situation from the perspective of the participants of that situation. We also will stress how important context and the situation are for constructing the meaning of speech acts, including, questioning. Section 3 examines the nature of the speech act of questioning and outlines the felicity conditions necessary for a successful, i.e., felicitous, act of questioning. Section 4 treats the polar yes-no question form of Irish. In section 5 we examine Irish alternative questions, a question form related to polar yes-no forms. Section 6 explores the nature of the answers to these question types, highlighting the main strategy used, the verb-echo strategy, when there are no direct words for 'yes' or 'no' in the language. We characterise the important features of the answers to the questions. Section 7 draws a number of conclusions and reviews how we have argued to support our claims regarding the management of meaning via polar yes-no questions.

2. The situation and its Context

The importance of context in assisting in the determination of speech act meaning in language has long been recognised. According to Nerlich & Clarke (1996), the first scholar who systematically linked the notion of context with function in an approach to linguistics, in order to highlight the important contribution of context to language use, was Malinowski (1944). Malinowski viewed the notion of situation as having core relevance to speech act meaning along with context. Malinowski's concept of the CONTEXT OF SITUATION builds on Wegener's (Nerlich 1990; Nerlich & Clarke 1996) distinction between three types of situation: (i) the situation of perception, (ii) the situation of memory, and (iii) the situation of consciousness.

Malinowski took a wide scope view of the term context of situation as encompassing the whole of the communicational circumstances, including the particular speech situation, as well as the general socio-cultural context—CONTEXT OF CULTURE.

According to Malinowski, in order to correctly understand a speech utterance, it has to be studied as part of a speech event, itself central to the particular context of situation. This context of situation has an internal structure, but it is also related to the wider social framework. In our view, this essentially equates to the cultural context and the idea of common ground of the interlocutors.

An analysis of the speech act with its context of situation is core and will assist us to: “in principle account for language in its social situation, rather than as merely a collection of structural units to be analysed individually” (Monaghan 1979:1). More recently, Stalnaker (1999) has argued for the centrality of context in speech act meaning determination, and in support of the maintenance of common ground (Keckes and Zhang 2009).

As linguists, therefore, we are concerned with the speaker and the hearer, and the goal that the speaker wants to achieve by uttering certain words, in this case, the requesting of information.

To fully understand how communication works, we also have to take into account the situation in which words are uttered. The speakers can only achieve their goals and the hearers can only understand the speakers if both parties can draw inferences from the linguistic, cognitive and cultural common ground that forms context.

In Nolan (2019) we proposed a model of a situation that applied to speech acts along with several important aspects of speech act characterisation (1). In Nolan (2014) we characterised the cognitive states for an actor in dialogue (2).

We elaborate on these here in respect of the speech act of requesting information, specifically for polar yes-no questions and related questioning forms.

- (1) Important aspects of speech act characterisation (Nolan (2019))
 - a. The set of *beliefs* that the Actor has at any given time;
 - b. The *goals* that the Actor will try to achieve;
 - c. The *actions* that the Actor performs and
 - d. The *knowledge of the effects* of these actions;
 - e. The *environment information / knowledge* the Actor has (which may be incomplete or incorrect).

- (2) Cognitive states for an actor in dialogue (Nolan 2014).
 - a. **BELIEVE'** (Actor, P), has the meaning that the Actor believes that P is true for the Actor, where P is an expression in a human natural language.
 - b. **KNOW'** (Actor, P) expresses a state of knowledge of the Actor with respect to P.
 - c. **WANT'** (Actor, P) means that Actor desires the event or state coded by P to occur.
 - d. **INTEND'** (Actor, P) means that the Actor intends to do P.

As we mentioned, context has a central role as a component of cognition in the determination of the conditions of knowledge activation as well as which elements of our knowledge apply in a given situation. Context is activated, and constructed, in the ongoing interaction as it becomes relevant, and is eventually shared by discourse interlocutors in the construction of the discourse common ground.

Context includes cultural knowledge, general knowledge and shared communal beliefs, and the general experience that arises from the interplay of culture and social community. Context may also include location and environment (Table 1). The types of knowledge characterised and found in common ground relates to declarative, procedural, heuristic, meta and structural knowledge (Nolan 2019). The function of any knowledge representation is to capture the essential features of a class of entities in a domain area and to make that information available to describe some particular entity.

In this research study, we argue that a speech act must be interpreted in the local context of a given situation. We consider a situation to be a structured entity with certain attributes that serves as a unifying device to link semantics to events through to syntax, and onwards to utterance

The forms, functions and pragmatics of Irish polar questions and answers

meaning. In Nolan (2017) we argued for a certain structure of a situation with specific components. In this account, we suggest that the structure of a situation (3) needs to include the constructional signature (Nolan 2017), illocutionary force, initial context at the time of the speech act utterance and containing the initial common ground of the speaker S and hearer H along with the preconditions that exist, the speech act proposition, the Belief, Desire and Intention (BDI) cognitive states of the speaker, and the post-context ‘*as it is*’ after the utterance of the speech act. The events and arguments of the situation remain represented, of course, as befits the speech act.

Table 1. Tentative structure of common ground

Structure	Volatility /Dynamicity
------------------	-------------------------------

Historical knowledge	
----------------------	--



The situational preconditions constrain what can be in the preposition for a specific illocutionary force. This depends directly on the situation and context framing the utterance. As well, certain preconditions hold for the successful performance of an illocutionary act. We can view these preconditions as ranging over the cognitive state of the agent. The conditions relate to the cognitive state of the agent with respect to Belief, Desire and Intention. These conditions may additionally have a degree of strength.

- (3) Constructional schema¹ for speech act meaning resolution
- | | |
|-----------------|---|
| SITUATION | <i>s</i> |
| SIGNATURE | Utterance syntactic pattern(s) |
| ILLOCFORCE | IL |
| INITIAL CONTEXT | (CommonGround CG)
InitialCG.S
InitialCG.H |

¹ The linking of constructions, considered as grammatical objects, into functional models of grammar is reported on in Nolan and Diedrichsen (2013).

Precondition(s)	–
Location.time	(time)
Location.space	(place – may be unspecified)
EVENT(s)	< v ₁ (... v _n) ... >
ARGUMENTS	<ARG ₁ , (ARG ₂ , ..., ARG _n) ... >
Semantics	Nexus-juncture relations
PROPOSITION	P
BELIEF	B
DESIRE	D
INTENTION	I : elicit information
POST CONTEXT	Postconditions PostCG.S PostCG.H

As we argued in Nolan (2019), in determining the meaning of a speech act utterance, all of these factors need to be assessed. Here we consider polar yes-no, and a related form, alternative questions, as they are found in Irish. Information questions of Irish are not treated here.

3. The speech act of questioning

3.1 Felicity conditions on the speech act of questioning

Interrogative sentences are associated with the speech act of requesting information via questioning. In order to ask a question as a speech act, certain things must be appropriate in the context in which speech acts are uttered. In other words, a sentence must not only be grammatical to be correctly performed, it must also be felicitous.

Some of the felicity conditions on questions and requests as speech acts are described in (4), where S = speaker; H = hearer; P = some proposition. A felicitous use of a question requires that S i) not be aware of the information requested and ii) believes that H has knowledge of that information.

(4) Felicity conditions on speech act of questioning

FELICITY CONDITIONS:	QUESTION
PROPOSITIONAL CONTENT:	Any proposition P
PREPARATORY CONDITION:	<i>Speaker</i> questions <i>Hearer</i> about proposition P <i>iff</i>
(i)	S does <u>not know</u> the truth about P.
(ii)	S <u>wants</u> to know the truth about P.
(iii)	S <u>believes</u> H knows the truth about P that S wants.
(iv)	It is not obvious that H will provide the information without being asked
SINCERITY CONDITION:	S wants this information
ESSENTIAL CONDITION:	Counts as an attempt to elicit this information

Although there is considerable cross-linguistic variation in the form of interrogative (Dryer 2005: 470–473), the conditions here are likely to universally define the speech act of questioning.

3.2 The polar yes-no question as an interrogative sentence

We identify an utterance as an interrogative questioning form because it has the (language dependent) morphosyntactic *cues* of an interrogative (Dryer 2005: 470–473), and because it requires an answer or some response from the addressee.

Interrogative sentences fall into three major classes depending on their syntactic and semantic properties. The required response to one of these question forms may be constrained in certain ways, depending on the nature of the question (5).

- (5) Types of questions
 - a. *Polar yes-no questions* that expect affirmation or negation.
 - b. *Alternative questions* that expect a reply based on one of the options actually presented within the question.
 - c. *Information questions (WH-questions)* that typically expect a reply from an open set of possible replies. The *wh*-word targets a specific information point.

The first of these forms, and the topic of this research study, is the polar yes-no questions that request confirmation or negation of some proposition. The second is alternative questions where a set of alternatives is proposed and a selection from amongst those is requested from the interlocutor. The third is the information question where the expected answer consists in providing some content indicated by the type of interrogative particle. We do not treat information questions here. Questions are used to seek information on a specific point, and this information gap is intrinsically flagged within the question.

In this study, we concentrate on the polar yes-no questions while touching briefly upon the other form, alternative questions, that are related to the Irish polar yes-no questions as we will see later. Polar yes-no questions are typically used to inquire about the truth or falsity of the proposition they express. As well as a positive confirmation or negative type answer, answers to polar questions can typically also assume any value on a scale between ‘true’ and ‘false’, as, for example, ‘maybe’, ‘I don’t know’, ‘perhaps’, ‘possibly’, and other such responses.

A polar yes-no question can be *biased* towards a particular polarity, positive or a negative, within the answer. This happens through the use of forms such as ‘someone’, for example, within the question, which bias the question towards a positive orientation, as in (6).

- (6) *An thugann einne cuairt an oiche seo caite?*
 QPRT give.V.PST anyone visit DET night this gone
 Lit: Did anyone give a visit last night?
 Did anyone visit last night? [P = SOMEONE VISITED LAST NIGHT]

This indicates that the speaker believes that the answer is positive and is seeking confirmation. We might note that the question in (7) has a different function to the question in (8). The ‘yes’ answer to the question in (7) is an *elliptical* form with the meaning sense of ‘*Yes, (I have been to Dublin)*’, that delivers the information. The answer to the question in (8) has a different function where the positive answer here is an elliptical form with the meaning sense of ‘*Yes, (your belief is correct)*’ in which the fact behind the speaker’s belief is confirmed.

- (7) *An raibh tú freisin in Baile Atha Cliath?*
 QPRT BE.AUX.PST 2SG before in:PREP Dublin
 Have you been to Dublin?
- (8) *An bhfuil an tacsái imithe freisin?*
 QPRT BE.AUX.PST DET taxi gone already
 Has the taxi gone already?

The functional difference between these two questions is that one seeks to satisfy an information gap and the other seeks confirmation of a belief. Common ground has a role to play with the resolution of these.

3.3 Rhetorical polar yes-no questions

Some polar yes-no questions have a rhetorical force (9). This rhetorical force arises in virtue of the fact that rhetorical questions can emerge when conditions supporting the felicitous use of the speech act of questioning are not met. Negative responses to the (rhetorical) polar questions would go against world or, more specifically, common ground knowledge. Hence, these questions are rhetorical in nature. Often, this rhetorical force can be used to humorous effect, as we see with some examples from Irish English in (10) and (11).

The function of both negatively and positively biased polar questions is to elicit confirmation. Questions which express disappointment or annoyance do not seem to expect a positive or negative answer.

A negative answer would be contrary to the speaker's expectation. A negative response may indicate surprise or disbelief with the implication that the speaker was expecting a positive response, however, some new evidence suggests the negative. Negatively orientated questions may be employed to express disappointment or annoyance, as in (12).

- (9) a. *Ní féidir leat mo cheist a fhreagairt, an féidir?*
Ní féidir leat mo cheist a fhreagairt,
 NEG able with:PREP+2SG my question REL answer,
an féidir?
 QPRT able
 You can't answer my question, can you?
- b. *Nil freagra mo cheiste agat, an bhfuil?*
 NEG answer my question at:PREP+2SG QPRT BE.AUX.PRS
 You can't answer my question, can you?

- (10) On rhetorical questions. Irish Times. Letters to the editor²

Irish Times. Letters to the editor. Tue, Apr 10, 2018,
Sir, – Isn't it time to stop publishing rhetorical questions in The Irish Times letter pages? Is it not the case that many letters published are simply rhetorical questions? Don't your readers deserve more than having to read rhetoric posing as a question? – Yours, etc,

Irish Times. Letters to the editor. Wed, Apr 11, 2018,
Sir, – To follow up on NAME's letter (April 10th) questioning the right of rhetorical questions to appear, is it not obvious that a letters page without rhetorical questions would be like a world without humming birds? After all, do humming birds just hum because they don't know the words? – Yours, etc,

- (11) a. Does a fish swim?
 b. I've given up asking rhetorical questions. What's the point?

Whenever these felicity conditions for the speech act of questioning are not met, the interrogative forms take on a specialised rhetorical character, within the discourse and, nonetheless, contribute to the conversation.

² <https://www.irishtimes.com/opinion/letters/rhetorical-questions-1.3455996>

Rhetorical polar yes-no questions are actually a particular kind of information seeking question that masquerade as a polar form but they do not facilitate a yes or no answer. The utterance ‘*Are you still here?*’ can function as an information question equivalent to ‘*Why on earth are you still here?*’.

(12)

- a. *Nach bhfuil tú abailte aon rud ceart a dhéanamh?*
 QPRT be.AUX.PST 2SG able any thing correct REL DO.MAKE
 Can’t you do anything right?
- b. *An féidir leat aon ní a dhéanamh ceart?*
 QPRT ability with:PREP+2SG any thing REL DO.MAKE correct
 Lit: Do you have the ability with you to do any thing right
 Can’t you do anything right?

If a question is asked in a context where the answer is obvious to both speaker and addressee, it no longer functions as a request for information but takes on rhetorical force and functions as an emphatic assertion. In all such cases, there are cues from syntax, and context, (and prosody) that alert us that the speaker is taking a rhetorical stance.

3.4 The Gricean Cooperative Principle

Core to this discussion is the assumption that the Gricean Cooperative Principle (Grice 1957, 1969, 1986) and its associated maxims apply (13). The speech act formalisation concerns the objective conditions of satisfaction for the speech act and its utterance meaning. In the discourse chain, the hearer’s response to the question depends on whether the hearer believes that the speaker is obeying Grice’s maxim of quality.

- (13) Gricean Cooperative Principle Maxims
Quality: Speakers' contributions should be true.
Quantity: Speakers' contributions should be only as informative as the situation requires and speakers should refrain from saying either too little or too much.
Relevance: Contributions should relate to the purpose of the exchange.
Manner: Contributions should avoid obscurity and ambiguity and be clear, orderly and succinct.

If the hearer believes that the speaker *is* obeying the maxim of quality in asking the question, then the hearer can conclude that the speaker really does not know the answer. In this case, the most cooperative response is to simply

inform the speaker of the answer, replying with yes, or no.

If the hearer believes that the speaker *is not* obeying the maxim of quality, then the hearer can conclude that the speaker does actually know the answer to the question, or that an answer is not actually required. In this case, the hearer can interpret the speaker's question *rhetorically*, as if it were meant only to bring the answer into the discourse.

4. Polar yes-no questions

4.1 The proposition framed by the polar yes-no question

We adopt a view of polar yes-no questions as denoting a set consisting of a proposition and its negation. There are essentially two syntactic constructional forms for this (14) and (15). A polar yes-no question specifically favours the core proposition framed by the question. This is the property of polar questions that makes them amenable to a yes-no response. As a proper polar question cannot simply denote a singleton set, the negative proposition is always available. Polar questions therefore make salient the affirmative, along with the negative version of a proposition, as the only alternatives under discussion in this form of the speech act of questioning. A polar yes-no question in Irish can therefore be considered to advance some hypothesis P for confirmation.

Polar yes-no questions differ from alternative questions in that polar yes-no questions typically privilege the positive proposition of the question, while alternative questions give equal weight to the listed alternatives as a set of choices to select from (16).

- [Polar question - analytic verb form]
- (14) Q: *An ólann sé bainne?*
 QPRT drink:V.PRS 3SG.M milk
 Does he drink milk?
- [Polar copula question]
- (15) Q: *An dochtúir é Lorcán?*
 QCOP doctor 3SG.ACC Lorcan
 Is Lorcan a doctor?
- (16) Q: *An ólann tú tae nó caife?*
 QPRT drink:V.PRS 2SG tea or coffee
 Do you drink tea or coffee?

As part of the felicity conditions of a question, we typically presuppose ignorance, or an information gap, on the part of the speaker, and a presumption

of knowledge on the part of the addressee. However, a speaker who already possesses the relevant information can felicitously pose the question to an addressee, if the addressee's knowledge is considered to be in doubt, as in some examination context. The overall goal is still to gain information.

A claim we defend here is that answers to polar yes-no questions have a sentential structure even when they consist of just one pronounced word. An important idea then, in our consideration of polar yes-no questions of Irish, relates to the answers of these polar questions and that they are derived by ellipsis from full sentential expressions, even when they consist of just a single word. The elided (unpronounced) clause is identical to the clausal content in the question, and this is why it can be elided. The elided material is in common ground and retrieved when needed for meaning resolution.

As well as the use of ellipsis from full sentential expressions, another reason why this is interesting is that Irish does not have any exact words which directly correspond to English *yes* or *no* and so necessarily employs different strategies where a yes-no answer is required. An early champion of the ellipsis hypothesis is Halliday and Hasan (2013). Consider the following quotation:

It is possible to consider *yes* and *no* as clause substitutes. But they are not really substitutes; for one thing, they can be accompanied by part or even the whole of the clause for which they would be said to be substituting, and that is precluded from substitution as usually defined. For example, in [Are you coming?] the answer /.../ could be *yes*, *yes I am*, or *yes I am coming*. They are realisations of a single clause feature, that of polarity, which is being expressed on its own instead of in association with the verbal group; and the fact that it is expressed on its own means that the whole of the remainder of the clause is presupposed; /.../."

(Halliday and Hasan 2013: 209).

4.2 The morphosyntax of polar yes-no questions

The morphosyntax of polar yes-no questions require the clausal form to have a question particle which is always found at the front of the sentence. Otherwise, no change in word order occurs over the clause. To pose a simple yes-no question, the question particle *an* is used. The response to a polar yes-no question also causes eclipsis to occur. In the Irish preterit, a past tense form denoting events that took place and were completed in the past, the particle *ar* (+ lenition) is used (Table 2). The forms of the question particle can vary according to the morphosyntactic context (Table 3).

The question particles *an* / *nach* require eclipsis, (see (17) and (18)), while *ar* / *nár* require lenition. In the Munster region of Ireland, *ná* is used

instead of *nach*. There is no lenition with *ná*, or eclipsis, but *h* prefixes a vowel. In casual speech the question particle may, on occasion, be omitted, but the eclipsis remains. The question particle *an* is used as a polar question marker in simple yes-no queries³. The particle *an* can also be used to support other simple queries that are not polar questions (19).

Table 2. Polar yes-no questions and the appropriate question particle

present tense	affirmative:	<i>An + verb + subject + object</i> <i>An ólann tú fuisce?</i> Do you drink whiskey?
	negative	<i>Nach + verb + subject + object</i> <i>Nach n-ólann tú fuisce?</i> Don't you drink whiskey?
Past/preterit tense	affirmative:	<i>Ar + verb + subject + object</i> <i>Ar ól tú fuisce?</i> Did you drink whiskey?
	negative	<i>Nár + verb + subject + object</i> <i>Nár ól tú fuisce?</i> Didn't you drink whiskey?

- (17) *An bhfuil tú ann?*
QPRT BE:AUX.PRS 2SG there
Are you there?
- (18) *Nach bhfaca tú é?*
QPRT.Neg see.V.PRS 2SG.NOM 3SG.ACC
Did you not see it? / Have you not seen it?
- (19) *An mó atá ann?*
Q much REL+BE.AUX.PRS there
How much is there?

Table 3. The polar yes-no question particle *an* and its various forms

Tense	affirmative	Lenition / Eclipsis	negative	Lenition / Eclipsis
Present	<i>an</i>	E	<i>nach</i>	E
Past/preterit	<i>ar</i>	L	<i>nár</i>	L

³ Data is used from the website:
https://en.wikipedia.org/wiki/Irish_conjugation#Interrogative_particles

We can note that, in Irish, the same particles used to introduce a simple yes-no question can also be used to introduce an indirect question, as in (20), where the question form is embedded within the clause. We do not consider these in this paper beyond mentioning them here.

(20) Introducing an indirect question

Níl a fhios agam an dtuigeann Aisling Gaeilge.
 NEG REL know at:PREP+1SG QPRT understand.V.PRS Aisling Irish
 I don't know if Aisling understands Irish.

5. Alternative questions

Alternative questions are reminiscent of polar yes-no questions in many ways but they are constrained in that they do not allow for yes-no answers. They are constructed in such a way that the choice is not yes, or no, but instead a selection is required by the responder to one of the alternatives listed in the framing of the question should be named in the answer. A primary quality of alternative questions then is that they typically only allow felicitous answers which choose one out of the set of alternatives listed in the question, or by declaring indifference to any of the listed alternatives.

Alternative questions have much in common with polar questions. A polar question has a set of two propositions, p and $\neg p$, but frames just one of these, p , in the question. The $\neg p$ option is implicit and salient but not syntactically stated. In contrast, alternative questions actually list the set of alternatives as option-1, option-2, and so on.

In the polar yes-no question, the allowed alternatives are logically a set of two propositions, a proposition p and its negation $\neg p$, while in the alternative question, the allowed alternatives are specified explicitly within the question clause. We recognise that sometimes, of course, in real world dialogue, the 'don't know,' or 'maybe' response may be given.

Alternative questions are therefore dependent on the presence of disjunction and the set of alternative propositions framed within the question is equal to the set of possible answers defined in virtue of the form of the question. Consequently, an alternative question is sometimes called a disjunctive question.

These alternative questions already contain a choice of answers and can take one of the schematic formats in (21). Alternative questions are used by the speaker to ask the addressee to decide which of the two or more specific alternatives holds (22). The alternative question may be posed in some different ways while the format of the answer remains the same (23).

- (21) a. *cé acu ... NP_X nó NP_Y*
 QPRT at:PREP+3PL ... X or Y
 Which/what ... X or Y
- b. *an ... NP_X nó NP_Y*
 QPRT ... X or Y
 Which/what ... X or Y
- (22) Q. *Cé acu is fearr leat, tae nó caife?*
 QPRT at:PREP+3PL BE:COP prefer with:PREP+2SG tea or coffee
 Lit: Which of them do you prefer with you, tea or coffee?
 Which of them do you prefer, tea or coffee?
- A1: *Is fearr liom tae.*
 COP prefer with:PREP+1SG tea
 I prefer tea.
- A2: *Is fearr liom tae ná caife.*
 COP prefer with:PREP+1SG tea to coffee
 I prefer tea to coffee.
- (23) a. *An fearr leat tae nó caife?*
 QPRT prefer with:PREP+2SG tea or coffee
 Do you prefer tea or coffee?
- b. *An ólann tú tae nó caife?*
 QPRT drink:V.PRS 2SG tea or coffee
 Do you drink tea or coffee?
- c. *An tae nó caife a ólann tú?*
 QPRT tea or coffee REL drink:V.PRS 2SG
 Lit: Is (it) tea or coffee that you drink?
 Do you drink tea or coffee?

6. Answering the questions

To understand questions, we need to rely on the nature of answers. Specifically, the analysis of question–answer pairs can be used to probe into the meaning of questions. In furtherance of this, we also need to understand, as best we can, the context of the situation in which the question was uttered, and how the context and the situation in which the question–answer interaction occurs contributes to creating and managing the pragmatic common ground.

6.1 The verb-echo strategy

In many languages yes-no questions are typically answered, not by an affirmative or negative particle, but by echoing the verb of the question for positive answers and echoing the verb of the question plus a negation marker of some kind for negative answers. We refer to answers like this as verb-echo answers. This is exactly the strategy used in Irish.

When a verb-echo strategy is used, we need to ask: *what is the structure of these answers?* The affirmative answer is an echo of the finite verb in the question, while the negative answer is an echo of the finite verb in the question combined with a sentential negation.

Irish employs verb-echo answers as a standard form of answer to a yes-no question. In particular, in Irish, the answers to yes-no questions echo the verb of the question for both affirmative and negative answers, along with a negation marker for negative answers.

6.2 The characteristics of the answer

Typically, In Irish, within the answer, the tense marked verb form is used *without* explicit nominal arguments (24.A1, 24.A2) expressed within grammatical relations, though there are exceptions ((24.A3). When a synthetic verb form (24.A3) is used, a pronominal appears in the grammatical relation of nominative subject within the answer.

In the case of analytic verb forms, the subject is always missing. In the synthetic form, the PN is conflated on the end of the verb as a suffix. Additionally, in negative polarity answers, the negative particle is also used.

- [Analytic verb form]
- (24) Q: *An ólann tú bainne?*
 QPRT drink:V.PRS 2SG.M milk
 Do you drink milk?
- [Positive response]
- A1: *Ólann.*
 Drink:V.PRS
 Lit.: drink
 Yes.
- [Negative response]
- A2: *Ní ólann.*
 NEG drink:V.PRS
 Lit.: not drink:v.PRS
 No.

[Synthetic verb form+1SG Negative response]

A3: *Ní ólaim.*
NEG drink:V.PRS+1SG
Lit.: not drink I
No.

Otherwise, a grammatical subject may be used when the speaker chooses an emphatic affirmation or denial (25.A2), in comparison to (25.A1).

(25) Q: *An ólann sé uisce?*
Q drink:V.PRS 3SG.M water
Does he drink water?

[Negative response]

A1: *Ní ólann*
NEG drink:V.PRS
Lit.: Not drink
No.

[Negative emphatic response]

A2: *Ní ólann sé ar chor ar bith!*
NEG drink:V.PRS 3SG.M at all
Lit: He doesn't drink at all!
No

An answer can sometimes allow for a non-specific response indicating a lack of precise knowledge (26). Additionally, sometimes the actual question can be embedded in the response indicating uncertainty (27).

(26) Q: *An raibh na feilméaraí sásta?*
QPRT BE.AUX.PST DET.PL farmers satisfied
Were the farmers satisfied?

A: *Bhí siad.*
BE.AUX.PST 3PL
They were (satisfied)!

A': *Nil a fhios agam.*
NEG REL know at:PREP+1SG
Lit: knowledge is not at me
I don't know.

- (27) Q: *An mbeidh mórán daoine anseo?*
 QPRT BE.AUX.PST many people DET+here
 Were there many people here?
- A: *Níl mé cinnte an mbeidh*
 NEG 1SG certain QPRT BE.AUX.PST
mórán daoine anseo.
 many people DET+here
 I am not certain how many people were here.

The answer to polar yes-no and alternative questions have several noteworthy and important characteristics. First, we can note that the verb within the answer is echoed from the question and inflected for tense. This is significant because tense is a clausal category, locating the time of the event denoted by a clausal in relation to the time of utterance. The presence of tense in the answer implies the presence of a clause (even though not all sentential elements are pronounced). Secondly, when it occurs, pronominal subject marking implies the presence of a subject, hence also the presence of a clause. Thirdly, ellipsis occurs with respect to the arguments of the verb. Evidence that this is the correct analysis, in terms of ellipsis, is provided from the syntax within the clausal form. Fourth, a constituent is case-marked appropriately for grammatical function. We notice this in particular on the pronominal. Essentially, apart from on the pronominal forms, nominative, accusative and dative case marking on nominals is otherwise lost in modern Irish. When a pronominal occurs, it is in subject position after the-verb and maintaining the VSO word order.

- [Copula construction]
- (28) Q: *An dochtúir é Lorcán?*
 QCOP doctor 3SG.ACC Lorcan
 Is Lorcan a doctor?
- [Positive response]
- A1: *Sea. (= is_{cop}+ea_{3sg.m})*
 COP+3SG.M
 Lit: Be he.
 Yes.
- [Negative response]
- A2: *Ní hea.*
 NEG COP 3SG.M
 Lit: Not be he.
 No.

As we have seen, a variation of the polar yes-no question is the copula-question. Under certain circumstances, as an answer to a copula-question with an indefinite predicate, the copula-derived phrases *sea* (COP+3SG = 'be-it') and *ní hea* (NEG.COP 3SG = 'NEG be it'), functions as logically equivalent to 'yes' and 'no'.

6.3 The meaning of polar and alternative questions

Schematically, the syntactic patterns of the questions discussed here are given in (29) though there can be some slight variation on these. If we accept that examples (8), (9), (10), and (16) are good exemplars of the polar and alternative questions we can explore the semantics and pragmatics of these at the interfaces, and the nature of the pragmatics of these questions in situational context in language use. We repeat the examples here as (30), (31), (32) and (33) in this discussion. In these examples, the various arguments are bounded by the situation and its context. The Speaker and Hearer are shown as S and H. Contextual knowledge resides in common ground.

The context, before the question is answered, has the speaker S uncertain as to whether the proposition is true, or false. Only one of these (P | ¬P) holds and this knowledge is revealed in virtue of the answer. In Table 4, we show the linking from context and situation to the polar question and answer.

- (29) a. qPRT V NP NP [Polar question - analytic verb form]
 a'. qPRT V+PN NP [Polar question - synthetic verb form]
 b. qPRT NP PN NP [Copula polar question form]
 c. qPRT V NP NP_x nó NP_y [Alternative question - two options]
 c'. *cé acu* ... NP_x nó NP_y [Alternative question - two options]

Polar question

- (30a) Q: *An ólann sé bainne?*
 QPRT drink:V.PRS 3SG.M milk
 Does he drink milk?
 P=YOU DRINK MILK | YOU DO NOT DRINK MILK

[Positive response]

- A1: *Ólann.*
 Drink:V.PRS
 Lit.: drink
 Yes.

(30b) Logical structure of the polar question and answer

- a. **Q.polar** [**do'** (x, **pred'**(x, y))]
 b. [**ASSERT'** (**do'** (x^{ELLIPSIS}, **PRED'**(x^{ELLIPSIS}, y^{ELLIPSIS})))]

Semantics:

Question' (P=HE DRINK MILK , P | ¬P)

CONTEXT BEFORE QUESTION

S: BEL' (p, true | false)

S: KNOW' (p, ?)

CONTEXT AFTER ANSWER

S: BEL' (p, true | false)

S: KNOW' (p, true | false)

Alternative question

- (31a) Q: *An ólann tú tae nó caife?*
 QPRT drink:v.PRS 2SG tea or coffee
 Do you drink tea or coffee?

P=YOU DRINK TEA OR COFFEE

[Positive response]

- A: *Ólann tae.*
 drink:v.PRS tea
 Lit.: drink tea
 I drink tea.

(31b) Logical structure of the alternative question and answer

- a. **Q.Alternative** [**do'** (x, **PRED'**(x, y1 ∨ y2))]
 b. [**ASSERT'** (**do'** (x^{ELLIPSIS}, **PRED'**(x^{ELLIPSIS}, y1)))]

Semantics:

Question' (P=YOU DRINK TEA OR COFFEE, tea | coffee)

CONTEXT BEFORE QUESTION

S: KNOW' (P, ?)

CONTEXT AFTER ANSWER

S: BEL' (P, tea)

S: KNOW' (P, tea)

In the context before the question is answered, the speaker is unclear as to whether H wants option-1 or option-2. We label these options y1 and y2 in the logical structure representation, and only one of these is selected within the answer by H.

Broadly, the question has a generalised logical structure and this yields an answer with a corresponding logical structure (31). The elided elements are flagged in the logical structure representation of the asserted answer—these are in common ground as referents because they were introduced within the question.

As a response to the question, the answer is a speech act of assertion. In the answer, the X argument is not spoken, it is elided, but is retrievable from context.

We show the linking from context and situation, via common ground, to the alternative question and answer in Table 5.

Polar question—information gap in common ground

- (32a) Q: *An raibh tú freisin in Baile Atha Cliath?*
 QPRT BE.AUX.PST 2SG before in:PREP Dublin
 Have you been to Dublin?
 P= YOU HAVE BEEN TO DUBLIN
 [Positive response]
- A: *Bhí mé.*
 Be:AUX.PST 1SG
 Lit.: was I
 I was.

(32b) Logical structure of the polar question—information gap in common ground.

- a. **Q.POLAR** [**be_at'** (x, y)]
 B. [**ASSERT'** (**be_at'** (x, y^{ELLIPSIS}))]

Semantics:

Question' (P= YOU HAVE BEEN TO DUBLIN, P | ¬P)
 Context BEFORE QUESTION
 BEL' (P, *true* | *false*)
 KNOW' (P, ?)
 CONTEXT AFTER QUESTION
 BEL' (P, *true*)
 KNOW' (P, *true*)

The purpose of this polar question is not about just confirming the proposition, though that is what also happens, but rather it is to saturate the information gap in the speaker's common ground from information that H provides within the answer.

In Table 6, we formalise the linking between the polar question and answer situation in order to resolve an information gap in common ground.

Table 4. Linking context and situation to the polar Q & A

Situation:	<i>this</i> .SIT _a
<u>SIGNATURE</u>	
a.	qPRT V NP NP [Polar question - analytic verb form]
a'.	qPRT V+PN NP [Polar question - synthetic verb form]
b.	qPRT NP PN NP [Copula polar question form]
<u>ILLOC</u> POLAR QUESTION—REQUESTING INFORMATION	
<u>INITIAL CONTEXT</u>	
1.	Is _A (3SG, PERSON) : Ontology: 3SG IS _A PERSON: <ARG ₁ >
2.	Is _A (milk, THING) : Ontology: MILK IS _A THING: <ARG ₂ >
3.	Is _A (drink:V, EVENT) : Ontology DRINK IS _A EVENT process: <v ₃ >:
4.	Speaker S
5.	Hearer H
<u>COMMON GROUND</u>	
CG.S	
1.	[exist ' (milk)] \wedge
2.	[be ' [milk, fresh ']
3.	[be ' [milk, consumed ']
CG.H	
<u>SPEECH ACT (SA)</u>	
UTT ₁ : [do ' (S, ask '(S, EXPRESSION ₁)) & CAUSE (hear ' (H, SA))]	
<u>EVENT(S)</u>	
EXPRESSION ₁ :	
[do ' (ARG ₁) drink ₃ ' (ARG ₁ , ARG ₂) \wedge be ' [ARG ₂ , pred ']]	
<v ₃ >: <i>ól</i> 'drink': [do ' (X ₁ ^{ELLIPSIS}) drink ' (X ₁ ^{ELLIPSIS} , Y ₂ ^{ELLIPSIS} _S)	
\wedge be ' [Y ₂ ^{ELLIPSIS} , consumed ']]	
<u>ARGUMENTS</u>	< ARG ₁ , ARG ₂ >
<u>SEMANTICS</u>	< <i>this</i> .SIT _a
< CG.S < CG.H < [do '(S, ask.polar.Q '(S, UTT ₁)) & CAUSE (hear ' (H, SA))] >>>>	
Nuclear juncture: Single nucleus, with all ARGS within the single NUC	
Location.time	Time of situation
Location.space	Location of situation
BELIEF	S: BEL' (P, <i>true</i> <i>false</i>) KNOW' (P, ?)
	H: BEL' (P, <i>true</i> <i>false</i>) KNOW' (P, <i>true</i> <i>false</i>)
DESIRE	D
INTENTION	I
<u>POST-CONTEXT</u> Postconditions	
PostCG.S	BEL' (P, <i>true</i> <i>false</i>) KNOW' (P, <i>true</i> <i>false</i>)
PostCG.H	—

Table 5. Linking context and situation to the ALTERNATIVE QUESTION AND ANSWER

Situation: *this.SIT_a*

SIGNATURE

1. qPRT V NP NP_x *nó* NP_y [Alternative question–1st option]
 2. *cé acu* ... NP_x *nó* NP_y [Alternative question–2nd option]

ILLOCF ALTERNATIVE QUESTION–REQUESTING INFORMATION

INITIAL CONTEXT

1. **Is_A** (2SG, PERSON) : Ontology: 2SG IS_A PERSON: <ARG₁>
 2. **Is_A** (tea, THING) : Ontology: TEA IS_A THING: <ARG_{2A}>
 3. **Is_A** (coffee, THING) : Ontology: COFFEE IS_A THING: <ARG_{2B}>
 4. **Is_A** (drink:V, EVENT) : Ontology DRINK IS_A EVENT process: <V₃>
 5. Speaker S
 6. Hearer H

COMMON GROUND

CG.S –

1. [**exist'** (tea)] ∧
 2. [**exist'** (coffee)] ∧
 3. [**be'** [tea ∧ coffee, **hot'**]]
 4. [**be'** [tea ∧ coffee, **consumed'**]]

CG.H –

SPEECH ACT (SA)

UTT₁: [**do'** (S, **ask.alternative.Q'**(S, EXPRESSION₁)) & CAUSE (**hear'** (H, SA))]]

EVENT(S)

EXPRESSION₁

[**do'** (ARG₁) **drink₃'** (ARG₁, ARG_{2A} ∨ ARG_{2B}) ∧ **be'** [ARG₂, **pred'**]]
 <V₃>: *ól* 'drink': [**do'** (X^{ELLIPSIS}₁) **drink'** (X^{ELLIPSIS}₁, Y_{2a} ∨ Y_{2a})
 ∧ **BE'** [Y₂, **consumed'**]]

ARGUMENTS < ARG₁, ARG_{2A} | ARG_{2B} >

SEMANTICS <*this.SIT_a*
 < CG.S < CG.H
 < [**do'**(S, **ask.Q'**(S, UTT₁)) & CAUSE (**hear'** (H, SA))] >>>>

Nuclear juncture: Single nucleus, with all ARGS within the single NUC

Location.time Time of situation
 Location.space Location of situation
 BELIEF S: KNOW' (p, ?)
 H: KNOW' (p, tea | coffee)
 DESIRE D
 INTENTION I

POST CONTEXT Postconditions
 PostCG.S BEL' (p, tea | coffee)
 KNOW' (p tea | coffee)
 PostCG.H –

Table 6. POLAR QUESTION AND ANSWER resolve an information gap in common ground

Situation	<i>this.SIT_a</i>	
SIGNATURE	q	
a.	PRT V NP NP	[Polar question - analytic verb form]
a'.	qPRT V+PN NP	[Polar question - synthetic verb form]
b.	qPRT NP PN NP	[Copula polar question form]
ILLOC	POLAR QUESTION-REQUESTING INFORMATION	
	<ul style="list-style-type: none"> information gap in common ground 	
INITIAL CONTEXT		
1.	IS_A (2SG, PERSON)	Ontology: 2SG IS_A PERSON: < ARG ₁ >
2.	IS_A (Dublin, THING)	Ontology: DUBLIN IS_A THING: < ARG ₂ >
3.	IS_A (visit:V, EVENT)	Ontology: VISIT IS_A EVENT process: <v ₃ >
4.	Speaker	S
5.	Hearer	H
COMMON GROUND		
CG.S		
1.	[exist' (2SG)] \wedge	
2.	[be' [Dublin, pleasant']]	
3.	[do' [2SG, visit' (2SG, Dublin)]]	
CG.H		
SPEECH ACT (SA)		
UTT₁:	[do' (S, ask' (S, EXPRESSION ₁)) & CAUSE (hear' (H, SA))]]	
EVENT(S)		
EXPRESSION₁:	[do' (ARG ₁) visit' (ARG ₁ , ARG ₂) \wedge be' [ARG ₂ , pred']]	
<v ₃ >:	<i>cuairtl</i> 'visit': [do' (X ₁) visit' (X ₁ , Y ₂) \wedge be' [Y ₂ , visited']]	
ARGUMENTS	< ARG ₁ , ARG ₂ >	
SEMANTICS	< <i>this.SIT_a</i> >	
< CG.S < CG.H		
	< [do' (S, ask.polar.Q' (S, UTT ₁)) & CAUSE (hear' (H, SA))] >>>>	
Nuclear juncture:	Single nucleus, with all ARGS within the single NUC	
Location.time	Time of situation	
Location.space	Location of situation	
BELIEF		
S:	BEL' (P, <i>true false</i>)	: S believes that P could be true or false
	KNOW' (P, ?)	: S does not know if P holds
H:	BEL' (P, <i>true false</i>)	: H believes that P is either true or false
	KNOW' (P, <i>true false</i>)	: H knows if P holds
DESIRE	D	
INTENTION	I	
POST CONTEXT	Postconditions	
PostCG.S	BEL' (P, <i>true false</i>)	: S believes that P is true or false
	KNOW' (P, <i>true false</i>)	: S knows if P holds
PostCG.H	-	

Polar question relating to belief on status of knowledge

- (33a) *Q:* *An bhfuil an tacsai imithe freisin?*
 QPRT BE.AUX.PST DET taxi gone already
 Has the taxi gone already?
 P=BELIEF THAT THE TAXI IS GONE
 [Positive response]
- A:* *Tá sé (imithe)*
 Be:AUX.PRS 3SG (gone)
 Lit.: is it (gone)
 It is / it is gone.

(33b) Logical structure of the polar question relating to the belief status of knowledge, and the answer.

- a. **Q.POLAR [be' (x, PRED')]**
 b. **[ASSERT' (be' (x, PRED' ^{ELLIPSIS}))]**

Semantics:

Question' (P=BELIEF THAT THE TAXI IS GONE, *true* | *false*)
 CONTEXT BEFORE QUESTION
 BEL' (P, *true* | *false*)
 KNOW' (P, ?)
 CONTEXT AFTER QUESTION
 BEL' (P, *true*)
 KNOW' (P, *true*)

The purpose of this polar question is not just about confirming the proposition, but also about the belief status of knowledge to saturate the information gap in the speaker's common ground from information that H provides within the answer. Here, context clearly contributes to the meaning resolution.

Table 7 shows a polar question and answer formalisation relating to belief on status of knowledge.

In Table 8, we elaborate in more detail on the structure of the activated context and common ground for speech act resolution, in particular in the question-answer interaction.

In our view, argued for here, common ground acts as a kind of decentralised knowledge system supporting the cognitive activation of relevant contextual knowledge.

Table 7. A POLAR QUESTION AND ANSWER relating to belief on status of knowledge

Situation	<i>this.SIT_a</i>	
SIGNATURE		
a.	qPRT V NP NP	[Polar question - analytic verb form]
a'.	qPRT V+PN NP	[Polar question - synthetic verb form]
b.	qPRT NP PN NP	[Copula polar question form]
ILLOCUF	POLAR QUESTION—REQUESTING INFORMATION, <ul style="list-style-type: none"> • Relating belief and status of knowledge 	
INITIAL CONTEXT		
1.	IS_A (taxi, THING)	Ontology: TAXI IS_A THING: <ARG ₁ >
2.	IS_A (depart:v, EVENT)	Ontology: DEPART IS_A EVENT process: <V ₂ >:
3.	Speaker S	
4.	Hearer H	
Common ground		
CG.S		
1.	[exist' (taxi)] \wedge	
2.	be' [taxi, departed]	
CG.H		
Speech act (SA)		
UTT₁:	[do' (S, ask'(S, EXPRESSION ₁)) & CAUSE (hear' (H, SA))]	
Event(s)		
EXPRESSION₁:	[do' (ARG ₁) depart ₂ ' (ARG ₁) \wedge be' [ARG ₁ , PRED']]	
<v ₂ >: <i>imigh</i> 'go:	[do' (X ₁) depart (X ₁) \wedge be' [X ₁ , departed]]	
ARGUMENTS	< ARG ₁ >	
SEMANTICS	< <i>this.SIT_a</i> >	
<CG.S < CG.H	< [do'(S, ask.polar.Q'(S, UTT ₁)) & CAUSE (hear' (H, SA))] >>>>	
Nuclear juncture:	Single nucleus, with all ARGS within the single NUC	
Location.time	Time of situation	
Location.space	Location of situation	
BELIEF		
S:	BEL' (P, true false)	: S believes that P holds
	KNOW' (P, ?)	: S does know if his belief is true
H:	BEL' (P, true false)	: H believes that P (or \neg P) holds
	KNOW' (P, true false)	: H knows whether P is true or false
DESIRE	D	
INTENTION	I	
POST CONTEXT	Postconditions	
PostCG.S	BEL' (P, true)	: S believes that P holds (or \neg P holds)
	KNOW' (P, true)	: S knows that P is true (or false)
PostCG.H	—	

Table 8. Activated context and common ground for speech act resolution

Structure	Contains
MORE VOLATILE / DYNAMIC	
1. Local dialogue	<ul style="list-style-type: none"> • Salient events and references within the dialogue chain
2. Language	<ul style="list-style-type: none"> • Linguistic system knowledge [i.e. IRISH LANGUAGE]
3. Environment	<ul style="list-style-type: none"> • Shared knowledge of the entities, actions and context of the local environment and which may prove relevant to the interlocutors within the dialogue. • Meta and structural knowledge • Knowledge structures within our overall mental models including schemata & frames.
4. Recent events	<ul style="list-style-type: none"> • Shared knowledge of the entities, actions in the context of the local environment.
5. Historical knowledge	<ul style="list-style-type: none"> • Declarative knowledge of concepts and facts • Shared cultural knowledge of (recent past to far past) historical context and associated entities, actions and consequences.
6. Common sense	<ul style="list-style-type: none"> • Declarative knowledge of concepts and facts • General ontological knowledge about the world, its entities and events. • Heuristic and experiential knowledge • Schemata (Event, Role, Image, and Proposition) • Frames
7. Cultural knowledge	<ul style="list-style-type: none"> • Ways of doing things in our community • ways of behaving in our society • Common belief sets • Cultural values • Shared perspectives • Schemata and frames • Shared worldview
TENDING TO BE LESS NON-VOLATILE / NON-DYNAMIC	

The types of knowledge⁴ characterised in common ground relates to declarative, procedural, heuristic, meta and structural knowledge, along a

⁴ Declarative knowledge is about concepts, facts and entities, and describes what is known. It encompasses simple statements that are asserted as either true or false.

scale from volatile and dynamic to less-volatile and less-dynamic. We argue that common ground contains relevant knowledge on local dialogue, language, environment, recent events, historical knowledge, common sense, cultural knowledge.

7. Discussion

Irish is no different from other languages in that it has clausal types for requesting information and asking (polar yes-no and alternative) questions. It differs in distinct morphosyntactic ways, of course. Asking questions is a very important human activity which is central to communication and understanding between people as they engage with each other. The construction and maintenance of common ground facilitates the construction of meaning within question-answer interactions.

This study argued towards several claims regarding polar yes-no questions, copula polar questions and alternative questions of Irish. In support of this argumentation, we have proposed a model of utterance meaning for the speech acts of requesting information with regard to these question forms of Irish that takes into consideration the question's answer.

We argued that the answers to polar yes-no questions and related question forms of Irish contain instances of ellipsis [Claim-1] and, as such, represent full clausal expressions with a complete semantics where the elided elements are from the question part of the question-answer pair. We have provided evidence that the propositional content in a question-answer interaction is inferred from the context [Claim-2], specifically from the question with which the answer is paired. We have also provided evidence

This declarative knowledge also includes attributes and their values relating to an entity or concept. Procedural knowledge characterises processes, rules, strategies, and procedures. This type of knowledge describes how an entity operates or how a problem is solved, and provides instructions on how to do something. Heuristic knowledge describes the experiential knowledge that guides our reasoning processes, and represents knowledge we gained through our experience of solving problems in our past. Meta-knowledge is high-level knowledge about the other types of knowledge, and how to use this knowledge. This describes knowledge about knowledge. We use this type of knowledge to guide our selection of the other types of knowledge necessary for solving some particular issue and to enhance our reasoning by directing the reasoning processes appropriately. Structural knowledge is concerned with concept relationships and concept to entities relationships, and it describes actual knowledge structures within our overall mental models. Our mental model of concepts, sub-concepts, and entities with all their attributes, values, and relationships is typical of this type of knowledge.

[Claim-3] that one of the functions of interrogatives is the maintenance of common ground via the update and exchange of information between the interlocutors. We proposed a tentative model of the activated context, and common ground, used in question-answer interaction for speech act meaning resolution. Common ground allows for access to shared knowledge and understanding.

Schematically, the syntactic patterns of the polar yes-no questions, copula polar questions and alternative questions of Irish discussed here are given in (34). Some variation is permissible on these.

- (34) a. qPRT V NP NP [Polar question - analytic verb form]
 a'. qPRT V+PN NP [Polar question - synthetic verb form]
 b. qPRT NP PN NP [Copula polar question]
 c. qPRT V NP NP_x *nó* NP_y [Alternative question with two options]
 c'. *cé acu* ... NP_x *nó* NP_y [Alternative question with two options]

The idea that a polar yes-no question is semantically a disjunction of p and $\neg p$, can be seen as a function mapping the proposition expressed by the question sentence onto a set consisting of that proposition and its negation. The propositional content is inferred from the set of p or $\neg p$ in context, specifically from the question with which the answer is paired.

Alternative questions differ from polar questions in that the disjunctive set of possible responses is not p or $\neg p$, as with the polar questions but, instead, the set of possible answers is constrained to the list of alternative options specifically listed in the question. The hearer picks one of these options in the construction of the answer.

We found that Irish does not have any words that are the direct equivalent of the English words 'yes' or 'no'. Instead, Irish employs a different strategy to answering questions looking for a positive or negative response. The strategy is to echo the verb of the question and use nominal argument ellipsis in the response for one or two arguments, constrained by certain usage conditions. The success of this strategy requires the construction and maintenance of common ground for the retrieval of elided arguments. Context and situation boundedness of the speech act of requesting information play an important role in this process of meaning construction and make for a felicitous question-answer interaction.

For several examples, we provided a formalised specification of the information needs that feed into the information flows of the meaning summation (indicated in Figure 1) of the particular utterance speech act.

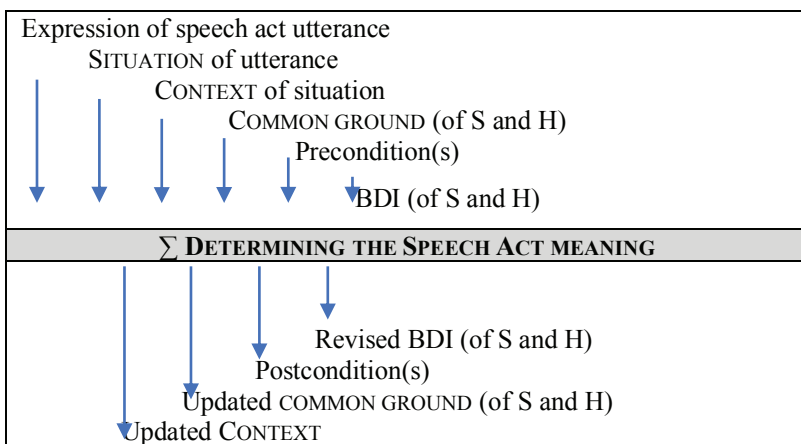


Figure 1. Determining the speech act meaning using multiple information sources

We found that the meaningful unpacking of the meaning of a speech act depends on the situation in which the dialogue utterance occurs and the context pertaining to that situation. The context and the situational frame contribute to the felicitous speech act and the various ways in which this happens has been demonstrated.

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CHAPTER SIX

SEMANTIC STRUCTURE OF THE SENTENCE: COGNITIVE AND PRAGMATIC ASPECTS

IRINA IVANOVA-MITSEVICH

1. Introduction

Communication may be considered as the central activity in human life because its aim is to organize all other activities. In the process of communication, the communicants present to each other their visions of actual situations they are involved in.

Language, being the main means of communication, should provide a certain mechanism that permits us to produce necessary stimuli or units to transfer the information we want to pass. This mechanism helps human beings to create different units, each having its own function. As it was shown by stratificational grammar (Lamb 1966), the function of the unit which we call a sentence is to present information about a certain state of affairs to the speaker's partner.

A sentence performs its function by representing the structure of some state of affairs or, in other words, a situation. Usually the sentence meaning is thought to be a replica of a situation (Fillmore 1968). But, there are some logical and communicative difficulties that do not allow us to accept such interpretation of the meaning of sentences.

Logically, this understanding of the meaning of a sentence leads to the conclusion that there should be as many sentence structures as there are types of situations. But actually, sentence structures are not so numerous and if we take into account all formal and meaningful differences their number does not exceed a dozen in any language. This number is far less than is necessary to reflect all possible structures of states of affairs.

From the communicative point of view the problem lies in the fact that such an approach to the meaning of sentences does not permit us to represent new types of situations which mankind may encounter (Bogushevich

1997a). Passing information to each other is possible only if the participants of communication have common structures.

However, a new type of situation has yet no structure for itself. A structure for it should be invented by a speaker. But how might the listener interpret it since the listener does not possess the appropriate structure?

Thus we cannot accept the idea that the structure of a sentence meaning is the replica of the structure of the situation. At the same time it means that we have to solve another problem, the problem of creating such meanings of sentences which could be understandable even if sentences refer to situations quite new to us.

Since a sentence is used in communication to pass our knowledge of the universe to others, its semantic aspect should be constructed so that it could simultaneously perform reference to a situation and indicate the way the speaker represents this situation.

Thus, the meaning of a sentence should be a result of correlation of, at least, two semantic structures. One of them is the structure of our knowledge about the state of affairs (“denotational field”) and the other is a structure of our logics (“signification”) (Bogushevich 1997a). These two structures have different origins and functions.

The former structure is the result of our interaction with the environment and its function is to arrange in a certain order the impacts of the world. The latter is our evolutionary heritage and its function is to organize our knowledge so that it could be prepared to be transferred to others in case we speak and to perform interpretation of a sentence in case we hear it.

The structure of the denotational field is the result of our ordering of the signals from the environment including the interaction with others. It may be treated as a generalized and abstract picture of the world. This picture is not stable but movable.

We may change it, and sometimes radically. We may substitute its elements, establish new relations within it. We may present this picture from different points of view as it is necessary for our needs in communication. All these processes should be analyzed and described by psychology and psycholinguistics.

Our linguistic aim is to find what, in the sentence semantics, gives speakers the possibility to present a situation in different ways, namely to find out what mechanisms underlie the variable reflection of a situation in the sentence structure.

In order to cast a light on this problem we should investigate the process of creating the sentence meaning, or in other words, consider in detail regulations of coordinating the structures mentioned above.

2. Nominative sphere of the sentence in the framework of compositional approach

In the search for solutions of the problems of sentence creation we start with analysis of the notions on which the whole investigation rests, namely the notions of “denotational field” (“situation”) and “signification” (“proposition”).

In compositional syntax (Bogushevich 1997a) these pairs of terms are used simultaneously, without any difference between them, i.e. as absolute synonyms, substituting each other only for stylistic needs. Meanwhile, the very introduction of such pairs suggests that they indicate different facets of meaning (“denotational field” and “situation”) and sense (“signification” and “proposition”).

2.1 Denotation vs situation

Let us first consider the difference between the denotational field and the situation. The term “situation” was defined by D. G. Bogushevich, as some denotational field reflected in a sentence (Богусевич 1990). Later, this term was used, without any special definition or description, to name some structured fragment of reality (Bogushevich 1997a) and later it was interpreted as a cognitive structure presenting some portion of a picture of the world.

Such use of the terms “situation” and “denotational field” shows that in the denotational sphere we have to differentiate between the cognitive structure, which is immune to syntactical structures and is a part of our cognition, i.e. denotational field, and situation, which is a model of some denotational field that is created for communication and directly enters the semantics of the sentence.

As a result, a given denotational field might be reflected by a number of differently structured sentences, each of which presents a specific view upon the field that is its own situation:

- (1)
 - a. John told Mary about an accident.
 - b. John and Mary spoke about the accident.
 - c. John asked Mary about the accident.
 - d. John read about the accident.

All these sentences reflect one and the same denotational field, i.e. the denotational field of verbal informing, but at the same time each of these sentences presents different aspects of the process of verbal informing, i.e.

different situations. Sentence (1a) presents *a situation of reporting information* (one subject gives information about something to another subject), sentence (1b)—*a situation of exchanging information* (two subjects simultaneously inform each other about something), sentence (1c)—*a situation of requesting information* (one subject makes a request for missing information from some other person), sentence (1d)—*a situation of informing oneself* (the subject gets the necessary information about something from books, mass media etc.).

2.2 Signification vs proposition

The relations of signification and proposition were established as a certain sphere, or better, characteristics of any sign (Frege 1952, 1960) and, according to the theoretical postulates of compositional syntax, this property is realized in ready-made logical structures, i.e. propositions (Bogushevich 1997a). At this point we may observe some logical inconsistency in the treatment of signification, because it cannot be at the same time a property of a sentence and a sphere independent of it. If we compare signification and proposition with denotational field and situation, we cannot but see a certain similarity in coordination between the constituents of these pairs of terms.

The denotational field is the ontological content which should be ordered in some way to be presented linguistically by means of a sentence. This logical-cognitive implementation for the needs of communication is performed by the signification sphere. This signification sphere (or just signification for simplicity) contains a number of logical cognitive categories employed to arrange the relations existing in the denotational field for presenting the latter in the sentence structure, so that it can be understood by the interlocutor. The interlocutor can understand the speaker only if both of them possess common properties in their interpretational systems. These common properties might be treated as universals, shared by all representatives of mankind and regarded as their evolutionary heritage. The existence of these universals enables human beings to use a specific system of interaction—language, and makes it possible for any human being to acquire the native language, learn any number of foreign languages and use them to organize cooperation with other human beings. These universals are dynamics/statics, directiveness/non-directiveness. They could be organized into two categories based on two basic oppositions: the category of “process” which is established on the opposition dynamics-statics and the category of “relation” established on the opposition directed/non-directed.

2.2.1 Category of relation

Let us first examine the category of relation. The significational sphere of a sentence comprises elements and relations between them. The elements might be equal or unequal in the relation binding them. It is reflected in their ability to exchange their places in a sentence or not. In case they cannot exchange their position the relation is ordered (i.e. directed). If the elements may exchange their positions and the meaning is not altered the relation is unordered (i.e. non-directed). This parameter can easily be tested by an attempt to exchange elements in the sentence, e.g.:

- (2)
- a. *John* resembles *Mike*.
 - b. *Mike* resembles *John*.
- (3)
- a. *John* takes *the book*.
 - b. **The book* takes *John*¹.

Sentence 2a is the same as 2b; but sentence 3a is not the same as 3b. In sentences 2a and 2b the relation is non-directed, while in sentences 3a and 3b it is directed.

Change of the position of a word in a string is characteristic of English and other languages that have no noun case. In languages that possess cases (for example, Russian or German) it is necessary to exchange the cases, for instance, Accusative instead of Nominative and vice versa.

2.2.2 Category of process

Now let us move on to the category of process. This parameter of the significational sphere describes the property of the relation itself. The relations presented in the sentences may be either static, i.e. not developing with time, or dynamic, i.e. changing with time.

The grammatical tests to identify the features of this parameter vary with languages. In English we can use three tests. First we should try is to use the question of the type—*What happens?* If the sentence can be used as an answer to this question we may say that it describes some process and the relation in it might be considered as dynamic, for example: *What happens?—John eats an apple*. Then we may try to use the predicate verb in the form

¹ Mark (*) indicates that the sentence is incorrect from the point of view of modern English grammar.

of Continuous, for example: *John eats an apple. John is eating an apple.* And finally, we may insert an adverbial indicating the degree of force or velocity, for example: *John eats an apple—John quickly eats an apple.* In case none of the tests gives positive results, the sentence should be considered as representing the static relations, for instance: *John has a book.* This sentence cannot be used in any of the contexts listed above.

2.3 Summary

In order to be understood, the speaker has to qualify every situation that is subjected to representation in the sentence as possessing a characteristic feature within each of the categories and combine them into a stable cognitive structure or proposition. It means that a sentence should show either a dynamic or static relation and, at the same time, it should be either ordered or unordered, for example:

- (4)
- a. John resembles Mary.
 - b. John meets Mary.
 - c. John has a house.
 - d. John eats an apple.

A non-directed and static relation is observed in the sentence 4a; non-directed and dynamic—in the sentence 4b; the sentence 4c is an example of directed and static relation; 4d—of directed and dynamic.

Thus, we may come to the conclusion that the signification sphere of a sentence comprises at least two aspects. One of these aspects, which might be named signification proper, is formed by the logical cognitive categories that are the evolutionary heritage of mankind: dynamics/statics, directiveness/non-directiveness. The other aspect—the propositional, includes stable combinations (propositions) that are created on the basis of binding together one of the binary features of one category with one of the binary features of the other category. Psychological and psycholinguistic investigations show that the propositional aspect, namely the mechanism of building propositions, develops in the course of language acquisition (Aitchison 2003).

Simultaneously with learning how to construct the propositions, a person learns the regulation for applying propositions for the representation of different states of affairs. These regulations are obviously culturally biased and vary from language to language, e.g. in the English sentence *He is said to be away*, the situation is qualified as static and directed, while in the

Russian translation of this sentence—*‘Говорят, что он уехал’*—the situation is also presented as directed, but dynamic. The same manner of presentation (directed and dynamic) is observed in the German translation of the initial English sentence: *‘Man sagt dass er weggefahren ist’*.

3. Semantic configuration of the sentence

Before proceeding to the next point of our discussion, it would seem necessary to sum up everything that has been said thus far. The nominative aspect of each sentence is a result of coordination of two mental spheres—Bedeutung (‘meaning’) and Sinn (‘sense’) (Frege 1952, 1960).

Bedeutung (‘meaning’) is made up of a set of denotational fields, which are results of our interaction with the environment and are the most general and abstract representations of it. They include all the elements and all the relations that we observe in reality. Each denotational field is a cognitive and conceptual representation of our knowledge about a certain fragment of reality. It is obvious that in actual communication it is not only impossible, but in fact unnecessary to transfer to listeners the whole structure of the denotational field. We reflect denotational fields not just for the sake of reflecting them. We do it to achieve our communicative aims. It is our communicative aim that determines the set of elements and relations among them, i.e. the situation we select from a certain denotational field which we want to reflect in the sentence.

Sinn (‘sense’) might be seen as including a group of interpretational logical categories (“process” and “relation”). These categories, being our evolutionary heritage, do not vary from culture to culture. Their function is to organize our knowledge (denotational fields) and to present it to others. Preparing part of a denotational field, i.e. situation, for presentation in a sentence, the speaker chooses one of the features of each of the logical categories and locks them together, thereby creating a proposition which he/she applies to a situation, arranging it for further linguistic presentation in a sentence.

Thus, we may conclude that the nominative sphere of an actualized sentence is the result of coordination of a situation as an ontological basis for the sentence, and the proposition as its gnoseological interpretation. This fact of coordination of the situation and proposition was mentioned in the compositional syntax (Bogushevich 1997a), but the result of it was not described. In the compositional syntax the proposition was treated as a frame into which the situation is inserted. This approach raises the question of what is actually reflected in a sentence—a modified proposition or a new structure having certain properties of the proposition and the situation. The

answer to this question might be found if we analyse the manner of selecting and inserting lexical items for the sentence. In compositional syntax, selection of the lexical items is determined by the properties of the elements of the situation they name, and simultaneously, with the insertion of the situation into a proposition, the lexical elements are distributed among the argument places of the proposition. This means that the use of the lexical elements in the sentence completely depends on the properties of elements of the situation reflected. But if we assume this, we won't be able to explain why it is sometimes impossible to use a lexical unit naming some functional element of the situation in all logically possible variants of arrangement of the elements of the situation, e.g. we may say *I wrote the note with my own hand* and *My hand could not write this note*, but the sentence *I wrote the note with my own pen* could not be transformed into *My pen won't write it*. In both initial sentences, the words 'hand' and 'pen' name the instrument of the situation of informing. Generally, the instrument may be presented as the initial element of the situation. This is true for 'hand' but not for 'pen'. It means that selection of lexical elements depends not only on the properties of the elements of the situation but also on the way they are arranged, i.e. on the proposition. It also means that selection of lexical elements is done after the situation and the proposition are coordinated. And still the functions of the elements of the denotational field influence the possibility of being placed in the first position of the sentence. We know that 'hand' is an inherent element of the doer of the action (i.e. 'I'), so it can easily undergo the process of metonymy. On the other hand, 'pen' is an additional instrument and can appear in this position only if the verb loses its direct object: *The pen won't write*. The latter sentence describes the quality of 'the pen' but not the action done by it.

Thus, lexical elements are applied to some structure that is neither a proposition nor a situation, but comprises the relevant features of both. This structure might be called "semantic configuration of the sentence". The semantic configuration, being a necessary stage in the process of creating a sentence, inherits a set of properties from its predecessors—the situation and the proposition. It is ontological because the situation that it incorporates presents part of the denotational field which is the reflection of the world surrounding us². It is cognitive, since it is based on a denotational field which is the result of cognitive processing of the information we receive from the universe. It is partially hereditary, as it comprises the logical

² This formulation is based on the materialistic view to which we adhere. If we try and adapt it to the idealistic view, we should name this feature not "ontological" but "ideal".

categories that are our evolutionary heritage. It is logically structured, because its components are arranged according to the connection of logical categories the speaker selected for this presentation of the situation. And thus it is partially subjective, since it is the speaker who selects and joins the logical categories together and applies them to the situation, in order to present it as he wishes. But as we have already said, the speaker is not completely free in his/her selection of this or that combination of logical categories for organizing situations. Sometimes the speaker is restricted by the language he/she uses. So we may say that the semantic configuration is language dependent. And finally, it is also communicatively dependent, as the speaker selects that very angle on the denotational field, i.e. situation, and the manner of possible logical arrangement of this situation, which is appropriate to his/her communicative aims.

4. Mechanisms of coordination of the situation and the proposition

The introduction of the semantic configuration leads to the questions of how this structure is created, i.e. how the proposition and the situation are coordinated and what is/are the operation(s) that ensure this coordination.

4.1 The centre of empathy

We assume that coordination of these two aspects of sentence meaning starts with selection of a participant of the situation for the first position of the proposition, or in other words, with establishing “the centre of empathy” in the situation (Kuno 1976; Kuno, Kaburaki 1977). The centre of empathy determines the perspective for presenting the situation and the placing of other participants of the situation in the positions of the proposition.

Selection of different participants for the centre of empathy, determines differences in presenting a situation in sentences:

- (5) *John* cut the bread with the knife into slices.

The centre of empathy in this sentence is on the Doer (*‘John’*). If the centre of empathy is placed on the Tool (*‘knife’*), the sentence has the following form:

- (6) *John’s knife* cut the bread into slices.

It's also possible to place the centre of empathy on the Object ('*bread*') and obtain the sentence:

- (7)
The bread cuts into slices easily.

But it is impossible to place the centre of empathy on the Result ('*slices*') without a radical change of the grammatical and/or lexical properties of the sentence:

- (8)
The slices are cut off the bread.

So, shift of the centre of empathy may explain a great number of formal differences, but it cannot help us to interpret differences when the centre of empathy is fixed on one and the same element of the situation:

- (9)
 a. **John** sent *Jane* a message.
 b. **John** sent a message to *Jane*.

- (10)
 a. **Jane** left *John* a note.
 b. **Jane** left a note for *John*.

The choice of the center of empathy does not prevent the addition of new elements to a sentence:

- (11)
 a. John sent *Jane* a message **by e-mail**.
 b. John sent a message to *Jane* **by e-mail**.

- (12)
 a. Jane left *John* a note **on the table**.
 b. Jane left a note for *John* **on the table**.

These examples 11a-b and 12a-b show that change in the position of the elements '*Jane*' and '*message*' (11a and 11b), '*John*' and '*note*' (12a and 12b) is not caused by the necessity to indicate comments (rhemes), because in these pairs of sentences the comments are the same ('*by e-mail*' / '*on the table*') and do not coincide with the elements that changed their positions.

The center of empathy does not block deletion of other elements of the situation from the sentence, so that the elements that remain can move closer to the predicate:

(13)

- a. He asked *me in a low voice* if I would tell her all I knew.
- b. He asked ~~*me in a low voice*~~ if I would tell her all I knew.
- c. He asked ~~*me in a low voice*~~ if I would tell her all I knew.

Since shift of the right-hand elements closer to the predicate and permutation of words in the two positions nearest to the predicate are not determined by the center of empathy, we may conclude that there must be a certain mechanism regulating the presentation of situation elements in the post-predicate part of the sentence.

Thus, we may speak about not one but two mechanisms of coordinating the situation and the proposition to form the sentence meaning. These mechanisms are employed to produce different ways of presenting situations.

4.2 The focus of speaker's interest

Variability of the sentence depends on the choice of situation element to be presented as a given element of the proposition. So, the sentence element which is most variable should be considered as the starting point of the mechanism of coordination of situation and proposition. Since we have found two mechanisms, there should be two most variable sentence elements. The first variable element (the center of empathy), as we have already said, occupies the left-hand position relative to the predicate. Thus, the second variable element should be sought among the right-hand elements of the sentence. Analysis of a number of English sentences showed that the most variable element is the one adjacent to the predicate. This element may present any participant of the situation and even elements characterizing the situation, e.g.:

(14)

- a. Our parents were talking *about selling us as slaves*.
- b. Men were talking *to one another* slowly about things that sounded dull.
- c. They talked *for almost an hour*.

This being so, the choice of situation element to be presented in this position depends entirely on the speaker and his/her interest, that is, upon his/her

evaluation of the elements of the situation, or what the speaker thinks to be the most important.

Thus this element may be considered as presenting “the focus of the speaker’s interest”.

The focus of the speaker’s interest is one of the most important instruments used by the speaker to produce variants of presentation of a certain state of affairs in a sentence:

(15)

- a. John talked *to Mary*.
- b. John and Mary *talked*.
- c. John and Mary talked *to each other*.

Variants of presenting the denotational field of verbal informing in sentences 15a-c are caused by differences in the elements upon which the speaker’s interest is focused. Sentence 15a reflects the process of verbal informing, so the focus of the speaker’s interest is on one of the participants. In sentence 15b, the focus of the speaker’s interest rests upon the very fact of the process. And, in sentence 15c, the bilateral character of the process of verbal informing is in the focus of the speaker’s interest.

Selection of different elements for the focus of the speaker’s interest may also determine formal differences in sentences presenting a given denotational field:

(16)

- a. John *told Mary* something.
- b. John *said* something *to Mary*.

The difference between sentences 16a and 16b, namely the inclusion of the preposition ‘*to*’ before the addressee when the verb ‘*to say*’ is used and the absence of this preposition when the verb ‘*to tell*’ is employed, is caused by different semantic configurations underlying these sentences.

The difference between the semantic configurations of the sentences above is caused by selection of different elements for the focus of the speaker’s interest and thus different ways of signification embodying one and the same denotational field. In sentence 9a with the verb ‘*to tell*’, the focus of the speaker’s interest is placed on the addressee, while in the sentence 9b with the verb ‘*to say*’, it is on the object.

4.3 Summary

Thus, we may state that the main operation of the process of logical arrangement of a situation by means of a proposition is selection of an element of the situation for the focus of interest. This operation initiates another operation, which consists in choosing an element for the center of empathy. The choice of the center of empathy is not quite free. It is restricted by the necessity to put the lexical embodiment of the focus of the speaker's interest just after the predicate:

(17)

- a. *He* read the letter: Dear Daddy, They've kidnapped me.
- b. *The letter* read: Dear Daddy, They've kidnapped me.

If the focus of the speaker's interest is placed on the object of the denotational field of verbal informing, the choice of the elements for the center of empathy is restricted only by two variants: the center of empathy might be placed either on the subject of the denotational field as in 17a, or on the instrument as in 17b.

Sometimes an element in the focal position leaves no alternatives for the center of empathy. For example, if the focus of the speaker's interest appears to be on the inherent instrument of the denotational field of verbal informing, only the subject of this denotational field can be formed as the center of empathy:

(18)

She said in a soft voice, "Toni."

5. Semantic structure of the sentence: pragmatic aspects

At this juncture we may ask if the speaker is actually free to choose the denotational concept for the focal position, or if his/her choice is predetermined by some external conditions. To answer these questions, we have to return to the definition of the notion "sentence".

On the one hand, the sentence is a model of some denotational field. On the other hand, a sentence is a constituent element of a speech act. Being an element of a speech act, it should be constructed according to the principle of pragmatic sufficiency (Bogushevich 1997b). The pragmatic sufficiency principle first of all determines the general aim of the utterance, i.e. its illocution (Austin 1962). Then it orders selection of denotational elements to be presented in a sentence and among them the element that the speaker thinks most important for realization of the illocutionary force.

The use of this element should be devoid of linguistic restrictions and depend only upon the speaker's will. And the speaker's will in its turn is determined by the illocutionary force of the utterance. The only element in the sentence which is free of linguistic restrictions and choice of which is ordered by the illocutionary predetermined will of the speaker is the one that appears just to the right of the predicate.

A speech act when it is not oral usually comprises more than one sentence which is presented as a text. A text, as it was shown by M.M. Bakhtin (Bakhtin 1986), is an element of the universal dialogue in a certain culture. This approach permits us to qualify a text as a communicative step created by a number of speech acts (i.e. as a complicated speech act). Speech acts constituting a text should be semantically and pragmatically coherent.

Pragmatic unity is coordination of the illocutionary forces of the speech acts of the text determined by the general illocution of the communicative step. Semantic coherence is coordination of different propositional content of speech acts (Vanderveken 2009) or, in other words, different situations that constitute the subject matter of the text.

Since a text consists of sentences and, as it was shown before, pragmatic and semantic factors operate on the sentence level in conformity with each other, we may suppose that they act together in production of the whole text as well. Further we will try to show how semantic and pragmatic coherence coordinate to produce a text and how they are connected with pragmatic and semantic factors employed in the production of sentences which constitute this text.

A text viewed as a complicated speech act is constructed to achieve a certain pragmatic aim. This pragmatic aim regulates the semantic and pragmatic properties of the text. The semantic sphere of the text should present a certain denotational field in conformity with the general pragmatic aim or the general illocution of the text. This general illocution, on the one hand, splits the denotational field into fragments (situations) to be reflected in sentences and, on the other hand, sets a number of micro aims for each sentence or, in other words, micro illocutions. These micro illocutions make up a pragmatic chain that result in realization of the general or macro illocution.

The macro illocution determines the manner of categorization and conceptualization of the situations which results in the creation of one or several denotational fields. Some conceptual representations of the elements of situations are common for the resulting denotational fields and semantically unite them. This union of situations presents the speaker's vision of the denotational field of the text which is determined by the macro illocution and provides semantic coherence for the text.

The other operation of text production is selection of components of the denotational fields for representing them in the form of situations and application of logical categories to these situational structures. It is carried out in compliance with the micro illocutions.

But performance of these operations is possible only if, among the elements selected for constructing situations, there are those that possess both semantic and pragmatic functions. Such situational components, being relevant for pragmatic aims, should be placed in that syntactic position in which they exert direct influence upon presentation of the situation in the sentence. At the same time, though these elements are scattered among different situations and different denotational fields, they still belong to the same denotational field.

This fact makes us conclude that they are semantically connected. They serve as explicit realization of the semantic coherence and being pragmatically determined, they arrange the text semantics in conformity with the pragmatic aim of the text. These elements perform the transition of the illocutionary force to the text semantics.

As it was shown above, these elements are those that are selected for the foci of interest in the sentences of the text as they are necessary components of the sentence meaning and their choice depends exclusively upon pragmatically determined will of the speaker.

5.1 Speaker's focus of interest as a basis of a text semantic model

To verify the hypotheses mentioned above it is necessary to take a text and analyze all the elements that appear in the foci positions. For that aim the text under analysis should have clear pragmatic properties. Such a text might be found in mass media.

As it was shown by Critical Discourse Analysis (Fairclough 1995), texts of mass media have two pragmatic aims: to inform and to influence. Influence is usually performed by imposing the speaker's attitude to the referential field described in the text. We suppose that the first aim corresponds to the semantic coherence while the second aim might be classified as a representation of pragmatic coherence.

The article chosen for the analysis contains information about legal actions undertaken by human rights organizations against the Metropolitan Police of London. We shall consider this information as the denotational field of the article.

(19)

The Metropolitan Police is facing *two separate legal actions*^F over its use of the controversial "kettling" technique during last year's student protests, it was confirmed today.

Cases are being brought *against the Met*^F by Public Interest Lawyers (PIL) and civil rights group Liberty over the use of the crowd-control measure during the demonstrations.

Thousands of students and lecturers were held *for hours*^F in freezing conditions during the anti-tuition fees protests in November and December.

PIL is bringing *a case*^{F1} on behalf of two students Rosie Bergonzi, 17, and James Moulding, 18, who were kettled *by the Metropolitan Police*^{F2} on the afternoon of the December 9 protest in Parliament Square.

The pair were not released *from Westminster Bridge*^F until around 11.30pm that night.

The claimants allege *breaches of their rights*^F under the European Convention on Human Rights, including their right not to be deprived arbitrarily of their liberty, the right to freedom of expression and the right to freedom of assembly.

Ms. Bergonzi, a sixth-form student from Brighton, was "kettled" *along with her friends*^F for over nine hours.

She was denied *access to food and water*^F and not permitted access to toilet facilities.

She claimed [that as she was being released *from Westminster Bridge*^{F2} she was punched *by a male police officer*^{F3} in an apparently unprovoked attack]^{F1}.

Mr. Moulding, who was accompanied *by several minors*^{F3}, asked repeatedly *for his group to be let out of the kettle*^{F1}, but claimed [that his requests were *continually refused*^{F4}]^{F2}.

PIL solicitor Phil Shiner said: ["Kettling has become *the stock police response*^{F2} to peaceful protest]^{F1}.

"On December 9, it ("kettling") appears to have been resorted to *by default*^F.

"The chilling effect upon the democratic right to peaceful protest has been recognised *by the Metropolitan Police*^{F1} and *the lengthy deprivation of liberty to which*^{F2} my clients were subjected *is wholly unacceptable*^{F3}."

A separate legal action is being led *by the human rights organisation Liberty*^F.

The organisation's legal officer Emma Norton said: ["Policing demonstrations *is no easy task*^{F2} but the police must distinguish *between the law-abiding majority and the handful intent on violence*^{F3}]^{F1}. Our young clients came away *from November's march*^F distressed and, in two cases, with broken bones.

"The tactic of 'kettling' large groups so that peaceful protesters and passers-by are trapped *for hours*^{F1} alongside more troublesome elements exacerbates *tensions*^{F2} and creates *a risk to public safety*^{F3}."

Scotland Yard has said [it will continue to use "kettling"^{F2} where necessary and has not discounted its use^{F3} during anti-cuts demonstration planned for March 26]^{F1}.

It has said however [that it has appointed a "kettling manager"^{F2} and will work closely with the TUC and Liberty^{F3}, which has been asked to independently observe^{F4} the policing operation]^{F1}.

On the first stage of our analysis we marked all the elements that appear in the foci positions within each sentence that constitute the text (we marked them with letter 'F': e.g.: '*facing two separate legal actions*^F').

On the second stage we established key denotations that make up a denotative structure of the text under analysis. The procedure for identifying key denotations included several steps (Чучкевич 2017).

First we calculated the total number of denotations in the text (N) and the total number of paragraphs in the text (n): Total number of denotations in our text is 265 and the total number of paragraphs is 18. Then we compiled the equivalent series of lexical units with identical reference (e.g.: '*the Metropolitan police, its, the Met, the Metropolitan police, a male police officer, the Metropolitan police, the police, the police, it, it*') and calculated the total number of words in the text referring to one and the same denotation (F), and total number of paragraphs reflecting one and the same denotation (M). Then we applied a range of "filters" in order to exclude: a) parentheses and b) the denotations reflected only in one paragraph of the text. Finally, we calculated the importance coefficient of each particular denotation by applying a special formula to each equivalent series of lexical units:

$$K_{imp} = F \cdot m / N \cdot n,$$

where K_{imp} –importance coefficient of the denotation; F –the total number of words in the text, reflecting the same denotation; m –the total number of paragraphs in which the denotation was reflected; N –the total number of words in the text; n – the total number of paragraphs in the text (Зубов 1986).

For example: *the Metropolitan police, its, the Met, the Metropolitan police, a male police officer, the Metropolitan police, the police, the police, Scotland Yard, it, it*; $K_{imp} = 0,03354$.

In order to assign the denotation, the frequency threshold is calculated according to the formula suggested by A. Zubov (Зубов 1986):

$$K_{imp} \geq (1/5n+1)^2/N \cdot n$$

The importance coefficient is equal or greater than 0,00444 ($K_{imp} \geq 0,00444$).

As a result, we received a list of key denotations, which we correlated with the focus of interest positions in the text.

The statistics showed that the percentage of correspondences between the focus of interest elements and the key denotation elements is 77.8%.

5.2 Summary

The analysis of the referential properties of the elements employed in the foci positions of separate sentences has shown that these elements actually indicate the connection of the denotational fields into which the referential field of the article is divided. They produce the framework of the event described in the article.

The components in the foci positions include names of the key elements of the event reflected in the text, namely refer to the event itself (*two separate legal actions, a case*). Then they name actions included into the event (*breaches of their rights, access to food and water, access to toilet facilities, the stock police response, from November's march, to use "kettling"*), the participants of the event and participants of the actions included into the event (*against the Met, along with her friends, a male police officer, by the Metropolitan Police, by the human rights organisation Liberty, between the law-abiding majority and the handful intent on violence*).

Since every event happens at a certain place and a certain time reference to them is included into the framework of the event described: 1) temporal reference, e.g.: *for hours* (repeated twice); 2) spatial reference, e.g. *from Westminster Bridge*. We may also observe in the foci positions lexical elements that possess clear evaluation of the event described, e.g. *arbitrarily, repeatedly, tensions, a risk to public safety*.

Thus we may conclude that the elements in the foci positions create the framework of the event described and produce the semantic coherence of the text. It means that the first aim of the mass media text, i.e. giving information, is realized by placing relevant elements in the foci positions. But the evaluation elements that indicate the attitude do not perform the function of shear information.

As it was shown by N. Fairclough, a mass media text is a means of governing the public (Fairclough 1995). It imposes the speaker's attitude to the event described and the analysis of the elements in the foci positions of this text supports this idea. Namely we find words with strong emotional coloring in the focus of interest positions, e.g.: *breaches of their rights, the law-abiding majority, arbitrarily, repeatedly, tensions, a risk to public safety*. Words with the emotional coloring appear not only in the foci

positions but their use in these positions perform the function of imposing of the speaker's attitude to the event described thus organizing the pragmatic coherence of the text.

6. Conclusion

Taking into consideration everything stated above we may conclude we present the system for creating sentence semantics in the following way: while perceiving and categorizing a fragment of reality, the speaker forms a model of it, i.e. a denotational field. This model includes the most abstract ideas about the objects of the reflected fragment of reality and possible relations binding them.

In the process of creating a sentence for transferring knowledge of the reflected fragment of reality to the partners in communication, the speaker selects a minimal number of denotational elements that are relevant for the present communicative conditions and establishes relations among them, i.e. creates a definite point of view on the denotational field, or in other words creates a situation.

In order to present a situation in a linguistic form, the speaker has to qualify the relations existing among the components of the situation by means of the significational entities which all human beings possess, i.e. to qualify them as dynamic or static and directed or non-directed. The speaker needs to construct an appropriate proposition to enable reflection of the situation in a sentence.

Then, employing operations of positioning the focus of the speaker's interest and the center of empathy, he/she makes a logical arrangement of the nominal components of the situation.

The first stage of this arrangement presupposes selection of the situational component which is most significant for the speaker, i.e. the focus of his/her interest and placing it as an adjacent right-hand element to the predicate.

At the second stage the speaker, in accordance with the selected focus of interest and possible restrictions imposed by the language he/she speaks, chooses the element of the situation which he/she considers initial for the situational relation and presents it as the left-hand element adjacent to the predicate.

As a result of these two stages, i.e. as a result of qualifying a situation by means of a specific proposition determined by the mechanisms of selecting the focus of the speaker's interest and the center of empathy, the speaker obtains a semantic configuration of a sentence,

This configuration incorporates communicatively biased information implied in the focus of speaker's interest which permits to "build in" the sentence in a wider context. It is the focus of speaker's interest that becomes the basis of creating of a model of a higher level, namely the deep semantic model of a text.

The foci of interest of separate sentences constituting the text perform three functions. They 1) provide the semantic coherence of the text; 2) organize the pragmatic coherence of the text and 3) unite and subordinate the two types of coherence to the general pragmatic aim (general illocution) of the text.

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CHAPTER SEVEN

LINKING CONSTRUCTIONS INTO FUNCTIONAL LINGUISTICS

ON FUNCTIONAL-SEMANTIC CHARACTERISTICS OF LEXICAL-MODAL DISCOURSE-TEXT 'TRANSITIONS' IN MODERN ENGLISH AND FRENCH

SABINA NEDBAILIK

1. Introduction

As it is known, a discourse-text is a coherent system, functioning as a complete message, possessing its own content and organized by abstract models, existing in the language, and characterized by some distinctive features (Zaitseva 2001). The very notion of 'content' applied to a text unity acquires its terminological use, different from the notions: 'sense' and 'meaning'. Every text presents a regular structure, thanks to a definite set of categories.

Thus, coherence and cohesion can be treated not only as semantic phenomena, being manifested simultaneously as structural, semantic and communicative integrity, 'interacting as form, content and function' (Arapoff 1998). It is quite evident that the communicative integrity of a text is expressed in the relations of succession between its forming components, micro-segments, or super-phrasal units (SPU) (Pastukhova 2001). Otherwise, each following sentence of an SPU (micro-text) is supported communicatively by a preceding one, what produces various theme-rhematic chains, structuring a statement informatively in the direction: from a known fact to a new one.

All sentences entering a (micro)text are interlinked not only by their thematic unity and the principle of communicative progression, but also by various external signals, indicating that components form together some structural complex. In this connection, the linking elements total numbers

can be made by pronouns, articles and auxiliary verb forms, and particles. Discourse-texts of different styles can also be formed by means of special elements, which in linguistic theory have the name of ‘logical connectives’, or ‘connecteurs argumentatifs’ (Moeschler 2011). These linking words, or so called ‘transitions’, also contribute to structure of the text unities and greatly facilitate any kind of work with them, i.e. reading, translating, comprehension. Otherwise, the connectors’ role is not limited by binding sentences—they can guide the understanding of any discourse by a receptor (Moeschler 2011).

2. Discourse-text connectors functional status

It’s quite evident that depending on the functional-stylistic character of discourse-text unities, the number and cast of connectors can differ considerably through the prevailing of certain subtypes. This fact can be explained by specific features of their composition, structuring, as well as by the extent of logical-semantic integrity of text fragments of some individual style. In its turn, this stipulates the possibility of more or less extensive variation of syntactic relations, means of realization and, as a result, of various types of language unit’s contextual synonymy.

It is easy to guess that these tendencies are expressed most distinctly and clearly in speech statements characterized by high precision and logics of presenting the material, informative density, which is observed particularly in scientific and official prose styles. Strict segmentation and linear structuring, and the compositional unity of such texts, necessitate constant and deepened use of linking language units of more or less expressed lexical semantics, that are seldom used on a sentential level for providing multilateral inter-phrasal and inter-propositional syntactic bonds.

3. Discourse-text ‘transitions’ classification types

Considering a generally accepted principle of connectors, or ‘transitions’, classifying into three main types: a) completely grammatical; b) lexical-grammatical; c) completely lexical means (Hall, Harris 1994), it is necessary to define more precisely the actual scope and content of all these subclasses.

Thus, the first group comprises pure copula elements, such as auxiliary verbs, conjunctions, prepositions, and some parallel constructions; correspondingly, the second division includes adverbial, verbal, parenthesis-modal conjunctive words, whole sentences and their parts, and prepositional-substantive complexes; the third group embraces various

word doublings, synonyms, antonyms, taking into account various possible connective word combinations, phrase segments and chains existing, such as: conjunction + conjunctive adverb, conjunctive adverb+ parenthesis element, part of a sentence + conjunctive adverb, and conjunctive adverb + conjunctive adverb. One can easily guess that a special interest for multi-aspect research in the field of communicative pragmatics is undoubtedly provoked by the units of the second group ‘transitions’ considered to be real signals of syntax-semantic relations, markers of so-called ‘left/right context’ (Arapoff 1998, Moeschler 2011).

3.1 Lexical-grammar ‘transitions’ main varieties in English and French

First of all, the sub-class of these elements is formed by parenthesis-modal adverbial-substantive elements, such as: a) ‘besides, moreover, more, furthermore, again, likewise, certainly, then, next, now’ (en.); ‘maintenant, en plus, ensuite, autant, encore, alors, certainement, en effet, enfin’ (fr.), expressing various nuances of connective type relations; b) ‘however, yet, still, though, although, hence’, etc. (en.); ‘pourtant, cependant, autrement, quand même, bien sûr, en même temps, par exemple’ (fr.), marking various nuances of contradiction type relations; c) ‘therefore, thereupon, thus, accordingly’ (en.); ‘conséquemment, finalement, enfin, correspondemment, donc’ (fr.), expressing consequence type relations,

It is quite natural to suppose that all of them can easily correlate with primary and secondary conjunctions with synonymic functional meanings, even replacing and supplementing them in certain positions. Just the elements of this kind are able to form particular peripheral compound groups of words in the language system, combining morphological features of one class with syntactic characteristics of another and are regarded as partial transforms, having special localization zones in the functional-semantic field of ‘conjunction’ (Zaitseva 2001). It is quite evident that most of these above mentioned lexical-grammar ‘transitions’ are incorporated into syntactic complexes not only as the bearers of constructive function, fixing contextual-logical connections between sentences and their parts, but also as the markers of modal assessment, signals of actual segmentation (Lebedeva 2001).

The very possibility of obtaining, by parenthesis, elements with the connective function can be explained, not only by their initial semantic similarity with so called ‘pure’ conjunctions and conjunctive words, i.e. the absence of subject-conceptual content in their semantics, but also by a clear tendency for ‘language economy’ (Arapoff 1998). The ability of parenthesis

adverbial-substantive type elements functioning as connectors in a large context is often considered to be a special ground for their raising to a special interclass sub-category of so called ‘conjunctive adverbs’. These exist in the language system as a ‘complex group of non-declinable lexical units, differentiated by distributive characteristics’ (Pravikova 2001), and are a constant reserve for conjunctions, conjunctive equivalents and other grammar linking means.

3.2 Semantic-functional manifestations of parenthesis-modal discourse-text ‘transitions’

Acknowledging the possibilities of frequent parenthesis adverbial-substantive, verbal and other type elements transposition into syntactic distributions most favorable for the acquisition of a secondary conjunctive function, it is necessary to mention the inner reasons and factors of this phenomenon. The main factor predetermining the position and functional charge change, together with their paradigmatic features, i.e. almost absolute morphological invariability (with the exception of some adverbial words’ ability to produce degrees of comparison forms, for example, ‘likely’) is their semantics initial relativity (Pastukhova 2001).

Primarily different language elements of adverbial-substantive, verbal nature, thanks to their lexical semantics abstractness and largeness of their manifestations scope are capable of expressing the widest spectrum of semantic-syntactic relation nuances in predicative structures, phrases, complexes, and super-phrasal unities (SPU), such as: temporal, locative, conditional, causative, concessive, successive, conclusive, contradictory. As a matter of fact, it causes a real and strong trend for their constant integration with purely grammar copulas, which results in possible partial or complete transforming of functional-semantic complex and correspondingly in their further moving first into peripheral and gradually towards the central zones of ‘conjunction’ functional-semantic field spheres (Pravikova 2001).

Of course, this process of ‘parenthesis-modal’ and ‘conjunction’, functional-semantic fields interaction is actually rather gradual and characterized by a low dynamic and a multi-stage course, which can be shown schematically by the figures presented following.

3.3 The main stages of ‘conjunction’ and ‘parenthesis-modal’ functional-semantic fields interaction process.

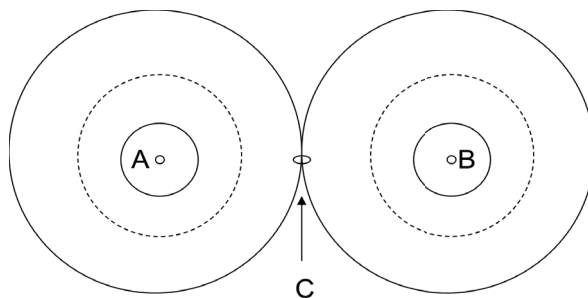


Figure 1. The first stage of two functional-semantic fields interaction.

Remark:

A—the center of ‘parenthesis-modal’ functional-semantic field sphere

B—the center of ‘conjunction’ functional-semantic field sphere

C—the point of two functional-semantic fields integration.

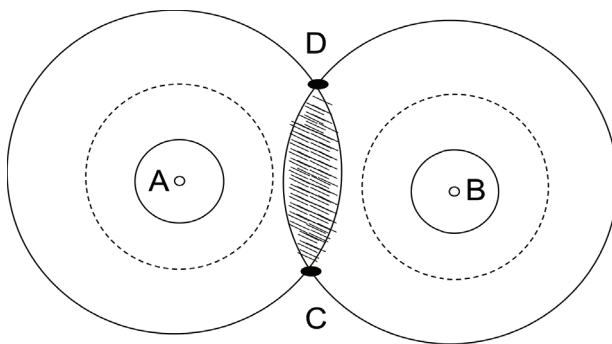


Figure 2. The second stage of two functional-semantic fields interaction

Remark:

C, D—the points, marking the border of two functional-semantic fields integration zone.

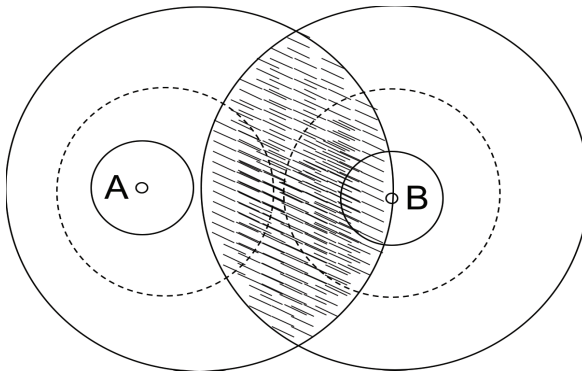


Figure 3. The third stage of two functional-semantic fields interaction

Remark:

The shaded segment marks the enlarged zone of two functional-semantic fields integration.

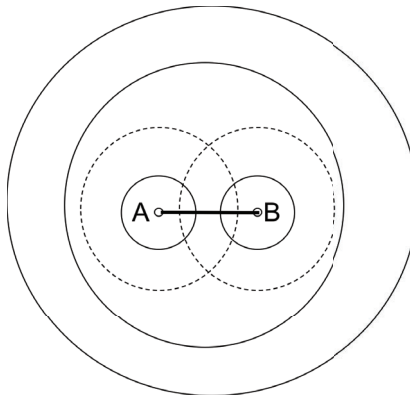


Figure 4. The fourth (final) stage of two functional-semantic fields interaction

Remark:

The circles inside mark the zones of parenthesis-modal ‘transitions’ localization adjacent to the centers of the functional-semantic field spheres.

Depending on the extent of ‘relativity’ component expression in connective elements general semantics, they can be localized in different circles of the ‘conjunction’ functional-semantic field structure, more or less distantly located from its central sections, which, in its turn, predetermines the

possibility of such units' use as its construction basic material.

4. Comparative functional-semantic analysis of different secondary conjunctives group elements

Naturally, the group of so-called secondary conjunctives can be formed in the periphery of the adverbial class, out of elements mostly disposed to be used as syntactic copulas in complex sentences and whole discourse-text fragments (SPU), because of their semantic 'relativity' and component expression top extent (Arapoff 1998a).

For example, conjunctive adverbial words and combinations, such as: 'moreover, furthermore, however, therefore', (en.); 'ensuite, encore, pourtant, en plus, alors, conséquemment', (fr.) are used for syntactic complexes parts binding with the same intensity as interrogative-relative adverbs ('when, where, why, how', (en.); 'quand, comment, où, pourquoi', (fr.)). Other elements of this group, such as: 'meanwhile, instead, finally, hence, also, consequently, nevertheless, next, still, then, otherwise, nonetheless, likewise, besides, thus', (en.); 'finalement, initialement, cependant, enfin, premièrement, deuxièmement, contrairement', (fr.) are most frequently used as inter-sentential discourse-text 'transitions' as well as prepositional-substantial combinations, prepositional-conjunction contaminants and compound copulas.

For example:

- (1). A national insurance contribution or a social security payment is simply an additional tax. **However**, by no means all countries have social security systems (Kisseleva 2011).
- (2). The new investigation methods have the power to minimize the risk of possible errors, **moreover** their application can then become multilateral if the working staff wishes (Kisseleva 2011).
- (3). On the basis of these figures, Britain is, contrary to popular belief, far from being a generous welfare state. **Finally**, on this subject one other important difference must be noted (Kisseleva 2011).
- (4). A number of new aids and methods are used in cases of emergency... **Besides** some of the institutions have taken a different approach (Kisseleva 2011).
- (5). Dans les années quatre-vingt-dix le niveau de vie moyen s'est élevé considérablement; cette hausse s'était alors avérée surtout favorable aux catégories les plus modestes; les classes moyennes étant les moins bien

logies. *En plus*, depuis le début des années 2000 la hausse du niveau de vie n'a été que de 1% pour les ménages les plus modestes (Paris-Match 2017).

- (6). La France est l'unique pays en Europe où les consultations homéopathiques continuent d'être remboursées par la sécurité sociale. *Cependant*, c'est aussi l'unique pays en Europe où tous les homéopathes sont tenus d'être d'abord médecins - généralistes. *Par exemple*, il est impossible de se spécialiser en homéopathie en France si vous ne possédez pas un diplôme de médecine générale (Paris-Match 2017).
- (7). ...*Premièrement*, les conditions des études expérimentales étaient discutées par les spécialistes, *deuxièmement*, tous les détails étaient précisés... *finalement* les conséquences négatives et problèmes des complications possibles étaient considérés (Paris-Match 2017).
- (8). Le ministère de la sécurité sociale de la France assigne toujours les allocations annuelles aux familles en ayant besoin, *par suite* les chiffres de natalité sont bien impressionnants ces dernières années (Paris-Match 2017).
- (9). Controlling the weight values by dilution provides considerable improvement in the fiber orientation profile. *And* active control is still needed to correct fiber orientation misalignment fault due to various reasons... (Kisseleva 2011).
- (10). ...tout est affaire de perspectives et de structure de consommation, *car* on peut observer à la fois l'augmentation des coûts de certaines dépenses contraintes (au premier rang desquelles le logement); *mais* aussi la baisse des coûts de communication. *En même temps*, cette baisse ne bénéficie pas à toutes les catégories de la même façon ... (Paris-Match 2017).

It is quite obvious that the copulative words in the above given phrases show certain differences in the extent of the expression of semantic features. Thus, the adverbial-substantial elements 'moreover' (en.), 'en même temps', 'en plus', 'par exemple' (fr.), uniting syntactic complexes parts: (2), (5), (6), (10) bring into them the lexical accents of 'addition', 'supplement', 'defining', 'detailing'. As far as the adverbial elements 'however' (en.) (1), 'cependant' (fr.) (6) are concerned, they probably add the lexical nuance of 'contradiction' into the whole syntactic complex and its semantics, functionally closely interacting with the conjunction 'mais' (fr.) (10).

Of course, the very possibility of combining two functions at the same time—of a binding element/ an adverbial modifier, proves the independence and largeness of their base lexical-grammar meaning, the lexical component

surely prevailing, and its ‘conjunction’ element having much weaker manifestation. Accordingly, all this necessitates postulating the above presented adverbial-substantive ‘transitions’ initial semantic features, preserved despite actual syntactic transpositions and ‘auxiliary’ functioning usual character. In case (4) the adverbial-conjunctive word ‘besides’ (en.) also acts as a copula binding two parts of a complex phrasal unity, thus it realizes primarily the ‘conjunction’ component potentially contained in its base semantics and peculiar in any extent for most adverbial words. In fact, this unit is not related concretely to any of phrase segments, which can be proved by the impossibility of supposed excluding combinations with this word from the syntactic complex in case of its possible segmentation. It is an obvious sign of this ‘transition’ of semantic dominant absence, and its transposition of initial category features, in conditions of the given syntactic distributions (Nedbailik 2015).

Of course, the sign of paradigmatic invariability, characteristic for given linking elements, provides their mutual integration in the sphere of morphology. As far as the parenthesis-adverbial words: ‘finally’ (en.) (3) ‘premièrement’, ‘deuxièmement’, ‘finalement’ (fr.) (7), ‘par suite’ (fr.) (8) are concerned, they certainly bring, into syntactic complexes being fastened, the lexical-semantic nuances of ‘consequence’, ‘succession’, ‘logical order’, ‘conclusion’, accentuating at the same time the most relevant, important information, contained in the statements segments. Otherwise, they play the role not only of modal quality explicators and modifiers (Lebedeva 2001a, Pastukhova 2001a), but also of communicative-pragmatic lexical intensifiers. One can easily guess that this position of ‘discursive elements’, that is of ‘left and right side in-semantic signals’ (Lebedeva 2001a), helps them to mark a passage from one (micro)theme to another, thus contributing to actual segmenting of syntactic groups.

It’s quite comprehensible that the idea of the extent of the ‘conjunction’ element, in an element expression in a language unit’s general semantic complex and possible transformation usual/occasional character, under the influence of one or another syntactic distribution, can be obtained only in the case of its multi-aspect comparison with specialized ‘conjunction’ function bearers—purely grammar copulas. Thus, considering the functional-semantic features of parenthesis-modal linking elements ‘moreover’, ‘finally’ (en.); ‘en plus’, ‘par exemple’, ‘cependant’, ‘premièrement’, ‘deuxièmement’, ‘finalement’, ‘par suite’, ‘en même temps’ (fr.) and so called ‘pure’ grammar copulas, such as ‘and’ (en), ‘car’ (fr.), one can distinctly see their close interaction by the meanings of ‘relativity’, ‘conjunction’: (1); (2); (3); (4); (5); (6); (7); (8); (9); (10).

The similarity of a ‘transitions’ functional charge, in the examples given above, is quite evident. Still, their obvious semantic differentiation is observed in the extent of lexical component’s expression in the general semantic complex. Surely, the conjunctions ‘and’ (en.), ‘car’ (fr.), as well as the adverbial-conjunctive word ‘besides’ (en.), bring, into the phrases given above, a purely grammar meaning of ‘joining’ and ‘entering’, as linking elements they can’t be considered as members. In other words, as in (9), (10) or mostly (4), they are totally deprived of any other functional charge and can be omitted without any violation of the phrase’s coherence and changes of their semantics.

For example:

(9). a.

Controlling the weight values by dilution provides considerable improvement in the fiber orientation profile. ... active control is still needed to correct fiber orientation misalignment fault due to various reasons...

At the same time, the omission of parenthesis linking words ‘moreover’ (2), ‘finally’ (3) (en.), ‘en plus’ (5), ‘par exemple’ (6), ‘premièrement’, ‘deuxièmement’, ‘finalement’ (7), ‘par suite’ (8) (fr.) would probably cause a visible modification of the general semantic structure of statements even in case of preserving their relative integrity.

For example:

(1). a.

A national insurance contribution or a social security payment is simply an additional tax. **However**, by no means all countries have social security systems (Kisseleva 2011).

b.

A national insurance contribution or a social security payment is simply an additional tax. ...by no means all countries have social security systems.

(2). a.

The new investigation methods have the power to minimize the risk of possible errors, **moreover** their application can then become multilateral if the working staff wishes... (Kisseleva 2011).

b.

The new investigation methods have the power to minimize the risk of possible errors, ...their application can then become multilateral if the working staff wishes...

- (3). a. On the basis of these figures, Britain is, contrary to popular belief, far from being a generous welfare state. **Finally**, on this subject one other important difference must be noted (Kisseleva 2011).
- b. On the basis of these figures, Britain is, contrary to popular belief, far from being a generous welfare state. ... on this subject one other important difference must be noted.
- (4). a. A number of new aids and methods are used in cases of emergency.... **Besides** some of the institutions have taken a different approach... (Kisseleva 2011).
- b. A number of new aids and methods are used in cases of emergency. some of the institutions have taken a different approach...
- (5). a. Dans les années quatre-vingt-dix le niveau de vie moyen s'est élevé considérablement; cette hausse s'était alors avérée surtout favorable aux catégories les plus modestes; les classes moyennes étant les moins bien logées. **En plus**, depuis le début des années 2000 la hausse du niveau de vie n'a été que de 1% pour les ménages les plus modestes (Paris-Match 2017).
- b. Dans les années quatre-vingt-dix le niveau de vie moyen s'est élevé considérablement; cette hausse s'était alors avérée surtout favorable aux catégories les plus modestes; les classes moyennes étant les moins bien logées. ... depuis le début des années 2000 la hausse du niveau de vie n'a été que de 1% pour les ménages les plus modestes.
- (6). a. La France est l'unique pays en Europe où les consultations homéopathiques continuent d'être remboursées par la sécurité sociale. **Cependant**, c'est aussi l'unique pays en Europe où tous les homéopathes sont tenus d'être d'abord médecins - généralistes. **Par exemple**, il est impossible de se spécialiser en homéopathie en France si vous ne possédez pas un diplôme de médecine générale (Paris-Match 2017).
- b. La France est l'unique pays en Europe où les consultations homéopathiques continuent d'être remboursées par la sécurité sociale. ... c'est aussi l'unique pays en Europe où tous les homéopathes sont tenus d'être d'abord médecins - généralistes.

- ... il est impossible de se spécialiser en homéopathie en France si vous ne possédez pas un diplôme de médecine générale.
- (7). a. ... **Premièrement**, les conditions des études expérimentales étaient discutées par les spécialistes, **deuxièmement**, tous les détails étaient précisés... **finalement** les conséquences négatives et problèmes des complications possibles étaient considérés... (Paris-Match 2017).
- b. ... les conditions des études expérimentales étaient discutées par les spécialistes, tous les détails étaient précisés... les conséquences négatives et problèmes des complications possibles étaient considérés...
- (8). a. Le ministère de la sécurité sociale de la France assigne toujours les allocations annuelles aux familles en ayant besoin, **par suite** les chiffres de natalité sont bien impressionnants ces dernières années... (Paris-Match 2017).
- b. Le ministère de la sécurité sociale de la France assigne toujours les allocations annuelles aux familles en ayant besoin, ... les chiffres de natalité sont bien impressionnants ces dernières années...
- (10). a. ... tout est affaire de perspectives et de structure de consommation, **car** on peut observer à la fois l'augmentation des coûts de certaines dépenses contraintes (au premier rang desquelles le logement); **mais** aussi la baisse des coûts de communication. **En même temps**, cette baisse ne bénéficie pas à toutes les catégories de la même façon ... (Paris-Match 2017).
- b. ... tout est affaire de perspectives et de structure de consommation, **car** on peut observer à la fois l'augmentation des coûts de certaines dépenses contraintes (au premier rang desquelles le logement); **mais** aussi la baisse des coûts de communication. ... cette baisse ne bénéficie pas à toutes les catégories de la même façon...

The functional differentiation of 'transitions' in these examples given above becomes even more evident, if one takes into consideration their location in syntactic unities. It is universally known that conjunctions can occupy a strictly fixed place corresponding to their utilitarian destination and thus any attempt to move them into some other position will cause an obvious violation of sense.

For example:

- (9). a. Controlling the weight values by dilution provides considerable improvement in the fiber orientation profile. **And** active control is still needed to correct fiber orientation misalignment fault due to various reasons... (Kisseleva 2011).
- b. Controlling the weight values by dilution provides considerable improvement in the fiber orientation profile, active control is still needed to correct fiber orientation misalignment fault due to various reasons **and**...
- c. Controlling the weight values by dilution provides considerable improvement in the fiber orientation profile... active control is still needed to correct fiber orientation misalignment **and fault** due to various reasons...
- (10). a. ...tout est affaire de perspectives et de structure de consommation, **car** on peut observer à la fois l'augmentation des coûts de certaines dépenses contraintes (au premier rang desquelles le logement); **mais** aussi la baisse des coûts de communication. **En même temps**, cette baisse ne bénéficie pas à toutes les catégories de la même façon ... (Paris-Match 2017).
- c. ... tout est affaire de perspectives et de structure de consommation, on peut observer à la fois car l'augmentation des coûts de certaines dépenses contraintes (au premier rang desquelles le logement); aussi la baisse **mais** des coûts de communication...
- d. ...tout est affaire de perspectives et de structure de consommation, on peut observer à la fois l'augmentation des coûts de certaines dépenses contraintes **car** (au premier rang desquelles le logement); aussi la baisse des coûts de communication **mais**...

Moving the conjunction into the beginning of the phrase results, as a rule, in its acquiring another functional charge, that of a discourse-text connector with an implied previous context:

- (9). d. ... **And** controlling the weight values by dilution provides considerable improvement in the fiber orientation profile ,... active control is still needed to correct fiber orientation misalignment fault due to various reasons...
- (8). c. ... **Et** le ministère de la sécurité sociale de la France assigne toujours les allocations annuelles aux familles étant en besoin... les chiffres de natalité sont bien impressionnants...

As a matter of fact, any moving of parenthesis-adverbial linking words in the frame of statements doesn't cause violations of their general semantic integrity.

For example:

- (2). c. The new investigation methods have the power to minimize the risk of possible errors, their application, **moreover**, can then become multilateral if the working staff wishes...
- d. The new investigation methods have the power to minimize the risk of possible errors ... their application can then become **moreover** multilateral if the working staff wishes...
- (3). c. On the basis of these figures, Britain is, contrary to popular belief, far from being a generous welfare state. ... on this subject **finally** one other important difference must be noted.
- d. On the basis of these figures, Britain is, contrary to popular belief, far from being a generous welfare state. ... on this subject one other important difference **finally** must be noted.
- (4). c. A number of new aids and methods are used in cases of emergency.... some of the institutions **besides** have taken a different approach...
- d. A number of new aids and methods are used in cases of emergency.... some of the institutions have taken **besides** a different approach...

(5). c.

Dans les années quatre-vingt-dix le niveau de vie moyen s'est élevé considérablement; cette hausse s'était alors avérée surtout favorable aux catégories les plus modestes; les classes moyennes étant les moins bien logées, depuis le début des années 2000 *en plus* la hausse du niveau de vie n'a été que de 1% pour les ménages les plus modestes...

d.

Dans les années quatre-vingt-dix le niveau de vie moyen s'est élevé considérablement; cette hausse s'était alors avérée surtout favorable aux catégories les plus modestes; les classes moyennes étant les moins bien logées, depuis le début des années 2000 la hausse du niveau de vie *en plus* n'a été que de 1% pour les ménages les plus modestes...

Of course, these experimental data and the results of the transformative and comparative multi-aspect analysis carried out here show, quite clearly, real margins and points of different types of parenthesis-modal lexical-grammar discourse-text 'transitions' and the mutual semantic-functional interaction of pure grammar copulas possibly being manifested in the aspects of integration/differentiation.

5. Summary

In general, all this obviously proves the broadness of the semantics of lexical-grammatical parenthesis-modal discourse-text 'transitions', which allows them to play both the role of intra-phrasal copulas and sentence modifiers, bringing into the total syntactic complexes a meaning with the lexical nuances of 'supplementing', 'addition', 'consequence', and 'logical order'. Surely, it gives a real ground for stating their functional integration with 'pure' copulas, by the common meanings of 'relativity', and 'conjunction', in a semantic complex. But, at the same time, they are obviously differentiated by the sign of lexical components presence/absence in general semantics. This also proves a real poly-functionality of parenthesis-modal adverbial-substantive conjunctive equivalents, permitting them to play the role of lexical intensifiers and discursive modal markers in the frame of syntactic complexes, structures and phrasal unities. Parenthesis-modal discourse-text 'transitions' of various genesis (adverbial, substantive, verbal) create a known parallel gradation of reality assessments (degrees of reality) of a fact, exposed in each of complex syntactic unities parts. In this connection, they can be also treated as the explicators of the text statements' modal quality and its most informative segments, capable of bearing the additional functional charge that the actual segmentation means.

6. Conclusion

Thus, one has an obvious reason to consider discourse-text lexical-grammar connectives as an open-bordered group of poly-semantic, poly-functional units with hybrid, mixed characteristics, localized at the crossing of ‘modality’, ‘conjunction’, ‘adverbial’, and ‘substantive’ fields and occupying there a separate open micro-field adjacent to the micro-fields of conjunctions and conjunctive words. It is quite comprehensible that the scope and frequency of many inter-sentential and sentential parenthesis-modal adverbial-substantive ‘transitions’, used in modern English and French, are stipulated by specific structural-compositional and stylistic features of written or spoken discourse-text statements.

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SECTION B.

**SEMANTIC CHALLENGES
IN DERIVING MEANING**

CHAPTER EIGHT

FIGURATIVE FRAMING OF BIG DATA

INNA SKRYNNIKOVA

1. Introduction

1.1 Etymology and evolution of big data

The term *big data* is pervasive and has long become a buzzword, yet its meaning still seems to be strikingly ambiguous and confusing. Until recently, data was mainly understood within, and restricted to, information technologies and business processes. Due to an ever-increasing volume of information and necessity to process it, data has become crucial in everyday organizational activities. It currently adheres to something more than technological concepts, and, with emerging new digital devices and platforms, big data have become common in daily lives of individuals, researchers and companies.

According to K. Cukier and V. Mayer-Schönberger, “big data’s ascendancy represents three shifts in the way we analyze information that transforms how we understand and organize society” (Cukier and Mayer-Schönberger 2013, 12). Data in its abstract sense has hardly changed, but our ability to obtain, manipulate, and comprehend data has. Despite a great body of interdisciplinary research into various characteristics and aspects of big data, a comprehensive study resolving the problem of big data ambiguity and contributing to its better understanding is still lacking.

This chapter is an attempt at filling the existing gap and giving an overview of some of the values and implications encoded in the current framing of the term “big data”. Drawing on the framework of embodied cognition and conceptual metaphor theory (G. Lakoff, M. Johnson 1980, 1999), it identifies the ways in which diverging interpretations of big data affect the functioning and performance of various professional fields and substantiates the critical role of metaphor in facilitating adequate understanding of the concept and making it meaningful both to professional communities and general public.

By tracking the evolution of the terms “data” and “big data”, the chapter seeks to reveal the meanings attached to them by different usage communities. The next step in our research is the framing analysis of news items about big data in a series of excerpts from the business and technology press aimed at revealing and substantiating the crucial role of metaphor in conceptualizing processes and phenomena of the digital world. The major claim of the chapter lies in the fact that the types of metaphors employed, and inferences drawn, reflect and influence the perception of big data, providing the implications of its current conceptualizations and shedding some light on its possible future.

Before delving deeper into the issues of framing big data it might be useful to learn where the terms “data” and “big data” come from. Their semantics have changed as a result of confluencing social, cultural, and linguistic factors, thus squeezing out old meanings and acquiring new ones (Aitchison 2001; Hickey 2003; Sweetser 1991).

English *data* is derived from Latin, where it is the plural of *datum*, which is in turn the past participle of the verb *dare*, “to give,” generally translated into English as “something given.” Sanskrit *dadāmi* and ancient Greek *δίδομι* are related forms. While *data* (piece of information) and *datum* (calendar date) are separate lexemes in contemporary English, their association is not accidental; medieval manuscripts frequently closed with the phrase *datum die* (on given day . . .), effectively time-stamping the preceding text. Early uses of *data* in English in a theological and mathematical context are attested for in the 17th century. Issue number 17 of the *Philosophical Transactions* (1693) contains four early uses, occurring twice in the sense of a mathematical variable and twice to describe historical events (Puschmann & Burgess 2014).

In Rosenberg’s view, the major shift in the meaning of *data*, understood as anything granted as a result of experimentation or discovery, took place in the 18th century, subsequently going beyond its early use in mathematics and natural philosophy and entering the fields of economics and administration (Rosenberg 2013). Being firmly entrenched in science and business in the 19th and 20th centuries, *data* expanded significantly both in terms of its frequency and use contexts. However, the quality of economic data was open to criticism due to its “vagueness and uncertainty” (Hamilton 1788) coupled with the lack of “statistical narrative” (Machlup 1940).

The former uses of the word *data* were expanded in the 1940s by the new ones to refer to any information used and stored in the context of computing followed by the dramatic rise in the frequency of its use from the 1960s onward (Rosenberg 2013, 23). With gradual digitalization of information, *data* was normally applied to manipulable digital objects rather

than to commonly accepted facts or the experimentation outcomes. As computing became more advanced, data also significantly changed its role, pervading both business and domestic environments which resulted in semantic bleaching (Sweetser 1988), i.e. generalization of the meaning of *data* caused by its use in broader cultural contexts.

In contrast to the origins of the word *data*, the etymology of the term *big data* is restricted solely to the business world. Initially being concentrated on the ways to deliver faster search results or store larger volumes of customer data, the discourse on data processing technologies in business has been centered on using the collected information for analytical purposes in general and for predictive modeling in particular. Such a state of affairs was possible due to the fact that data mining firmly established itself as a result of the broad introduction of computers into the corporate world in the 1960s.

The launch of the Accel Partners Big Data Fund (Gage 2011) marked a turning point in the popularization of the term *big data* in the media. Accel distributed \$100 million among startups involved either in big data generating (Facebook, Etsy, Groupon) or in providing data solutions (Cloudera, CouchBase, or Comscore). Big data in this sense suggested a long-awaited shift from relational database management systems to platforms providing long-term performance advantages over traditional solutions.

Originating from the context of technology and business, big data is currently a part of the academic agenda and applied industry research against the background of ever-growing availability of user-generated content (Lazer et al. 2009). It frequently refers to either user-generated digital information or the one which is both collected and stored by computers. For example, resorting to user-generated content, an impressive number of computational studies make a wide range of inferences from evolution of social networks, consumer preferences to election outcomes, etc.

From this perspective, big data denotes varied available abundant information, obtained either by measurement or by being user-generated. Whereas the data in the old days, that Hamilton and Machlup speculated on, was relatively sparse, manually collected, processed and interpreted, big data today requires specialized tools to be captured, stored, analyzed, and interpreted. Hence, in terms of its quantity, mode of collection, and the requirements for its analysis, big data is more abstract than traditional data.

1.2 Properties of big data

Big data is known to have specific characteristics and properties that imply both the challenges and advantages of dealing with digital information.

Initially big data properties were referred to as the 3 Vs: volume, variety and velocity. This list of Vs has been recently expanded to 10 properties which cover multifacetedness of big data (Firican 2017):

- *volume* as the most obvious and salient property of big data is manifested in the ever-increasing amount of uploaded, stored and retrieved information;
- *velocity* is understood as the speed at which data is generated, produced, or retrieved;
- *variety* presumes handling both structured, semi-structured and unstructured data (audio, image, video files, social media updates, log files, click data, machine and sensor data, etc.);
- *variability* refers to inconsistencies in the data and the multitude of data dimensions resulting from multiple disparate data types and sources;
- *veracity* is reliability of the data source and its context as a basis for the analysis which, in contrast to other properties of big data, tends to decline;
- *validity* is associated with accurateness and correctness of the data for its intended use achieved after data cleansing (which is a metaphor to refer to the resulting high quality data fit for any analysis);
- *vulnerability* is a property stressing big data breach which has become common and raises serious concern;
- *volatility* as a critical property refers to tolerable recentness of one's data before it is considered to be irrelevant or useless;
- *visualization* is referred to as an increasing challenge to represent big data visually using tools different from traditional graphs: tree maps, sunbursts or cone trees (all the three terms are metaphorical);
- *value*, the last but highly critical property of data, results in understanding and proper targeting of customers, optimizing processes, and improving machine or business performance.

The facts mentioned above lead us to argue that the evolution of the terms “*data*” and “*big data*” is characterized by the tendency for greater computability and commercialization. It means that our understanding of data largely depends on the properties of data and the ways of its processing and storage. The language we use to talk about data also reflects growing data quantity. It is exemplified in using *data* as a count noun possessing both

singular and plural forms, while *big data* is grammatically a mass noun. Conceptually, it enables to distinguish between single units of information and a homogeneous complex. Another aspect of big data which is to be taken into consideration is its diverging interpretations depending on the field it is employed in and properties of data relevant in a particular academic or business setting. For companies, big data is viewed as a big thing in marketing, forensic analytics, capital management, decision making, etc. On the other hand, people are increasingly concerned with possible implications that these developments might infringe on their freedom of choice and the right to be left alone (Kirn 2015). Despite overwhelming media coverage, a clear definition of big data is still missing. Nonetheless, the term itself has firmly established itself in business, scientific and popular discourses.

2. The power of metaphor in making sense about big data

2.1 Explaining big data through metaphors

Given considerable confusion and ignorance about what big data is, the pressing issue for data analysts and general public at the present stage is to find an effective and powerful tool capable of enhancing deeper insights into the essence and various aspects and nuances of big data. The solution to resolving the mystery of big data, in our view, lies in applying metaphor to describe intricacies of the digital world.

The explanatory power of metaphors is manifested in highlighting certain aspects of an unfamiliar phenomenon while obscuring other ones, thus enhancing our understanding of complex abstract things which are not available in the surrounding reality. For instance, Wilken's (2013) study on metaphors in the Internet and mobile technology reveals how marketers recruit metaphors as a part of a deliberate rhetorical strategy. With ongoing endeavours to grasp the concept of big data, which is still in its infancy, it is hardly surprising to see that current discourse about big data abounds in metaphors. But what is the role and relevance of metaphors both for making data and big data meaningful and in shaping the meanings of these phenomena? How are oil, tsunamis, exhaust, deluges, nuclear waste and teenage sex similar or different when data-related analogies are drawn? Another question to be answered is whether interpretation of (big) data, its meaning and inferences is context- and subject-dependent?

Introducing an apt metaphor in the discourse of big data creates the possibility of mutual understanding for people talking about data practices. It serves as a bridge between subjects in specific digital fields and the

general public. Due to the transference of meaning from one domain to the other, metaphor enables people from different backgrounds to have conversations on the topic. Traditionally metaphors form correspondences between concepts that share conceptual similarities. This is not the case with big data, given its ambiguity, as there is no other concept which it references, no other domain that it utilizes to be understood.

2.2 Previous research on (big) data metaphors

Numerous studies point out that the media discourse around big data is rife with both strong claims about its potential and metaphors to illustrate these claims (C. Puschmann, J. Burgess 2014). The repertoire of metaphors, employed to refer to and explain what big data is, ranges from bacon and oil to fume exhausts, leaks, footprints and teenage sex in various types of discourse. Some researchers claim there is a certain need to displace established models of knowledge creation and reject scientific tenets such as representative sampling and the notion of theory (Anderson 2008; Mayer-Schönberger & Cukier 2013; Weinberger 2012). Others propose to reframe dominant metaphors for big data and replace them with embodied metaphors, which are based on our physical experience, thus helping people exercise more control over data and its subsequent uses. Otherwise, big data becomes an inevitable industrial, machine complex bearing down on us (Watson 2015). Although such views may seem provocative in their novelty, they point to the widely held belief that data can be effectively managed to tackle a wide range of societal issues, from economic growth and development to security and health care, with far-reaching implications.

Previous research on big data metaphors is quite abundant as is seen from the overview above. S. M. Watson in her “Data Is the New “___”” paper emphasizes how helpful metaphors can be in understanding abstract concepts that due to their complexity or scale are beyond human comprehension (Watson 2015). Elaborating further on the value of metaphors as powerful means of clarifying abstract technology-related concepts and phenomena to general public, she notes that despite their explanatory power, metaphors can sometimes be obscure and misrepresent. Metaphors employed in popular culture to talk about data still make sense to corporations involved in information technologies that build and disseminate them while ordinary people are unable to understand how those corporations use data. In this sense, data are fundamentally dehumanizing, and purely industrial metaphors for data takes power away from the person to which the data refers and pass it to those who possess the tools to analyze and interpret data. Thus, data becomes obscured, specialized, and distanced.

Such state of affairs can hardly contribute to better understanding of big data calling for the pressing need for a new framing of a personal, embodied relationship to data. The undisputable merit of introducing embodied metaphors lies in the fact that they have the potential to make big data as humanizing as possible and ground data in our embodied experience thus stimulating the public's investment, interpretation, and understanding of our relationship to data.

2.3. Embodied cognition view of metaphor and its merits

Taking into account obvious advantages of the embodied approach to metaphor, the present chapter follows the line of embodied cognition research in general and Lakoffian conceptual metaphor theory (CMT) in particular as applied to framing analysis of (big) data. G. Lakoff's theory of metaphor was first elaborated in his seminal *Metaphors We Live By*, co-authored with Mark Johnson in 1980, where he reveals the cognitive (conceptual) nature of metaphor and its pervasiveness in everyday life, rejecting the commonly accepted view of metaphor as a merely ornamental means employed by poets and novelists (Lakoff, Johnson 1980, 3). In this view, conceptual metaphors are regular correspondences (cross-domain mappings) between a more concrete, embodied, and thus better understood *source domain* and an abstract, intangible *target domain*¹. The linguistic metaphors we mostly use unconsciously are surface realizations of conceptual metaphors. The latter typically assist in solving routine problems of inference by treating a more abstract topic (e.g., argument) as a target for a more concrete concept (e.g., war), which serves to frame our understanding of the target (Lakoff 1993). This seemingly simple understanding of one thing in terms of another is rather a way of inferring meaning about what is otherwise insubstantial, poorly understood, or little known (Albro 2018, 14). Following the conventions of CMT, both the source and target domains are capitalized in this chapter to differentiate between conceptual metaphors and their linguistic manifestations.

The cognitive turn in metaphor studies gave rise to numerous applications of the conceptual metaphor theory in a range of fields, such as media studies, discourse analysis, communication studies, and political science (Harrison, Todd, & Lawton 2008; Kress 1989; Ritchie 2003; van Dijk 1997). Primary conceptual metaphors tend to be similar across languages as people, regardless of a language they speak, seem to be

¹ A more detailed overview of recent publications on CMT and its applications outside linguistics can be found on G. Lakoff's website <https://georgelakoff.com>

governed by similar underlying cognitive principles arising as a result of human interaction with the environment. These principles relate embodied human experience and abstractions by means of analogous reasoning, although being sensitive to social and cultural factors. Related theories of semantic analogy and conceptual blending also refer to the cognitive process as bridges between different conceptual categories and point out its reflection in language (Fauconnier & Turner 1996; Sweetser 2001). Subsequently G. Lakoff reviewed some of the assumptions of his early theory, and his new Neural Theory of Language and Metaphor revolutionized neuroscience and cognitive linguistics postulating that metaphors are neural connections, and they are present in the human brain as coherent, highly hierarchical interrelated networks or cascades (Lakoff 2008).

Metaphors in political discourse enable mass media professionals to rely on their interpretative power and construct the salient narratives they wish to promote. Framing pressing societal issues in a certain way through employing a set of corresponding metaphors repetitively, which in their turn evoke intended inferences, ultimately forms stable neural connections in the minds of a target audience. Once firmly entrenched into a neural network, they are very hard to change. In this sense, as Koller (2005) rightly notes, metaphors serve as “an interface between the cognitive structure underlying a discourse, on the one hand, and the ideology permeating it”. For example, conceptualizing foreign policy as a game rather than as a war implies certain rules, procedures and penalties in terms of strategies that are applied when playing it.

2.4 Recurring big data metaphors and their implications

Metaphors are known to be vital in introducing new technologies, facilitating the ways to familiarize ourselves with the novelty. Owing to metaphors, the television entered our living rooms by way of framing the cathode ray tube as wood, thus literally turning the technology into furniture in our homes. Similarly, the Internet has become a source of numerous different metaphors reflecting changes in the ways we think about it and referring to it as “revolution, evolution, salvation, progress, universalism, and the ‘American dream.’ Being, to some extent, similar to data, people *surf, drown, and dive into* content of the Internet.

Puschmann and Burgess in their 2014 paper argue that data, formerly understood as records and suggesting human agency of their creation are treated as distinct units of information or observations. Big data, however, being a uniform mass, is out of human control and, thus, a force to be curbed

and controlled. They identified two most recurring big data metaphors in the trade and news press: *BIG DATA is a FLUID FORCE TO BE CONTROLLED* and *BIG DATA is A RESOURCE (FUEL) TO BE CONSUMED* as the most recurring patterns of conceptualizing data (Puschmann & Burgess 2014). The former is exemplified in such language uses as *flowing data, swimming in oceans of data, diving into torrents of digital information, absorbing new waves of data, coming of data tsunami*. The latter emphasizes the nourishing nature of big data for companies involved in handling it suggesting the formerly uncovered value and meaning of data that can be *mined, pumped out, generated, refined, consumed* which gives rise to the popular understanding of *data as the new oil*.

As the amount of digital information is mounting, the discourse about big data is evolving, suggesting the challenge to effectively control big data and transform it into a valuable resource. The language in the examples above suggests that the situation with data management has changed dramatically. In the early days of computing we seemed to be hungry for data while now we are currently drowning in it. Another notable change Puschmann and Burgess point out to is the shift from solid to liquid state. Despite the fact that water as a source domain for conceptualizing data contributes to people's awareness of its essential and valuable nature triggering positive inferences, the danger of torrents, floods and tsunamis of data implies the looming destructive potential of these natural phenomena which can hardly be harnessed through application of existing technology such as dams, irrigation, etc.

Elaborating further on the use of appropriate metaphors reflecting various aspects of big data, Awati and Shum (2015) emphasize that the interpretation of data-related metaphors is context- and audience-dependent.

Different audiences will relate and react to these metaphors differently depending on their interests and priorities. A marketing professional might view customer-related data, collected via call centers, surveys and databases as a resource to be exploited, whereas an IT manager in the same organization might worry about being washed away by the tsunami of structured and unstructured data stored on her organisation's servers (Awati & Shum 2015).

They have extended a model of big data conceptualization patterns by creating a mind map of metaphors presented below in Figure.1. The undeniable advantage of the approach is an attempt to present an array of metaphoric conceptualizations of big data reflecting its numerous properties (10 Vs) mentioned above. However, in our view, the source and target

domains of some metaphors do not map perfectly when viewed from the CMT perspective.

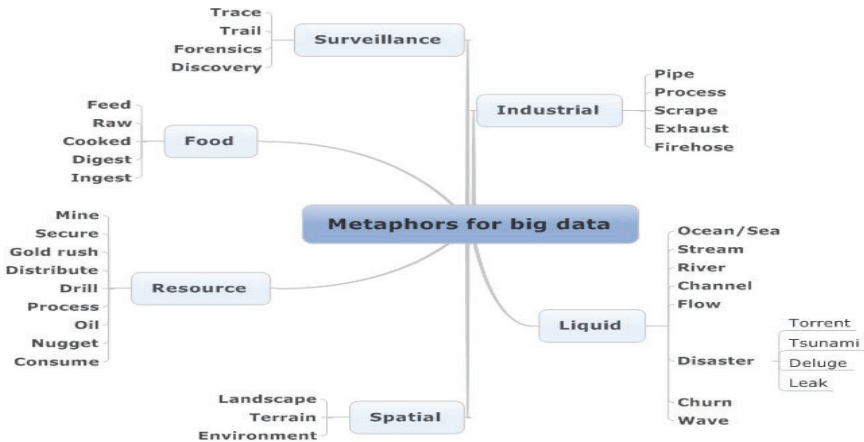


Figure 1. Metaphor Mind Map adopted from (Awati & Shum 2015)

Commenting on the liquid metaphors and fluid ethics, Awati and Shum (2015) claim that since we can tap or tame the power of oceans and seas through the industrial metaphors of pipes, streams and channels, the metaphors serve their purpose. However, we are still unaware of routes some channels of data might take which frequently results in their unauthorized use.

These ideas echo the sociological and cultural views of big data metaphors which can be found in D. Lupton’s (2016) work. Her list of metaphors employed to talk about big data includes the most pervasive liquid-related metaphors of *streams, flows, leaks, rivers, oceans, seas, waves, deluge, flood* or even *tsunami* and object metaphors where data is understood *as trails, breadcrumbs, exhausts, smoke signals, shadows, etc.* The latter activate the notion of data as tiny elements of another activity or entity or as less tangible derivatives of the phenomena from which they originate. Lupton argues that the current rhetoric of big data suggests both attraction towards and fear about this phenomenon. Bringing numerous benefits into our lives, big data, however, generates anxieties associated with their volume, power, ceaseless movement, complexity, mystery and ability to generate knowledge about people’s lives which would be otherwise publicly unavailable. As a result, unparalleled volumes of personal information searchable and downloadable from the Internet

contributes, to a greater extent, to blurring formerly known distinctions between the public and private sphere.

These rather vivid descriptions of data as a fluid, uncontrollable entity possessing great physical power emphasise the sheer volume and fast nature of digital data movements, as well as their unpredictability and the difficulty of control and containment. They suggest an economy of digital data and surveillance in which data are collected constantly and move from site to site in ways that cannot easily themselves be monitored, measured or regulated (Lupton 2016).

3. Research procedure

3.1 Scope, methodology and corpus

All the studies mentioned above treat the metaphors of big data in the same fashion, focusing solely on cross-domain mappings, which is not sufficient for us to be able to grasp the essence of big data. They seem to overlook the fact that the metaphors we unconsciously use talking about big datasets are not the same.

The current chapter seeks to propose a qualitatively new metaphor-facilitated mode of interpreting big data consistent with their numerous inherent properties and with regard to a particular aspect of data to be highlighted in a specific context. Following the line of the Lakoffian deep semantic analysis and by applying a four-stage top-down metaphor extraction procedure (linguistic metaphor → conceptual metaphor → entailed metaphor → inferences) we extracted metaphors, both textual and pictorial, from business and technology press as well as from excerpts about (big) data in the Internet blogs and IT professionals' websites. The resulting metaphor corpus comprises 205 textual and 48 pictorial examples of metaphors representing big data. Such an approach enables us not only reveal possible conceptualizations of this ambiguous phenomenon leading to its varying interpretations, but also to identify certain inferences about the nature of big data (which is not possible at the purely linguistic surface level of the semantic analysis) revealing their divergent understanding by various professional communities. The findings seem to provide deeper insights into further implications of dealing and managing big data in an effective and reasonable manner. The analysis undertaken reveals that, being seemingly similar at the surface level, data metaphors differ at the inferential level, but correlate with, and reflect their aforementioned properties.

3.2 Big data property-based metaphor choice

The commonly accepted major property of big data, volume, reflects itself in the most numerous group of fluid metaphors. The ocean as well as flood, tsunami and deluge metaphors stress an unprecedented amount of digital information available for processing, with the former highlighting the mere abundance of data and the latter pointing out to mounting concern as for our ability to effectively handle and manage the available datasets.

The velocity aspect of data is reflected in the data race metaphor extracted from the Bloomberg professionals' website where the race to AI utilization in finance is referred as a marathon, not a sprint to emphasize how fast digital technologies have pervaded all aspects of our life. The term "data race" is metaphorical itself to denote cases which occur during the execution of a multi-threaded process when two or more threads in a single process access the same memory location concurrently.

Variety, validity and variability of big data are reflected in the food and cleansing metaphors. The food-related metaphors seem to be the earliest ones as they have been used by IT professionals long before big data became fashionable. Data feeds are frequently referred to as raw data, or they might be cooked to varying degrees and need to be subsequently ingested and digested. Interestingly, but we still do not have an appropriate metaphor to refer to the end of the digital digestive tract. However, the raw data are supposed to be cleaned first which is another data cleansing metaphor professionals' resort to to describe a key step in data preparation prior to analysis. The "rawness" of data is considered to be a relative term denoting one's position in the data processing chain (Awati & Sham 2015). Hence, data is affected by humans, and the medium rare or clean data of one IT professional may appear raw or polluted to another one. Moreover, a data collector normally chooses what data is to be collected, so "raw" data may mean foregrounding a certain relevant aspect, while ignoring another minor one. What exactly matters is a controversial issue of any modelling approach (e.g. discussions around economic forecasts, urban planning decisions, or environmental impact indices).

Data veracity and vulnerability manifests itself in the leak and trace metaphors use. The post-Snowden effect has long made us aware of continuing data spills and leaks as we are hardly surprised when we hear telemarketers know about us more than they are expected to. Similarly, social networks and media platforms have encouraged us to be less wary about sharing personal details. As for the teenage-sex analogy, it vividly echoes the popular hype related to the notion of big data which appeared in

a 2013 tweet of Dan Ariely, Professor of Psychology and Behavioral Economics at Duke University:

Big data is like teenage sex: Everyone talks about it, nobody really knows how to do it, everyone thinks everyone else is doing it, so everyone claims they are doing it ... (<https://twitter.com/danariely/status>, January 6, 2013)

The oil and bacon metaphors refer to the datasets as assets which can be mined, dug into or chewed up for insights reflecting their value as a resource. However, resources can be natural, which is verbalized in such language uses as data goldrush, data is our new oil, data trove, and industrial assuming the presence of platforms, mining and refining. Still, it might be more reasonable to distinguish between the metaphors related to big datasets themselves as opposed to those referring to big data-related processes and to address them separately. Since datasets are varied, the metaphors we use to talk about them should reflect that. What particularly affects that decision, which metaphors are preferable, is the kinds of data.

Illustrative in this regard is the BIG DATA is NUCLEAR WASTE metaphor which has been applied as a response to the widely known DATA is THE NEW OIL metaphor. The latter is credited to the British mathematician Clive Humby who highlighted the need for data processing and compared it to oil refining aimed at unlocking its true value. However, the new oil metaphor is apt only when we draw parallels to describe the ways data can power artificial intelligence, automation and predictive analytics. In most cases the metaphor becomes inaccurate and problematic. Data also possesses numerous other properties which cause the analogy to break down. Firstly, while oil is a limited resource, data is effectively durable and reusable which means that storing it siloed, similar to oil, brings no benefit and reduces its usefulness.

Due to the misconception this is often what is done with big data revealing such property of data quality as volatility. Secondly, dissimilar to oil, data, once processed, normally presupposes further applications. For example, patients' medical data can be helpful in diagnosing and treating an individual patient. It can be subsequently anonymized and fed into machine learning for the benefit of other patients. Thirdly, with the world's oil reserves dwindling, extracting it becomes increasingly challenging and expensive. Conversely, due to computer technology advances data is becoming increasingly available while our business and leisure activities move online. The (nuclear) waste metaphor, on the contrary, is a reference to a particular kind of big data: personal electronic data, which serves as a warning to treat personally identifiable information with care and respect since, being like crude oil, it is dangerous, long-lasting and, once it has

leaked, there is hardly anything we can do to stop or prevent it. A recent example from the Guardian, commenting on the leakage of customers' personal information, vividly shows the power of the (nuclear) waste metaphor in revealing how the data collected by corporations and governmental agencies is radioactive in its tenacity and longevity.

When HM Revenue & Customs haemorrhaged the personal and financial information of 25 million British families in November, wags dubbed it the "Privacy Chernobyl", a meltdown of global, epic proportions (The Guardian, January 15, 2008).

Still, we should be aware that not all big data is radioactive and separate our metaphors. Coming up with some new ones can also contribute to greater clarity in issues we now face in the new data economy.

Sorting out our research corpus of metaphors we have made an attempt to present the repertoire of metaphoric models to refer to big data matching them to the big data properties they reflect and corresponding linguistic corresponding linguistic manifestations (Table 1).

As for the property of data visualization known to be an ever-exacerbating challenge to represent big data visually due to its complexity and disparity, traditional graphs seem to be of little use. This is where metaphor, given its multimodal nature, becomes a strikingly indispensable means to effectively present numerous properties of data as is shown below.

Table 1. Property-correlated metaphors of data

Data Property	Conceptual Metaphor	Linguistic examples
Volume	DATA is FLUID (LIQUID) DATA is DESTRUCTIVE FORCE	<i>Why data lakes are an important piece of data management? Streaming data is meant to process large volumes of data. Enterprises are awash in data tsunamis.</i>
Velocity	DATA is a STRONG FAST ANIMAL to be controlled	<i>How to harness the power of big data for a new economy? Data races are a common problem in multi-threaded programming.</i>
Variety	DATA is FOOD (raw, medium rare, cooked)	<i>Do not make any changes to your raw data file. Scientists often ask statisticians to cook data.</i>
Variability	DATA is a PRODUCT	<i>Data warehouses are governed in unique ways.</i>

	HAVING DISPARATE DATA is ARGUING	<i>They function as a place where unlike data converge. Business world has hundreds of unreconciled data.</i>
Veracity	UNSTRUCTURED DATA is DIRT STRUCTURING DATA is CLEANING	<i>Obtaining correct data is achieved through its filtering. Part of data business is its cleaning.</i>
Validity	GOVERNING DATA is MEASURING ANALYZING DATA is MANIPULATING an OBJECT CLEAN DATA is a WEAPON	<i>Measuring data enables to answer research questions. Begin by manipulating your data in a number of ways. Correct and accurate data are a powerful weapon for any company.</i>
Vulnerability	MISHANDLING DATA is DAMAGE VIOLATING INTEGRITY DATA is FRAGILE OBJECT	<i>Data leakage is known as low and slow data theft. We provide 5 tips to prevent the damage of unintentional data spill.</i>
Volatility	DATA is PERISHABLE FOOD (PRODUCT)	<i>Customer data decay fast. Your customer contact data is rotting under your nose.</i>
Value	DATA is a VALUABLE COMMODITY (RESOURCE)	<i>Mine data to uncover their true value. Big data is the new oil. What is the Big Data Gold Rush all about?</i>

The metaphor in Figure 2 visualizes such properties of data as volume and velocity, emphasizing its increasing amount and uncontrollable and unpredictable movement. As for Figure 3, it reflects both the soaring value of data as a resource we depend on, comparable to the value of oil, and the danger of its spill which can negatively affect the whole ecosystem. It prompts that the function of visual metaphor is twofold: to visualize the positive meaning attached to data as a valuable resource and to warn against using it unwisely and improperly.

Owing to metaphor, Figure 4 vividly shows how the use of Internet and social networks forces us to share personal information, as a result we leave our traces there (digital fingerprints or footprints), that are subject to unauthorized use by marketers, computer scientists, and law enforcement and intelligence agencies. The metaphor, thus, uncovers the vulnerability of personal data and urges us to be wary of publicly sharing the information about who we are, where we go, what we prefer.



Figure 2. DATA is FLUID
Sources: <http://dismagazine.com>



Figure 3. DATA is a RESOURCE
<https://towardsdatascience.com>



Figure 4. DATA is FOOTPRINT
<http://dismagazine.com>

3.3. Embodied model of data interpretation

The transition from the industrial age to the information era calls for a major shift in a set of preferable metaphors we employ to make sense about digital information. Industrial metaphors may still make sense to business entities, but not to individuals in a data-driven society. Therefore, we argue that the most effective data-related metaphors should be rooted in our embodied experience as a fundamental part of the way we think and act in the world. Industrial metaphors do not seem to be apt as they lack a connection to the basic domain of experience of individuals, including our bodies, interactions with our physical environment, and interactions with other people. Industrial metaphors share an experiential perspective of a bodiless tech-savvy actor, as opposed to embodied metaphors drawing from the perspective of individual people.

The most powerful and popular metaphor capable of tying big data closely to the body is DATA is FOOTPRINT (FINGERPRINT, SHADOW). The strong potential of these metaphors is in acknowledging the presence of a person, yet distinguishing between the person and their remaining traces. This analogy is a subcase of DATA is A BYPRODUCT metaphor which reveals the meaningful information about who we are or where we have been deducible from our traces.

A good example of a more personalized embodied and practice-oriented conceptual model of data is the metaphors employed by the Quantified Self

community². Being the early adopters of self-tracking technology, the community has made continuing attempts to shift to the embodied perspective of data. While some of their metaphors are still mechanistic, others seem to be more sympathetic focusing on embodied experience and our personal reflection on who we are in the modern digital age.

The DATA is A MIRROR metaphoric model pertains to data as something worth reflecting on, enabling us to see ourselves in the ways that others might see us. But, similar to mirrors, data can be distorted providing a false view of a person whom it concerns. The more introspective view of data is prompted by DATA is SELF-EXAMINATION metaphor referring to the self-tracking process. Despite the fact that such an approach to data can be criticized as excessively self-centered, it contributes to gaining sufficient self-knowledge. It results from the careful selection of things to track as a self-observation procedure.

The list of embodied metaphors is far from being exhaustive and can be further extended due to considerable progress in natural sciences and bioengineering enhancing our understanding of human nature and genetic makeup. In a data-driven society DATA is BLOOD or DNA since we tend to think of DNA as biological information programming. DATA is TRACES of people's digital life where we leave our fingerprints and footprints. Shifting to these metaphors serves as a starting point of reframing our position as individuals concerning the ways and reasons data implicates our identity and existence.

Metaphors not only help us to think about the future; they are a resource deployed by a variety of actors to shape the future...Metaphors can mediate between structure and agency, but it is actors who choose to repeat old metaphors and introduce new ones. Thus, it is important to continue to monitor the metaphors at work to understand exactly what work it is that they are doing (Wyatt 2004, 257).

Thus, embodied metaphors urge us to look into our future and replace old outdated views of data with those ones which will benefit us in the long run.

² The Quantified Self community, whose motto is "Self-knowledge through numbers", organizes events to guide self-tracking tools to individuals and legal entities worldwide.

4. Final considerations and further research agenda

As is seen from the chapter, *data* and *big data* function in discourse as contested and evolving terms, and metaphor is a powerful and relevant cognitive mechanism both for making these complex phenomena meaningful and shaping the meanings of these phenomena. The metaphors we unconsciously use to refer to data reflect the ways in which we view and understand it as well as what our hopes or concerns might be. Another finding is that media discourse about big data is highly figurative to signal the need to stick to familiar embodied concepts to humanize the intricacies of the digital world. Endowing data with human qualities metaphorically enables us to transfer agency to inanimate subjects, thus affecting our ability to make critical decisions about them. Drawing data nearer to individuals, at least metaphorically, could ultimately change the design of the systems that manage it, regulate the amount of personal data publicly available and improve policies that protect it.

Conceptual metaphors capture and reify the value we attach to data and determine what we do with it. Reframing metaphors from industrial to more humanizing and embodied contexts will provide a better way to treat ourselves not as mere living organisms but rather as information organisms. Acting on our behalf, our data profiles must grasp their agency and reflect our interests. Bringing more embodiment into data metaphors will result in more human control over data making individuals capable of interpreting and effectively managing their own personal data.

Applying embodied data metaphors will enhance public consciousness of digital processes and instigate people's awareness of possible data use which, in its turn, will shape policy positions related to technology designs and business models applied. Another merit of metaphors is in the fact that they involve the public to eliminate the gap between IT experts who tend to use their professional data-related jargon and the general public struggling to understand it. The need for reframing data has spurred the Human-Computer Interaction field to evolve into Human-Data Interaction, the emerging field of study aimed to improve the legibility, agency, and negotiability of data-driven interactions between individuals and complex technical systems (Grady 1999). An embodied experience-based understanding of our digital nature will only become increasingly critical, with subtle borderlines between our online and offline lives gradually dissolving.

In this chapter, we have substantiated the power of metaphors of big data to propose a mode of interpreting how data is understood, used and managed. In doing so we have examined the utility of embodied concepts employed to explain the essence and properties of data in the current

discourse and outlined its possible future interpretations. While such ideas have been posed in previous studies, the current chapter has advanced this discussion by demonstrating how the understanding of data itself and data-related processes is context-, property- and subject-dependent. This contributes to situating data as part of an emergent world where metaphor serves as a mediator between IT communities and laymen by prompting modes through which data becomes comprehensible to everyone.

Therefore, metaphor as a cognitive mechanism rather than a mere ornamental device has a vital role to play in future research into digital data. However, to maximize its effectiveness and utility, it should be situated within a realm of adjacent concepts and particular research techniques to comprehend the relevance of digital data. This means that to research data through metaphor an interdisciplinary approach should be adopted to integrate methods of data science, linguistics, cognitive science and neuroscience which will shed some new light on the nature of data. As these final considerations reveal, metaphor alone is not a single solution capable of revolutionising how we think about data. However, we argue that it is vital in any endeavours to develop methods and research design that seeks to understand what the actual current and future underpinnings of data are. The implications for future research into how the metaphors we use will contribute to our understanding of data society can be found in further interdisciplinary studies of figurative reasoning processes reflecting conceptualizations of data by various communities. It is still unclear if metaphors of data will be industrially driven, accumulating power and authority in the hands of technocratic entities adopting a certain agenda on data globally. Another question to be answered is whether our data-driven society will be more humane and person-oriented to reflect our values and exercise more control over data in a distributed and individually empowering manner.

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CHAPTER NINE

OVER IN RADIOTELEPHONY COMMUNICATIONS

MARIA DEL MAR ROBISCO MARTIN

1 Introduction

The risk of misunderstanding is always present in any kind of human communication, but it becomes critical when this problem is addressed in aviation. Effective radiotelephony communication between air traffic controllers and flight crew members is vital in international air navigation as it is claimed by SEPLA¹ (2017) which recognises the absolute importance of unambiguous communication to improve safety. The spectacular increase in the number of international flights in the last decade has brought with it the evidence that, besides standard phraseology, some other means are needed to guarantee safety in commercial aviation. The ICAO² has encouraged the carrying out of research on the English language employed in these communications for the purpose of designing teaching materials to improve the linguistic competence of both controllers and pilots. Thus, this study follows the publications of cognitive linguists such as Brugman (1981, 1988), Dirven (1993) and Tyler and Evans (2003, 2004) who deal with polysemy and with the polysemous preposition *over* in particular. It is based on a corpus consisting of authentic cockpit voice recordings which have been processed using the AntConc software (Anthony 2018). The purpose is twofold; First, to demonstrate that, in the 78 cockpit voice recordings, *over* appears with more meanings than with the primary configuration; Second, to systematize the senses of *over* in this context. The findings

¹ SEPLA (2017). The use of common language in radiotelephony communications. (pdf)

[https://www.google.com/search?q=SEPLA+\(2017\)+The+use+of+a+common+language+in+radiotelephony+communications&rlz=1C1EODB_enES511ES511&oq=SEPLA+\(2017\)+The+use+of+a+common+language+in+radiotelephony+communications&aqs=chrome..69i57.1604j0j8&sourceid=chrome&ie=UTF-8](https://www.google.com/search?q=SEPLA+(2017)+The+use+of+a+common+language+in+radiotelephony+communications&rlz=1C1EODB_enES511ES511&oq=SEPLA+(2017)+The+use+of+a+common+language+in+radiotelephony+communications&aqs=chrome..69i57.1604j0j8&sourceid=chrome&ie=UTF-8)

² the International Civil Aviation Organisation

suggest that *over* is used in eleven distinct senses and that they create a semantic network. A pedagogical implication is that polysemy constitutes a key element in this language and, as such should be treated in the development of the corresponding teaching materials.

For over fifty years aviation radiotelephony has been based on a standard phraseology designed to achieve the utmost clarity and brevity. It consists of codified and limited dialogues between air traffic controllers and flight crew members. Its aim is to minimise failures in communication. The spectacular increase in the number of international flights in the last few decades clearly showed that, besides standard phraseology, some other means were needed to guarantee safety in commercial aviation. In 1997, the ICAO created the *Proficiency Requirements in the Common English Study Group* with the purpose of analysing all the legal requirements and linguistic questions related to the language which was going to be used in aeronautical communications. In March 2003, it was decided that 1) English should be available as a universal medium for radiotelephony communications on international routes. 2) All pilots and controllers should pass an English language exam to achieve an operating level equivalent to level four, in a ranking from one to six. 3) All pilots and controllers should make a global use and a correct application of the standard radiotelephony phraseology in these interactions. 4) It would be necessary to carry out a range of studies and research to analyse the English language employed in these communications, and to design and create all kinds of teaching resources to provide both air traffic controllers and pilots with an acceptable command of English.

Following these *ICAO Language Proficiency Requirements* that took effect in 2008, this paper focuses on the language employed in radiotelephony communication, in particular, on the study of the preposition *over*. The study of *over* is important because a) the polysemy of a lexical item can affect the interpretation of a sentence in different ways, and create misunderstandings, b) prepositions are amongst the most polysemous words in English, c) the semantic network associated with any preposition in one language rarely overlaps with the meanings of any single linguistic form in another language (Taylor 2003, 112), and d) the preposition *over* is perhaps the most polysemous of the English prepositions (Taylor 2003, 113). The aim of the paper is to show the multiplicity and fuzziness of meaning in natural language, in contrast with the simplified view suggested by the standard radiotelephony phraseology. The purpose is twofold; First, to demonstrate that, in 78 authentic cockpit voice recordings between pilots and air traffic controllers, the preposition *over* appears with more meanings than with the Primary Sense which is the only meaning included in the

standard radiotelephony phraseology; Second, to systematize the senses of *over* in this context, which constitute a complex network of related meanings.

This paper draws heavily on studies carried out by cognitive linguists such as Brugman (1981, 1988), Dirven (1993), Taylor (2003) and Tyler and Evans (2003, 2004). They demonstrate that the distinct senses of the preposition *over* form a highly structured network since they link to one another. On the other hand, research papers (Pliso and Locher 2014; Lopez et al 2013; Mc Grath 2011) dealing with the standard phraseology in ATC³ communications can be found after the ICAO requirements and the IATA⁴ study. However, little (Robisco 2009) has been written on the different meanings of *over* in the aviation standard phraseology and in the aeronautical ground-to-air communications.

After following the ICAO recommendations and basing our study on cognitive linguistic principles, the findings of this paper suggest that the Primary Sense is the only meaning of *over* proposed by the standard radiotelephony phraseology although in ATC communications, *over* is used in ten more senses. A pedagogical implication is that polysemy constitutes a key element in these critical interactions and should be treated as such in the development of the corresponding teaching materials. In addition, the design of an English-based controlled language which might eliminate complete misunderstandings due to polysemy has been proposed. This paper⁵ is part of a series of studies analysing prepositions encountered in the radiotelephony communication from a cognitive approach.

2 Some principles of Cognitive Linguistics

This study deals with the issue of polysemy, which is the association of two or more related senses or meanings with a single linguistic form (Taylor 2003, 103). In particular, the prepositional usage of *over* is analysed, and we examine how its senses are categorized. Categories, according to Rosch (1975, 198), are organized around a central example which can be represented at various levels of abstraction or generality. They exhibit an internal structure, where not all the members share the same attributes and there are varying degrees of category membership, and their boundaries are

³ Air Traffic Control (ATC)

⁴ International Air Transport Association (IATA)

⁵ Previous research (Robisco 2009, Robisco and Cuadrado 2013) analyzing *over*, *above*, *under* and *below* and the use of metaphor and metonymy in ATC communications has been carried out. The corpus of this study regarding *over* is larger than the one employed in previous works.

fuzzy. Adapting Wittgenstein's metaphor (1958, 66f), the different senses of prepositions are linked through family resemblance categories, and consequently, fuzziness and gradualness are expected.

Brugman (1981, 1988), Dirven (1993) and Lakoff (1987) all argue that systematicity exists in the semantics of English prepositions. Tyler and Evans (2004, 260) go even further and demonstrate that, by considering a few basic assumptions about the nature of language and applying a set of cognitive principles, many of the multiple uses associated with *over* are related in relatively straightforward, systematised ways. These senses originally arose from contextual meanings or from reanalysis of a particular aspect of a recurring complex conceptualization of the preposition whereby a polysemy network organized around a Central/Primary Sense was formed.

The first cognitive principle to be considered is that we, as human beings, build the rich interpretations that we need in interaction by using our knowledge of linguistic forms, our general background knowledge of the world, and also, our use of image schemata. Lakoff and Johnson (1980, 181) suggest that image schemata might be so deeply grounded in common human experience that they constitute universal pre-linguistic cognitive structures. They derive from our experience of the human body and create our conceptual structure, determined by how and what we experience in the world around us. For instance, PLACE, GOAL and PATH, which will be used later in this analysis, are image schemata which structure one conceptual domain.

The second principle is that metonymy and metaphor are two basic processes of preposition meaning extension. The overwhelming majority of spatial senses of *over*, examined in detail by Brugman (1981, 1988) are related through metonymy. Taking into account the notions of path and place, there is a metonymic relationship between the path followed by a moving entity and one of the infinite number of points located on the path. *Over* in (1) refers to a location whereas in (2) denotes the path.

- (1) We are over water, aren't we?
- (2) a. They are flying over the sea
 - b. But we are going over the sea

Tyler and Evans (2003, 105) suggest two criteria for determining whether a particular use of *over* exemplifies a distinct sense, or whether the instantiation is only a meaning extension of a single sense. The first criterion determines whether the example provides an additional meaning to the one proposed by the Prototype/Primary Sense, and the second criterion determines whether the meaning of *over* can or cannot be transferred from another sense and/or context in which it occurs.

The terminology introduced by Langacker (1987, 231) is used for the analysis. The *trajector* (*TR*) is the entity which is located, for example *we* in utterance (1), while the *landmark* (*LM*) is the entity which serves as a reference point, *water* in (1). Prepositions may profile different aspects of the TR-LM relationship. If the relationship is static like in (1), *over* denotes the location of the TR whereas if it is dynamic like in (2), it can denote the end-point of the TR's movement, the starting-point of the TR's movement, or some part of the entire trajectory followed by the TR. Other aspects that may be relevant are the shape, size, and dimensions of the LM and the TR; the presence or absence of contact between the TR and the LM; the distance between the TR and the LM; the orientation (functional relationships such as support, containment and accompaniment) of the TR with respect to the LM.

According to Dirven (1993), Tyler and Evans (2003), and Brugman (1981), the Prototype/Primary Sense configuration of *over* describes a particular spatial relationship which involves the notion of a TR being located higher than, but potentially within reach of the LM. The LM is conceptualized as being within the sphere of influence of the TR (Dewell 1994). The TR might be close enough to the LM that, under some circumstances, the TR could come into contact with the LM. This sense, which standard radiotelephony phraseology uses, is listed first in the dictionary entries, and to Tyler and Evans (2003), it shows highly salient contrasts with other prepositions such as *above*, *under* and *below*.

3 The standard radiotelephony phraseology

The following utterances are taken from an aeronautical communication manual (Hinton et al. 2002, 65-98). In each of the spatial scenes described by them, *over* refers to a spatial relation in which the TR is higher than the LM which, as it has been mentioned above, corresponds to the Primary Sense configuration.

- OVER (place) CONTACT (unit call sign)
- TRAFFIC (direction) BOUND (type of aircraft) OVER (significant point) AT (time)
- TRAFFIC IS (classification) UNMANNED FREE BALLOONS WAS OVER (place) AT (time)
- HOLD VISUAL OVER (position)

- ESTIMATE UNMANNED FREE BALLOONS (identification and classification)
- ESTIMATED OVER (place) AT (time)
- EXPEDITE CLEARANCE (aircraft call sign) OVER (place) AT (time) REQUESTS (level or route)
- REQUEST CLEARANCE (or INFORMATION) TO DUMP FUEL OVER (location) AT (level) (flight direction)
- POSITION (distance) (direction) OF (significant point) (or OVER or a ABEAM (significant point))
- POSITION OVER THRESHOLD
- OVER APPROACH LIGHTS

4. The corpus

This study is based on a database of cockpit voice recordings⁶ used by investigators to identify the cause of an accident or an incident. Between 1976 and 2000 more than 1,100 passengers and crew lost their lives in accidents in which investigators determined that language had played a contributory role⁷.

The database comprises 78 files, taken from fatal aviation accidents which occurred between July 1962 and April 2010. They were processed using the AntConc software (Anthony 2018) to create an electronic corpus of 3980 items (80563-word tokens). It provides concordance hits, word lists, and collocates apart from statistical lists of all the items included in the texts. *Over* has 108 entries in the concordance list, having 38 concordance plots and is 144th in the word list, after other spatial prepositions such as *on*, *in*, *at*, *up*, *out* and *off*. Here, *over* is analysed when it functions as a preposition or an adverb, not when it is part of a compound noun.

Although the corpus is limited, a clear pattern seems to have emerged. It provides an accurate picture of natural discourse which enables to evaluate the distinct senses of *over*, upon which the study is grounded.

⁶ www.planecrashinfo.com. An aviation accident database which includes all civil aviation accidents of scheduled and non-scheduled passenger airliners worldwide, which resulted in at least one fatality.

⁷ See ICAO statistics accident reports (ADREP) or NTSB reports

5. An overview of *over* in aeronautical discourse

In this section, analysed instances show that *over* constitutes a complex network of related meanings and demonstrate that ten more senses of *over* appear in these conversations between air traffic controllers and pilots compared with one proposed by the standard radiotelephony phraseology.

All the utterances share the characteristics of spoken language (Carter and McCarthy 1988), the lack of grammatical accuracy, restatements, hedges, false starts, redundancies, and they reflect the social context in which they are produced.

5.1 The Primary/Central Sense of *over*

Instances from (1) to (3) imply the Primary/Central Sense of *over* which is, in fact, the unique sense proposed by the standard phraseology. It has the highest number of examples in this linguistic corpus (32 out of 78 instances). In each of the spatial scenes described by these sentences, the TR is higher than, but within a region of potential contact of the LM.

In instances (1) *over* denotes a static relationship of place where the TR is located vertical to, and not in contact with the LM. The greatest difference among them is that the properties of the LM vary.

The LM is conceptualized as vertical and extended in (1a) through (1g) whereas it is considered as non-vertical and extended in (1h) through (1p). In (1b) and (1g) the TR, *the clouds*, might not be smaller than the LM, *McMurdo*, as it is assumed in other utterances. The use of *over* in these sentences can be related to further uses of the preposition which denote a covering relationship between the TR and the LM (see section 5.2).

The LM is vertical and non-extended in (1q) (1r) and (1s); in (1q), the TR should be located in a higher position and vertical to the LM because air traffic controllers need to check that the aircraft landing gear is down. Encyclopaedic knowledge and inference is needed to interpret some utterances, e.g., in (1r), the TR does not denote people but an aircraft and in (1s) *guy* implies an aircraft. These examples are linguistic realizations of the metonymy CONTROLLER FOR CONTROLLED (Kövecses and Radden 1998).

The LM is non-vertical and non-extended in (1t) through (1z). In 1(t) and 1(u), the LM refers to the outer marker, an imaginary spatial point where pilots start the landing manoeuvres. The LM in (1x) and (1z) is also not a physical entity, it is a radio signal (VOR) transmitted by a network of ground radio beacons. More examples of metonymy can be observed in (1u), (1v) and (1w). In (1u) *you* refers to the aircraft and *field* refers to the airfield and

to the whole airport.

On the other hand, in (1u) and (2) the TR-LM relationship has changed from static to dynamic. Besides, a new element has been introduced, namely the shape of the path, which is such that it virtually covers the total area of the LM. Tyler and Evans' analysis (2003, 70) shows that, prepositions do not indicate any dynamism in themselves, but it arises from the integration of linguistic prompts at the conceptual level allowing us to construct a mental conceptualization of the spatial scene by using real-world or encyclopaedic knowledge.

New elements of TR-LM interaction comes out in (3). First, the TR is in contact with the LM. Second, the shape of the path has varied; the recurring curved, arc-like path of the TR is different. Finally, the notion of the LM as an obstacle that the TR (*the aircraft nose tire*) must surmount by first ascending, then descending is making its appearance. Some instances of *over* discussed below (see section 5.3) will be meaning extensions of this configuration.

So far, although the previous instances have different elements of meaning contributed by the context (+/- verticality, shape of path, +/- extended LM, +/- motion), in all of them *over* involves a unique spatial configuration of the TR being higher than the LM within the same sphere of influence. Following Tyler and Evans' criteria (2003, 132), they represent the Primary Sense of the preposition *over*. Nevertheless, not all the instances have the same central status within the category constituted by the primary sense. The meaning of *over* in (1) and (2) is more central to the category than the one in utterance (3).

Table 1. Sentences from the corpus where *over* has the primary/central sense

	+vertical	-vertical	+extended	-extended	+contact	- contact	+motion
(1)	x		x			x	
a. We're right over the airport here and climbing to two thousand feet	x		x				
b. But right now over McMurdo we have a pretty extensive low overcast	x		x				
c. No actually, it's over Anchorage somewhere	x		x			x	
d. Approximate speed over the ground is 320	x		x				
e. Approximate speed is 280 over the ground	x		x				
f. 220 of speed over the ground	x		x				
g. we've got a low overcast over McMurdo	x		x				
h. Affirmative, over the water, you....		x	x			x	
i. Pilot assumes they are over ground		x	x			x	
j. It looks over the.... (lake)		x	x			x	
k. It is out over the water at least hopefully, no actually, it is....		x	x			x	
l. It's quite a good view out over the lake there		x	x			x	
m. I'll advise you when you are over the water (2 instances)		x	x			x	
n. I'd like to do that out there over the bay if I may (2 instances)		x	x			x	
o. It indicates flight level one zero zero, over the sea, heading...		x	x			x	
p. We are over water, aren't we?		x	x				
q. Now, the guys ask him over the tower	x			x			
r. We are directly over the site where that airplane or whatever was just exploded	x			x		x	
s. I 'm going to land right over that guy	x			x		x	
t. Acknowledges 701 over the outer marker		x		x		x	

Table 1 continued:

	+vertical	-vertical	+extended	-extended	+contact	- contact	+motion
u. You will be making a three sixty over the outer marker (2 instances)		x		x		x	x
v. I think that's over the training field		x		x		x	
w. Looks like it's just about over the field at this time (2 instances)		x		x		x	
x. Get about halfway up there uh...over this VOR		x		x		x	
z. ...So we get over this one VOR headed to Alexandria		x		x		x	
(2)		x	x				x
a. They are flying over the sea		x	x				x
b. But we are going over the sea		x	x				x
(3) The aircraft nose tire is travelling over bumps in runway	x			x	x		x

5.2 The Covering Sense of *over*

The notion of covering and obscuring represents an added meaning not visible in the Primary Sense which cannot be derived from context. Here, the verticality of the TR to the LM is not essential.

The usage of *over* in (4) can be related to its meaning in (1g) and (2). Langacker (1987, 157) suggests that any senses which are not directly derivable from the central sense should be traceable to a sense that was derived from the primary sense. Taylor (2003, 120) also claims that membership in the category *over* is not established on the basis of similarity with the central member, but by a chaining process in which attributes of the senses of *over* are linked to one another in different utterances.

In (4a) and (4e) the TR is also located higher than the LM as in the Primary Sense and it is larger than the LM as in (1g) but the consequence of the LM covered by the TR is that they are in contact and the LM is no longer visible. In (4b), (4f) and (4g) the attention is drawn to the metonymy employed. The rain, the instrument panel and the lights are conceptualised as being two-dimensional entities, e.g., in (4f) the amount of lights indicating failures or safety issues constitute the TR which covers the LM, *the instrument panel surface*.

Table 2. Sentences from the corpus where *over* has the covering sense

	+vertical	-vertical	+extended	- extended	+contact	-contact	+motion
(4) a. Put the mask over your nose (10 instances)	X			X	X		
b. In three and a half miles the heavy rain is all over the field		X	X		X		
c. There's a heavy rain shower over the field visibility		X	X		X		
d. The heavy rain is at one and a half miles from touch down all over the field		X	X			X	
e. have iced over							
f. I have got indications all over the place		X	X				
g. It was like lights are out all over the place		X	X				

5.3 The ABC Trajectory Cluster

Instances (5), (6), (7) and (8) provide the additional meanings of On-the-other-side-of, Transfer, Temporal and Completion. They cannot be inferred by context as the primary configuration (the TR higher than and within the sphere of influence of the LM) is not active anymore. They derive from reanalysis of the complex conceptualization called the *ABC Trajectory Cluster* (see Tyler and Evans 2003, 126).

With the help of the example *The cat jumped over the wall*, Tyler and Evans (2003, 266) demonstrate that the cat moves from place A to B which is located higher than the wall (representing the wall as an obstacle to the cat's forward motion) and then it moves to place C, the endpoint of the cat's motion. When we interpret this sentence, making use of our encyclopaedic knowledge, we know that the cat cannot be suspended indefinitely in space and due to gravitational forces, it will descend. So native speakers infer that

the cat is on the other side of the wall and not suspended over the wall or on top of it. Here, *over* designates a curved, arc-like movement as it occurred in (3). The focus can be on the whole trajectory or at any point of this trajectory, i.e., on point B, it yields the sense of On-the-other-side-of as in (5). If the focus is on the action towards C, it yields the Transfer Sense as in (6) or, if the focus is on the moment when the motion arrives at point C, it is implied that the process involved has finished or it has been completed as in (7).

The A-B-C Trajectory Cluster

(Tyler & Evans, 2003:71)

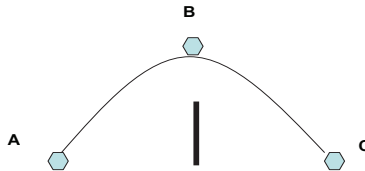


Figure 1. Schematization of *The cat jumped over the wall*

5.3.1 The On-the-other-side-of Sense of *over*

The instances in (5) are extensions of the spatial meaning of the On-the-other-side-of Sense of *over*. According to Tyler and Evans' (2003, 81) this sense implies that the TR is located on the other side of the LM relative to the starting point of the trajectory. The point C in Figure 1 and its relation to point A cannot be derived from the primary spatial configuration of *over*. Thus, this sense has become strengthened as an autonomous sense as a result of reanalysis of the complex conceptualization represented in Figure 1 (Tyler and Evans 2003, 81). Furthermore, every spatial scene is conceptualized from a particular vantage point (Langacker 1992). Here, this conceptualization involves a shift in vantage point (Langacker 1992) from being off-stage (the vantage point specified in the Primary Sense for *over*) to being in the vicinity of point A.

Table 3. Sentences (5) from the corpus where *over* has The On-the-other-side-of sense

- (5)
- a. We've got a fighter over out over here
 - b. Ok I got lights over here
 - c. It's over here to your right
 - d. He lost all his instruments over there
 - e. That's Troutdale airport over there about six of...
 - f. What heading do you have over there?
 - g. Do you need any help over there?
 - h. We had a message from the Wright Valley and they are clear over there
 - i. Where is the airport, I don't see it, you see those lights over there, that's the stadium
 - j. See a highway over (there)- no cars
 - k. What really happened over there today?
 - l. Over right, heading zero eight zero
 - m. We're gonna detour over to the left
 - n. He was right over here a minute ago
 - o. it's got a little whiskey hatch over here
 - p. ...have to wait for separation on this guy over here
 - q. Would you swing over to that and land?
 - r. I'm not over here
 - s. you know...., it would be nice to go over there
 - t. but they work you hard over there
 - u. We can step over him for two five

Over here and *over there* denote a TR-LM relationship which is always static, the verb fails to indicate any sense of motion. It is evident that in the sentences in (5) there is no interest from the speaker to be neither specific nor meticulous about the information provided. The spatial meaning is expressed by *there* and *here*; e.g., in (5a) *over here* denotes the end-point of a path, which is imaginary, the TR follows an unspecified trajectory and finishes in the region of the speaker. The TR can only be on the other side of the LM if the vantage point constitutes the opposite side.

In some instances, such as (5l) and (5m) the direction of the path is specified. (5d), (5f) and (5h) have common patterns of meaning extension. In (5d) a metaphor is used to express that some instruments of the control panel do not work; with the term *lost* the speaker indicates his annoyance

and his conceptualization of them as objects. In (5f) the metonymy implies that it is the aircraft that is flying on a specific course and in (5h) the weather condition is the characteristic which has been highlighted, where *clear* refers to the people, and not to the sky. In (5u) *him* again refers to the aircraft which represents an obstacle (see Figure 1).

In (5q) *over* forms part of a verb-particle construction which contributes to the meaning of the whole unit.

5.3.2 The Transfer Sense of *over*

The utterances in (6) are also a consequence of the conceptualization represented in Figure 1. They involve the interpretation that the movement of an object through an *A-B-C Trajectory* results in a transfer of the entity from point A to point C. Tyler and Evans (2003, 87) suggest that ‘change in location of an entity is experientially correlated with transfer of entity; thus, change in position can often give rise to the implicature that transfer has taken place’. This interpretation illustrates that the transfer meaning constitutes a distinct sense, as it could not be derived from context.

Table 4. Sentences (6) from the corpus where *over* has the Transfer sense

<p>(6)</p> <p>a. Thank you, steppin’ over to two five right over to the other tower</p> <p>b. So if you can get us out over that way?</p> <p>c. Transmissions over aircraft interphone system</p> <p>d. USAir 1016 switched over to 18:39:30</p> <p>e. over to the tower you do the same</p>
--

For instance, in sentence (6a) the transfer notion implies that the aircraft is moving towards runway *two five right* (point C) and will be controlled by another tower. In (6b) the aircraft is conceived metaphorically as an object which can be stored, moved, etc so air traffic controllers have control over it to direct its movements. In the case of (6c) and (6d), non-physical entities can be identified as TRs or LMs. In (6d) *over* functions again as a particle.

5.3.3 The Completion Sense of *over*

Regarding the *ABC Trajectory Cluster*, when the TR is at point C, the process the TR is involved in is completed. This sense is describing a

process rather than a purely spatial relation. This is reflected syntactically by the fact that in this sense *over* is not a spatial particle but rather an adprep (Langacker 1992). It has adverbial meaning. Thus, the LM has no salient properties⁸.

Table 5. Sentences (7) from the corpus where *over* has the Completion sense

- (7)
- a. Ok sir, the change over, the temperature is 23 degrees, ...
 - b. We have a pretty extensive low overcast. Over
 - c. Turn left heading 280 radar positioning for ILS approach over
 - d. Reporting leaving the outer marker inbound, over?
 - e. 500 feet on radar vectors. Over.
 - f. Two nine eight zero, over
 - g. Wind 290 at 18 knots over
 - h. one, two, seven, one, five, over

(7a) indicates that the change has been done. In the other examples, *over* is used by the air traffic controllers to give a clear signal of the end of the communication or to give the turn. *Over* here implies a framing move which is common in these kinds of transactions (McCarthy 1991).

5.3.4 The Temporal Sense of *over*

There is a tight correlation in our experience between distance and duration as it is reflected by the conceptual metaphor +TIME IS SPACE+. In this sense, *over* designates a temporal relation between a TR and a period of time. Again, the TRs and the LMs are non-physical entities.

Table 6. Sentences (8) from the corpus where *over* has the Temporal sense

- (8)
- a. Speed brakes deployed 75% and then 98% over the next 42 seconds
 - b. everything that has unfolded over the past few minutes

⁸ “The relationship profiled by an adverb crucially differs from the relationship profiled by a preposition; an adverb takes a relationship as its TR and does not have a salient LM” Tyler and Evans (2003, 86)

5.3.5 The Excess Sense of *over*

In (9) *over* can make sense only if the Excess interpretation arises. In (9a) and (9b), the TR moves beyond the LM which represents an intended target (a certain bank angle). An excess of rolling is implied. The pilot has to reduce speed if he wants to roll at a fixed angle and prevent the flight from having incidents. The spatial experience of physically going above and beyond gives rise to an understanding of distinct parameters such as speed and weight which are not primarily spatial in nature.

Table 7. Sentences (9) from the corpus where *over* has the Excess sense

- (9)
- a. over bank, over bank, over bank
 - b. Over bank (2 instances)
 - c. I say we land over weight so we...

In (9) *over* can make sense only if the Excess interpretation arises. In (9a) and (9b), the TR moves beyond the LM which represents an intended target (a certain bank angle). An excess of rolling is implied. The pilot has to reduce speed if he wants to roll at a fixed angle and prevent the flight from having incidents. The spatial experience of physically going above and beyond gives rise to an understanding of distinct parameters such as speed and weight which are not primarily spatial in nature.

5.4 The More Sense and the Control sense of *over*

There is a conceptualization in terms of verticality in (10). The More Sense has arisen because of the independently motivated experiential correlation between greater quantity and greater elevation, i.e., greater quantity is conceptualized in terms of increased vertical elevation. Owing to this experiential correlation, the implicature of greater quantity comes to be conventionally associated with *over* (Tyler and Evans 2003, 97).

Table 8. Sentences (10) from the corpus where *over* has the More Sense and the Control sense

- (10)
- a. A two tone over speed alarm
 - b. I wouldn't get it over two hundred
- (11) I am going to put that over you

In (10a) and (10b) speed is conceptualized in terms of spatial relationships although it is a non-physical entity. These examples refer to a kind of speed which is measured in accordance with factors such as the mass of air around the aircraft, the distance to the ground, the wind direction, etc. The normal interpretation of *over* in this context is ‘more than’. If these examples were to be rephrased so as to express exactly and precisely what a speaker intended, the results would be intolerably wordy.

In (10b) it is evident that the *speed* (the TR) cannot be higher than the LM (*two hundred*). Examples such as (10a) and (10b) indicate that we are dealing with a distinct sense of *over*. First, they provide the additional meaning of “more” and secondly, (10b) cannot be deduced by context if we only pay attention to the Primary Sense configuration.

Another experiential correlation associated with vertical elevation is the phenomenon of control and power. This meaning component associated with *over* is illustrated by the following instance:

(11) I am going to put that over you

Here, the relationship between the TR and the LM is one of power not of spatial orientation. The power is understood in terms of vertical elevation and of physical proximity. The captain (TR) is conceptualized as being in a higher position/rank than the officers (LM) and exerts influence or control over the LM. Thus, this example represents the Control Sense, and represents the functional element of *over* where the TR is within the sphere of influence of the LM.

5.5 The Examining Sense of *over*

The aircraft *F115* (the TR) is higher than the aircraft (the LM) and within its sphere of influence. This TR-LM proximity implies an imaginary connection between the examiner and the examined. So far, *over* has the features of its Primary Sense. But the TR’s objective of looking at the LM provides the additional meaning of examining. Our knowledge allows us to infer that, when something is looked at, it is for a purpose. This element of directing attention is essential here. If we consider the hypothetical example “The mechanic looked over the landing gear” there is no way of predicting the Examining Sense from the primary configuration since the TR (*the mechanic*) must be physically underneath the LM (*the landing gear*).

Table 9 Sentences (12) from the corpus where *over* has the Examining sense

(12) They said they get closer and look you over
--

5.6 The Repetition Sense of *over*

Finally, the Repetition Sense is only exemplified in two instances in the corpus.

Table 10. Sentences (13) from the corpus where *over* has the Examining sense

(13) a. We shall be turned over b. Gotta get it over again
--

Over in (13a) designates a spatial relationship. The TR follows a trajectory which starts in A moves to B and finishes in A, which is the end-point, that is, point C. It implies a notion of curved path as in example (3) but here it is in a horizontal plane. The example (13b) is again conceptualized as cyclical in nature but it does not refer to a spatial configuration. According to Tyler and Evans (2003, 144) this sense which denotes repetition may be due to an iterative application of the *A-B-C Trajectory*. This iterative component of this sense cannot be predicted from the Primary Sense of *over*.

6. Discussion

The results of this study show that there are eleven distinct senses of *over* in radiotelephony communications. Out of the 78 utterances: *over* has the Primary configuration in 32, the largest number of examples in the corpus; it designates the Covering Sense in 16, one of these utterances is the most repeated cluster (10 times); it denotes the On-the-other-side in 21; it has the temporal sense in 2; it implies the Transfer sense in 4; it refers to the Completion sense in 7; it shows the excess meaning in 4; *over* is conceptualized in terms of verticality in 4, while it has the More Sense in 3 and the Control Sense in 1; it designates the Examining Sense in 1; and finally, it exemplifies the Repetition Sense in 2 instances. However, the standard radiotelephony phraseology includes only the Primary Sense of *over*.

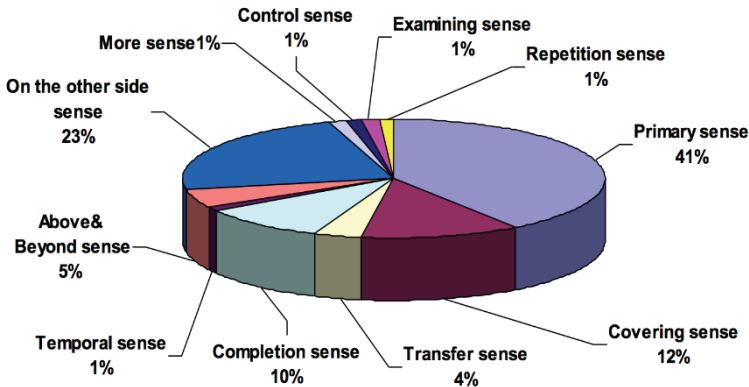


Figure 2. Percentage of the relative frequency of the different senses of *over*

It is essential to draw attention to these polysemic aspects of the language employed in the recordings, especially if the aim is to demonstrate that the standard radiotelephony phraseology does not reflect the authentic discourse. They may create misunderstandings, more likely among non-native speakers.

All the senses have been systematized following Tyler and Evans' (2003) criteria and they have shown that they are related through meaning chaining relationships. They do not constitute categories with clear-cut boundaries nor are they structured in terms of a set of shared features, but rather by a criss-crossing network of similarities. Following Wittgenstein's metaphor (1958), these similarities remind us of the resemblance between members of a family. It has already been suggested that some instances are better examples of the category than others. The prototypes serve as reference points for the preposition *over* to enable the categorization of instances which are not so clear.

For instance, (3) can be considered a marginal member of the Primary Sense category if it is compared to (1). In (1g) the TR presents characteristics which are shared by the Covering Sense utterances. Moreover, in (1g) and (4) the shape of the path is such that it virtually covers the total area of the LM. The distinct senses from the *ABC Trajectory cluster* derive from the salient attribute of *over* in (3) the curved shape of the path created by the TR. (12) is understood thanks to (11) which exemplifies the More Sense of *over*. (13) is due to an iterative application of the *A-B-C Trajectory senses*.

In addition, the findings clearly suggest that metaphors and metonymies, e.g., in (1r), (5u), (8), (10) and (11), play a vital role in the comprehension

of *over*. They relate and organize both spatial and non-spatial senses of *over* even when *over* does not denote a purely spatial relationship between the TR and the LM. Both pilots and air traffic controllers should be aware of the fact that metaphors which are embedded in the conceptual system of their native languages may differ from those present in English.

At this point it is convenient to make some comments on the pedagogical implications of the preceding descriptive work. With the aim of avoiding misunderstandings, which can have fatal consequences in these emergency communications, we can suggest two possible approaches.

7. Pedagogical implications

The first approach is based on the principle (Cuenca and Hilferty 1999) that a new lexical item is never learned alone, but it is immediately integrated into a network of learnt items. This means that learners are always ready to activate such existing schemata when a new preposition or a new sense of a learnt preposition appears. This process facilitates their retention within the long-term memory. Therefore, the systematization of the polysemy network of *over* can be very helpful in improving resources for pilots and controllers to acquire the distinct senses. The classroom discussion should focus on its different meanings as well as on the links that exist among them. Students should be aware that the meanings of *over* and other prepositions are clearly grounded at some level in our spatio-physical interaction with the world.

Hence, studying the meanings associated with spatial particles should offer learners fundamental insights into the relation between language, mental representation and human experience. For instance, an explanation of the semantic network of a particular preposition may clarify the distinctions in usage amongst different prepositions by pointing out their salient features.

Before moving on to the second approach, it is important to mention the role of figurative language to activate specific schemas. Metaphors help to build meaningful relations between what students already know and what they are setting out to learn (Glynn and Takahashi 1998). Structural mappings serve as early mental models in which students can form limited but meaningful understanding of more complex concepts. In addition, metaphors invite interaction (Black 1962, 38) by forcing students to work out the relevant resemblance between target and source domains.

The possible second approach is the use of a controlled language where items only have a single meaning in order to minimize any polysemy which may create misunderstandings. In the *ICAO Annex 10*, it is recommended that the English language should be thoroughly simplified by codification

and limitation. Standard radiotelephony phraseology has proved to be enough to fulfil communication needs in routine situations. However, the analysis of a series of incidents and accidents led to the approval of the new Amendments to Annexes in order to deal with non-routine communications.

Although *ICAO* documents use terms such as *common* English and *general* English, the holistic scale which has been established for the assessment of pilots indicates that the pedagogical approach to this kind of language falls into the ESP field. An alternative method for dealing with non-routine communications might be the development of a controlled language, similar to the one already in use for aircraft maintenance procedures. Should this proposal prove to be feasible and advantageous, a corpus of the discourse used in this type of situation will be the first step to be taken.

8. Conclusions

To summarise, eleven senses of *over* have been found in the ATC communications. They are represented as a connected network of related meanings, rather than a list of arbitrary meanings which share the same phonological form. They are organized around a primary sense from which additional meanings have been systematically derived.

The fact that the standard phraseology provided by the *ICAO*, whose global use and correct application are key defences against human errors according to the *IATA*, only includes a single sense of *over*, may create failures in communication, especially among non-native English speakers, since they may not recognise the meanings of the other ten senses shown in this study. Although the airline safety record has been impeccable over the last decades, the verbal interaction between air traffic controllers and flight crew members is still the weakest point in the complex chain of factors which guarantee commercial aviation safety. Lack of linguistic competence will not provide the pilot with an appropriate or complete set of circumstances in which to act, and it will not provide him with the knowledge required to deal with unusual circumstances.

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CHAPTER TEN

LINGUISTIC AND COGNITIVE BASES OF DIFFERENTIATION OF CONCEPTUAL METAPHORS AND METONYMY

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Introduction

Up to now, the scientific community has been discussing the essence of metaphor and metonymy. In the paradigm of cognitive science, which explores the processes of perception, categorization and understanding of the world, metaphor and metonymy are considered as the manifestation of analog capabilities of the human mind. The relevance of metaphorization and metonimization of speech lays in the fact that these are ways to connect objective and subjective reality in order to convey to the listener not only the meaning of the statement, but also our internal state and attitude to what was said. That is, metaphorization and metonimization in speech are ways of combining our thinking with language, which allows people to communicate most effectively.

Two different ways to perceive the world and therefore two types of operations with signs—metaphor and metonymy—determine the need to study cognitive mechanisms of their generation and functioning. The goal of this paper is to determine and to justify the linguistic and cognitive grounds of differentiation of conceptual metaphor and metonymy.

The study consists of three main parts, the first of which is entitled “Metonymy in cognitive theories”. This part offers a brief review of different approaches to the study of metonymy. The second part (“Metaphor in cognitive theories”) presents the theories of conceptual metaphor and the

cognitive classification of metaphors. The third part of the paper considers approaches to the distinction between conceptual metaphor and metonymy.

1. Metonymy in cognitive theories

In linguistics, metonymy is traditionally understood as a mechanism for a word to acquire a new meaning and accordingly to expand the semantic volume of a word. This interpretation of metonymy was the basis for analyzing metonymy as a stylistic figure, exploring it as a mechanism and result of the development of secondary meaning of the word related to the primary, but without imagery.

Cognitive linguistics expanded the interpretation of metonymy and separated cognitive metonymy (a mechanism for the conceptualization of reality) from linguistic metonymy (a semantic mechanism for developing the meaning of a word). The well-known hypothesis of Jackendoff says that information obtained from outside is collected and processed at the mental level in the human brain (Jackendoff 1984: 83). As a result, a certain information structure is formed, and it reflects a person's cognitive experience in the form of certain "quanta" of knowledge—concepts (Concise Dictionary of Cognitive Terms 1996: 90). Metonymy is present in this conceptual system as a cognitive model—a conceptual structure the elements of which are in a substitution relation (Lakoff 1998: 32). In this case, conceptualization is understood as the primary formation of concepts (Concise Dictionary of Cognitive Terms 1996: 93).

Nowadays, cognitive linguistics regards metonymy as a conceptual phenomenon and as a fundamental technique of cognition and the understanding of reality. As a mechanism of cognitive modeling metonymy may be characterized from the point of the following theories.

The theory of conceptual metaphor of Lakoff and Johnson. The linguistic function of metonymy is indirect reference, when one entity substitutes another. On the other hand, metonymy goes beyond the scope of a linguistic phenomenon and functions in our conceptual system in the form of sustainable, regular metonymic concepts (for example, part-whole), systematized in our mind and reflected in the culture through the language. Metonymic concepts allow us to conceptualize one entity through its relation to another. They present in a structured fashion not only our language, but also our thoughts, attitudes and actions. They are based on our experience, and this basis is more obvious and "tangible" than metaphorical concepts, as it implies direct physical or causal associations (Lakoff, Johnson 1980: 35-39).

The theory of prototypes and idealized cognitive models in the works of Kövecses, Lakoff, and Radden. (Kövecses, Radden 1998; Lakoff 1988) explains prototypical effects in categories using a metonymic process in which parts of a category represent the whole category. For example, in Western culture, the concept of *mother* is prototypically associated with the concept of *housewife mother*. The relationship between the mother and the housewife is metonymic and exists only at the conceptual level: the category *mother* metonymically includes the sub-category *housewife mother*. Social stereotypes, in particular, are the types of metonymic models in which the representative of a category stands instead of the category as a whole.

Manifestations of the category in the form of “prototypical” effects lies in the fact that the central members of the category, ones that are closer to the prototype are faster identified, acquired and used more often than non-central ones, that is, they are used to perceive the category as a whole. It is especially vivid when a part (an element, subspecies, etc.) is used instead of the whole, and that is the metonymic categorization model (Kubryakova et al. 1996: 144-145).

The theory of frame semantics developed by Fillmore, Koch, and Baranov (Fillmore 1982; Koch 1999; Baranov, Dobrovolskij 1997). In their opinion the base to form the figurative meaning consists not in the meanings of the multivalent word, but in the frames and scenarios associated with them. In this case, the metonymic meanings of words are described as the result of conceptual transformations of frames (scenarios) and their slots/subslots (Baranov, Dobrovolskij 1997: 13).

The frame analysis of the metonymic transformations of multivalent nouns allows us to make a conclusion that the essence of metonymy as a cognitive mechanism lies not only in the enumeration of various models or types of metonymic relations, but, rather, in determining the principles which let us choose one of many categories as a source or a target of metonymic transformations.

The theory of profiling or active zones of Langacker (reference or conceptual phenomenon) (Langacker 1993) considers metonymy not only as a conceptual phenomenon, but also as a cognitive process giving us access to one mental entity through another. According to this theory, the word gets a specific meaning as a result of profiling, that is, the selection of an element in a certain conceptual area. The metonymic meaning of the word corresponds to the so-called active zone of the profiled element—that part of it that is directly involved in the situation described (*She heard the piano—the active area of the piano profile—sound*) (Langacker 1991: 189-201). Langacker explains the cognitive essence of metonymy as follows:

An entity, designated with the help of metonymy, serves as a reference point, which opens mental access to a desired goal (that is, an entity to which we refer) (Langacker 1993: 30).

Thus, we do not just use one nomination to designate another, but perform a complex mental operation to access some mental entities with the help of others.

The theory of conceptual integration of Fauconnier and Turner (Fauconnier, Turner 1998) considers metonymy as a mechanism for new meaning acquisition, and one of the cognitive processes for creating a new meaning is the conceptual derivation. Conceptual derivation implies the presence of two or more source spaces (mediated by a linguistic form); as a result of their mutual influence, as well as due to the action of certain mechanisms, a new concept arises. As factors leading to a conceptual derivation, it is proposed to consider, firstly, the interaction of concepts, secondly, the ability of the concept to form mental spaces and mental fields.

The ability of the concept to form the mental space and mental field is a consequence of the fundamental capability of human consciousness to divide things into parts/whole. Due to this capability, a person is able to switch attention from a concept represented by a linguistic unit to a conceptual structure (mental field), against which this linguistic unit is understood. A concept represented by a language unit is closely related to the concept of a higher level of abstraction, which acts as a mental field. The latter ensures the derivation of a new concept. It acts as a source of additional information necessary for the emergence of a new concept (conceptual structure), since a new concept does not always arise out of the characteristics of the original concepts that have been explicitly borrowed.

All of the above corresponds to the characteristics of conceptual metonymy, and, therefore, means that the theory of conceptual integration can be applied not only to the conceptual metaphor, but even to the same extent to the conceptual metonymy.

The theory of conceptual semantics presented in the works of Johnson, Lakoff, Pinker, Paducheva (Lakoff, Johnson 1980; Pinker 2007; Paducheva 2004) considers metonymy as a process (shift of attention focus), and as a result (conceptual metonymy, metonymic concept). Metonymy is regarded in the context of the notion “denotative situation”, which means a fragment of reality that has to be conceptualized. Paducheva points out that the same denotative situation can be differently conceptualized in a language. At the same time

The lion's share of the differences between different conceptualizations of one situation falls on two parameters—estimation and a focus of attention (Paducheva 2004: 156).

The basis for metonymic shifts is the selectivity of human perception, which is reflected in the language in the form of various shifts in the focus of attention when describing the same extra-linguistic situation. In the process of conceptualizing some aspects of reality are emphasized, actualized, while others are blurred, shaded in the background a schematization of reality takes place (Paducheva 2004: 157). But the aspects of the situation that are shaded in this conceptualization are implicitly present in the context of the statement made, they are connected with the actualized aspects by adjacency principle ex. *part-whole*, *parameter-value*, *cause-effect*, etc. There we can talk of metonymy.

Conceptual metonymy in Gestalt psychology. The concept of “prominence” allows talking of the metonymy in terms of Gestalt psychology. Koch claims that metonymy is based on the relation between the background and the figure (Koch 1999: 151). Each concept embodied in a lexical unit is a figure in relation to another adjacent concept—the background—within the same frame. The figure-ground effect can be represented by the example of the metonymic relations of the part and the whole within the frame, where the whole turns from a background into a figure and represents the whole frame, and the part acts as a figure transforming into the background and represents one of the concepts of this frame (in the “whole-part” metonymy, the reverse occurs). From this point of view, another definition of metonymy can be derived: a process in which

when using a lexical unit, certain pragmatic, conceptual and emotional factors can influence the background concept in such a way, that the figure and the background are interchanged (Koch 1999: 152).

It should be noted that, despite the fact that cognitive linguistics has produced various approaches to the description of the cognitive mechanisms of metonymy, they cannot be considered as contradictory. It is obvious that the discrepancies between the stated approaches are mostly due to difference in terminology, and partly due the point of view and level of abstraction.

2. Metaphor in cognitive theories

A metaphor in cognitive linguistics is understood as a mechanism, a process, and a result in a single and generalized form, a form of thinking. If it is necessary to specify the meaning of the term *metaphor*, the following terms

are used: metaphorical process, metaphorical meaning, metaphorical model, metaphorization mechanism, etc.

The cognitive theory of metaphor highlights its conceptual properties. It is the study of metaphor as a component of our conceptual system that determines the direction of research in the modern theory of metaphor. In this paper, the metaphor is considered in two aspects: static and dynamic, that is, as a result and as a process. The study of metaphor in statics allows us to see the result of the completed process of metaphorization in the language world view. The dynamic aspect involves the study of the mechanism of creating a metaphor and the emergence of a new unique meaning that occurs every time "here and now".

The most important theories considering conceptual metaphor are the following:

The theory of conceptual metaphor of Lakoff and Johnson (metaphor in the static aspect) considers metaphor as a cognitive phenomenon, one of the central processes in the conceptualization of the world, a part of the mental system and language (Lakoff, Johnson 1980; Lakoff 1987; Lakoff, Turner 1989).

Lakoff and Johnson have shown that metaphor, as an essential element of our conceptual system, is an important tool for categorizing the world, structuring perception and sensory experience. The conceptual theory of metaphor is based on the assumption that the knowledge of the world is organized in the form of mental structures—idealized cognitive models (ICM, mental models, cognitive models) (Lakoff 1987). Models are not only the concepts existing separately, but also the communications characterizing the position of concepts concerning the category of time, space, reason and purpose.

Lakoff indicates that cognitive models of different types (propositional, figurative-schematic, metonymic, metaphorical) can be used to describe the categorization process. The latter—metaphorical models—are models of transition from propositional or figurative-schematic models of one domain to the corresponding structure of another domain. Metaphorical transfer implies the presence of the source domain (area) and the target area. During the migration process, the model structure of the source area is transferred to the appropriate structure of the target area. For example: the metaphor *channel* allows us to move from the knowledge of the movements of objects in containers to the understanding of communication as the movement of ideas in words (Lakoff 1988: 11).

The frame structures the knowledge of a stereotypical, thematically unified situation. This property implies the presence of a conventional beginning in the frames, which is the presence of stable features. These

features, as commonly understood, occupy the upper levels of the frame and remain stable constantly.

The theory of conceptual integration (mixing, blending) of Fauconnier and Turner (Fauconnier, Turner 1998) develops the theory of conceptual metaphor and examines the metaphor in the dynamics. The essence of metaphor in this theory is that while the discourse is unfolding, the merging of mental spaces, integrated spaces (blends) appear.

Conceptual integration is described by the authors as the main mental operation underlying the ability of a person to reasoning, making conclusions, decision-making, invention, evaluation, global insight, conceptual compression, manipulation of “diffuse ranges of meaning”, which leads to the creation of a new value, has dynamism and flexibility, is done quickly and unconsciously (Fauconnier, Turner 2000). Mental spaces, as defined by Fauconnier, are

small conceptual areas (packets), constructed in the process of thinking and speaking, which are created for the purpose of local understanding and action (Fauconnier 1996).

Mental spaces are models of discourse understanding that are created and changed directly in the process of communication. They have considerable flexibility, instability and are not required to maintain consistency and coherence at every moment. Mental spaces are structured through frames and various cognitive models: image-schematic (container, part-whole, top-bottom, source-goal), propositional (proposition, scenario, feature bundle, taxonomy, radial category), metaphorical, metonymic, symbolic.

Mental spaces are non-linguistic entities. Here the question arises, how do linguistic forms and mental spaces correlate? Fauconnier treats linguistic forms as "instructions" in the conceptualization of a situation, language

gives minimal but sufficient information for finding the domains and principles appropriate to the conceptualization of a particular situation (Fauconnier 1996).

Fauconnier notes that mental spaces do not reflect so-called "objective reality". They embody the image of how people think and speak about certain things, and at the same time they do not carry any information about the things themselves (Fauconnier 2000: 283-304).

One mental space can be structured by knowledge that belongs to different conceptual domains. For example, a mental space that is a scenario of a book purchase situation might include knowledge from conceptual

areas such as literature, education, reading, buying, selling, etc. Mental spaces are based on background knowledge, but they are not given to us in some ready form, they arise every time anew. The processes of conceptual integration happen because of man's ability to think figuratively, to establish links between mental spaces and their elements (Rubert, Nilsen 2002).

The idea of "ties" (mappings, connections) between mental spaces is central for the theory of conceptual integration. These connections can be metaphorical or metonymical; they can be based on identity, similarity, analogy and other pragmatic functions.

Parallelism between metaphors and underlying literal concepts leads to the existence of main types of conceptual metaphors:

1. *Orientation metaphors* structure abstract and subject spheres in accordance with non-metaphorical linear orientations in space, with the oppositions such as *up-down*, *inside-outside*, *deep-shallow*, etc. (Lakoff, Johnson 1980). For example, in the process of conceptualizing *time* the general metaphor of this type is a spatial metaphor *time is landscape we move through*, built on the basis of imaginative schemes *back and forth*: compare to *forward (front) is future*, *back is past*. In the process of metaphorical transfer, information and possible logical inferences from the source region of space are projected onto information and logical inferences about time (Lakoff, Johnson 1999: 145).

2. *Ontological metaphors* structure abstract entities (events, actions, emotions, ideas) on the basis of human experience connected with physical objects (objects and substances) when the properties inherent in material objects (shape, consistency, size) are projected onto abstract objects (*society is a building*, *emotions is health*) (Lakoff, Johnson 1980: 25-32).

3. *Structural metaphors* of the field of experience and activities (*time, life*) conceptualize due to the overlaid structure of other areas (*money, travel*): *time is money*, *life is a journey*.

4. *Metaphor "container"* represents such meanings as "filling containers"—specific language units.

One of the important advantages of the theory of conceptual integration is the possibility of simultaneous parallel analysis of the most heterogeneous connections established for the generation of a new mental space.

3. Distinction between conceptual metaphor and metonymy

In considering the problem of interaction between metaphor and metonymy, there are three complementary directions:

1. Metonymy as a conceptual basis of metaphor (the continuum hypothesis of Jakobson (Jakobson 1990)),
2. Metaphor as a conceptual basis of metonymy (metaphorical scheme of Lakoff),
3. Metaphor and metonymy as two separate cognitive processes (Warren).

In this paper the third direction, metaphor and metonymy as two independent cognitive processes, is considered as the most logically justified, and it is proved with the use of cognitive-matrix method of research (Zhabotinskaya 2009).

The difference between metaphor and metonymy is seen in the fact that the metaphor includes a systematic projection of ontological, figurative-schematic and logical structures from the target area to the source area based on the relationship of similarity between the interacting areas, and metonymy includes the relationship of adjacency, expressed by various associative links, and leads to a referential shift.

Warren highlights several systemic differences between metaphor and metonymy (Warren 2003: 113-118; 124, 126).

a) Metaphor is based on a hypothesis (in the metaphor of *life is a journey* *life* appears as if it were a *journey*), whereas in the metonymy there is no hypothesis (for example, in the meaning of the word *kettle* in the sentence *The kettle is boiling*), "non-literal" metonymy is superficial, the nature of associations in it is predictable. In metaphor, the association between the source and the target is arbitrary and unpredictable, because any property of the source and target areas can become common (hypothetically);

b) Metaphor is necessary either as a rhetorical device or as a means of filling gaps in the vocabulary. For metonymy these functions are optional;

c) Unlike metaphor, referential metonymy does not occur above the phrasal level;

d) Metaphor can be based on several common properties of the source and target areas simultaneously, which determines the effectiveness of metaphor as an economical means of creating new, associatively rich values; metonymy correlates the source and target areas by means of only one associative link;

e) The nature of associative relationships in itself is various: in metonymy, the association is more likely to occur when the speaker is confronted with source and target relatively at the same time (contiguity in space/time, causality), whereas in metaphor, the association is based on partial similarity and the simultaneous presence of the source area and the target area is not obligatory.

Metaphors can give rise to topics whose aspects are developed by the speaker throughout large segments of the text (Kiselyova, Pankratova 2013); individual thematic metaphors in the process of conventionalization can become conceptual (Lakoff, Johnson 1980). Metonymy never causes the duration of the developed topics, despite the fact that there are repetitive metonymic models (i.e. part instead of whole, capacity instead of content).

When it comes to metaphor and metonymy division deep processes, G. Lakoff's basic thesis is that

the foundation of thinking activity is metaphor intertwining, building a cognitive map or a concept chain, can be taken... (Lakoff 1988).

Such a chain building is implemented within the idea of proposition structures of a conceptual domain area. In a chain the information concentration is situated in nodes, where every node shows the information of certain substance and its place in a chain (Taylor 1995).

When analyzing the characteristics of a subject specific concepts for this subject can be marked (*apple is a fruit*) as not basic characteristics, and concepts which are general for definitions of other subjects and phenomena of the physical world (shape, taste, color, space and time characteristics) as basic ones. Because of such information division, Langacker (2000) suggested splitting domains into basic and non-basic, with indirect connections between them.

"Basic domains" are defined as domains of space, supporting understanding of different spatial configurations; the domain of time, helping us to understand changes; domains of different senses; domains of emotions and feelings. The basic domains equipment is not as important as the fact that they are minimal, irreducible and inexplicable in other terms. Though there is a connection between basic domains, it is hardly possible to explain a taste in terms of space or time in terms of color. Basic domains form the lowest level in conceptual hierarchy, they have no "background", but they are an original, most generalized background for other concepts, they form the conceptual potential amount which is used in different ways by certain concepts (Zhabotinskaya 2009: 63; Trofimova 2018: 328).

"Non-basic domain" is understood as a background concept or conceptual complex of any difficulty level. From minimal concepts to holistic knowledge systems the difficulty rises. It is important that any non-basic domain has its "background", its base as a context for its very domain conceptual specifics definition.

Now we turn to the methods of differentiation between conceptual metaphor and metonymy. Let us consider the example of using the conceptual interframe network for a cognitive matrix analysis of the

metonymic expression *agrofirm sowed the seeds of the plant* and the metaphoric expression *he sowed doubt in them*.

At first, in order to do this, we have to build the domain matrix of the literal expression *agricultural workers sowed the seeds of the plant* in the form of an event frame, which includes the following domains: *the worker of the agrofirm* and *the seeds of the plant*.

AGENT-SOMEONE (*worker*) connects with SOMETHING (*agrofirm*) with the help of the possessive frame (the scheme of possessiveness) as part (*worker*) and the whole (*agrofirm*).

The concepts connected by a possessive frame are adjacent and are capable of mutual substitution in the construction of metonymic concepts.

Thereby, the concepts *workers* and *agrofirm* can replace each other at the logical level.

When we build a metonymical concept that is based on the event frame, the domain *workers* (part) is obscured and the domain *agrofirm* (the whole) is profiled.

We can see that, in the metonymic statement, the starting point of the impact of the action frame on the subject frame *seeds* in the possessive scheme part-whole changes its place from *agent worker* to *agrofirm*. We observe the change of the gestalt, but the focus of attention remains within the matrix (*agrofirm* (the whole) substituted *workers* (part)). The action frame in this case unfolds within the event frame.

With this construction of the domain matrix of conceptual metonymy part-whole the phrase *agricultural firm sowed the seeds of the plant* will be verbalized.

To analyze the metaphorical expression *he sowed doubt in them* it is also necessary to construct a domain matrix based on the event frame.

There are two domains in the domain matrix: the domain SOMEONE-AGENT (*the sower*) and the domain SOMETHING-PATIENT/OBJECT (soil). These domains are interconnected by an action frame (contact scheme) INFLUENCE AT. Action frame takes place in the following schemes: THUS-METHOD (sowing), INSTRUMENT (seeds), AIM (profit), RESULT (crop), which are related domains to domain *the sower*.

The verb *to sow* means *to put seeds in the soil prepared for sowing*. After sowing the seeds, the SOWER waits for the result in the form of crops in order to make a profit. The process of sowing seeds, caring for crops, waiting, harvesting, its realization and profit is accompanied by certain emotions and feelings: the desire to benefit from the actions, the preliminary analysis of what, when and where to sow; excitement and doubt, anxiety of the correct choice of material, time and place of sowing; uncertainty in obtaining the final result due to unforeseen circumstances.

Thereby, the gestalt of this event frame is *someone puts something somewhere in favorable conditions for obtaining the necessary result*, which is accompanied by an emotional state of waiting for the result, and uncertainty in obtaining the result, which are the categories of the base domain and which refer us to the sensory level.

It is this gestalt that is the physical basis of the conceptual metaphor which causes a number of systemic associations according to the context of the use of this metaphor: the domain AGENT (sower) with the domain *agent* (politician), the domain PATIENT (soil) and the domain PATIENT (voter), *the seeds* correspond to the information that is put into the head of the voter, etc.

It is also necessary to examine the abstract concept of DOUBT, expressing the emotional state of a person associated with the basic domain, where the source is our sensory experience. The abstract concept of DOUBT does not have its own pre-conceptual structure, but expresses the emotional state of a person in its pure form. It is the same desire, but doubt, anxiety, uncertainty and dependence on unforeseen circumstances.

A conceptual metaphor is a projection of a more concrete and structured concept on the abstract concept that does not have its own pre-conceptual structure. These concepts belong to different cognitive domains. The verb *sow* in the event frame refers to the agronomic area (the source area) connected with sowing seeds, while the target area is an abstract concept of DOUBT relating to the sensory field.

In order to connect an abstract concept with physical experience, we have to activate the comparative frame, which is formed by interspatial connections of identity and similarity. In the base of a conceptual metaphor lies a scheme of similarity: SOMETHING-referent is SOMETHING-correlate, where a qualitative scheme SUCH is the basis for similarity. In the analyzed conceptual metaphor SOMETHING-correlate is a conceptual matrix, activated in the consciousness with the help of the lexeme SEEDS.

SOMETHING-referent is an abstract concept DOUBT belonging to the basic domain of SENSORY EXPERIENCE. Accordingly, SUCH-referent is SUCH-correlate.

The domain matrix when building this metaphorical scheme expands its borders with the help of the action frame due to the domains of RESULT and PURPOSE. Action with superimposed expectation and purpose give sensations that take action beyond the matrix, beyond the physical experience into the space of abstract concepts in the form of gestalt.

On the basis of the connection between the nature of actions and sensory as gestalt, the subject and taxonomic frames are involved into the scheme of comparative connection with one of the abstract concepts of the gestalt,

bringing under this concept the structuring of a physical event. In this case, the possessive identification scheme disappears in the taxonomic frame (IS), and the comparative relation appears (IS AS IF).

The gestalt does not change, but the focus of attention goes beyond the matrix, increasing the information component and thus changing and strengthening the meaning of the statement.

In this construction of the domain matrix conceptual metaphor is verbalized in the form of the statement *he sowed doubt in them*.

The next step in our reasoning is the sample analysis of conceptual metaphor and metonymies on the basis of their domain matrices with the use of a framing network.

Building examples of conceptual metaphor

1. Ontological metaphor:

*No **time to lose** in the Middle East peace process.*

In this phrase the metaphor is created by the verb *lose*, which in its literal meaning means *to stop having someone or something that you had before* (Mueller 2013: 511).

The interpretation of the verb *to lose* is *to not be able to find someone or something to lose something because of missing, lost, etc.*; figurative meaning—to spend pointlessly, waste. The meaning of this verb assumes that the AGENT must be an animate person. To analyze this metaphorical expression, it is necessary to construct a domain matrix of the event-related frame, which can be represented as follows: AGENT (SOMEONE) lost a PATIENT (SOMETHING).

The conceptual matrix of the event-related frame consists of two domains: the AGENT-domain and the THING-domain

These domains are connected by an actional frame (contact scheme) LOSE (lose), which is expanded, assuming such components as the RESULT (stop having) and SO (EVALUATION), irrevocably.

The subject frame THING also expands one aspect of THIS (QUALITY) is important, and unique. This characteristic is present implicitly in the metaphor, because if it is impossible to replace the lost thing with another, then it is unique.

The gestalt is the physical action of LOSING in this event-related frame and the accompanying feeling of irretrievable loss of something unique, in this case the THING.

The abstract concept of TIME as a category is connected with the mental space of the abstract non-material sphere and does not have its own pre-conceptual structure, so it should be expressed through a specific physical concept.

A comparative frame is formed by the interspatial connections of identity, similarity and resemblance to connect the abstract concept of TIME with the physical experience of LOSING THING, where the general gestalt will be the feeling of irretrievable loss of something unique. In comparative frame the qualitative scheme SO (irretrievably) of the actional frame and the qualitative scheme SUCH of a subject frame is a unique THING, in this case it is the basis of similarity.

Accordingly, the SOMETHING-referent is an abstract concept of TIME, and SOMETHING-correlate is a THING.

The gestalt does not change, but the focus of attention goes beyond the matrix, changing and strengthening the meaning of the statement.

2. Structural metaphor:

Hunting for a Job? Try the Internet.

The verb *hunting* creates a metaphor in this phrase (Muller 2013: 423). The verb *hunt* means in its direct meaning: *to hunt animals, birds for the purpose of killing or fishing*; and in a figurative meaning—*strive to find, to get something*. The meaning of this verb assumes that the AGENT must be an animate entity (human or animal).

An event-related frame is constructed to build this metaphorical expression: SOMEONE (AGENT-hunter) hunts SOMETHING (PATIENT-animal, bird).

There are two domains in the domain matrix: domain SOMEONE (AGENT-hunter) and domain SOMETHING (PATIENT-animal, bird). Domains are connected by an actional frame (contact scheme)—HUNTING (hunt). The actional frame unfolds in two ways: THERE (hunting place) and TOOLS (weapons, hunting skills).

The abstract concept STRIVE TO GET does not have its own conceptual structure, and is an emotional state of man—search, waiting, excitement, etc. The process of hunting is accompanied by a certain emotional state: search, waiting, excitement, etc. The gestalt is that someone makes the required actions (the hunter lies in ambush and waits for prey—the applicant should publish the application for a work and waits for letters from employers); or hunter looks actively for prey—the applicant views jobs, writes to employers,

goes to interviews; the tool in hunting is a gun and hunter skills, and when someone is looking for a job, it is professional skills, interviews.

The gestalt of the event-related frame is the physical basis of this conceptual metaphor and causes a number of systemic associations according to the context of the use of this metaphor: domain AGENT (HUNTER) with domain AGENT (the APPLICANT), domain PATIENT (PREY) and domain PATIENT (JOB); actional frame HUNTING corresponds to the actional frame EAGER TO GET A JOB. Conceptual metaphor is a projection of more concrete and structured concept on abstract concept without its pre-conceptual structure. These concepts belong to different cognitive domains. The verb to HUNT in an event-related frame refers us to the source area, which is associated with hunting animals and birds using hunting skills and a gun, while the target area is an abstract concept to STRIVE TO GET.

The comparative frame is activated to connect the abstract concept of the APPLICANT with the physical experience HUNTER HUNTS. The comparative frame is formed by interspatial connections of identity, similarity and resemblance. The conceptual metaphor is based on the scheme of similarity: SOMETHING-referent is like SOMETHING-correlate, where qualitative scheme SUCH is the basis of similarity.

In this conceptual metaphor SOMETHING-correlate is a HUNTER; SOMETHING-referent is an abstract concept APPLICANT, which belongs to the basic domain of SENSORY EXPERIENCE. Accordingly, SUCH-referent is like SUCH-correlate. On the basis of the nature of actions and sensory as gestalt, the subject and taxonomic frames are involved in the scheme of comparative connection with one of the abstract concepts of the gestalt, bringing under this concept the structure of a physical event. In this case, the possessive identification scheme disappears in the taxonomic frame (IS), and a comparative relation (IS LIKE) appears. The gestalt does not change, but the focus of attention goes beyond the matrix, changing and strengthening the meaning of the statement.

3. Container metaphor:

*You know, when you're young and you feel like your nerves are on the outside of your body and if somebody just brushes your leg you're **in so much pain** because you feel raw.*

The preposition *in* creates a metaphor in this phrase. The meaning of this preposition in this context is an indication of presence—something inside something. This fact shows that the source-area in this metaphor is a certain container and there is an object inside it. An event-related frame is

constructed to analyze this metaphorical expression: SOMETHING is inside SOMETHING. It can be represented as a domain matrix which is built by the domain AGENT (SOMETHING-physical object) and the actional frame LOCATES (scheme of state/process). The actional frame unfolds in one aspect THERE into the domain of SOMETHING (CONTAINER), which unfolds in a subject frame in two aspects SO (the way of being–has limits, boundaries) and FUNCTION (to place something). The gestalt of an event-related frame is that SOMETHING is inside SOMETHING that has spatial boundaries. The abstract concept of PAIN does not have its own conceptual structure, so it must be expressed through a specific physical concept.

To form a metaphor on the basis of this event-related frame, a comparative frame is superimposed on it—an IS LIKE scheme of similarity—and as the result the feeling of PAIN is like a CONTAINER, and SOMETHING (the human body) is like a physical object, which is inside this CONTAINER. In this case, there is the specificity of the association in the English metaphor—*the human body is inside the pain*, not the pain is inside the body in the Russian meaning. The principle of modeling is the same, regardless of language.

The meaning of this metaphorical expression is that the pain envelops the speaker and the person seems to be inside this pain, and cannot go beyond this physical sensation as from the container (gestalt). So, the conceptual metaphor of this phrase is that the physical sensation of PAIN-referent is like CONTAINER-correlate, in which the human body is located. The gestalt does not change, but the focus of attention goes beyond the matrix, changing and strengthening the meaning of the statement.

4. Orientational metaphor:

*I admired his work with young musicians; **he supported them** so much, and did so much for musical young people.*

The metaphor is created by the verb *supported*, which means *to be a support for something, not let something to fall* (to keep something in a vertical position).

To determine the source domain and the target domain, it is necessary to unfold the support frame in the aspect of *keep in a vertical position (SO) in order not to fall*. Considering the physical basis of this metaphor, *active work* (domain goal) is like *vertical position* (domain source).

Considering the physical basis of event-related frame IS LOCATED VERTICAL POSITION (domain source) is an abstract concept.

To analyze this metaphor, first of all, it is necessary to construct an event-related frame. This network contains two domains that have their own meaning: the AGENT domain (SOMEONE/SOMETHING providing support) and the PATIENT/OBJECT domain (SOMEONE/SOMETHING receiving support). Domains are connected by an actional frame (contact scheme) to SUPPORT, which unfold in components of the TARGET (not let to fall) and THE MODE OF ACTION–SO (in a vertical position). The gestalt *keep in a vertical position* activates the physical experience of the horizontal position being characterized by a state of rest, unconsciousness, or death (lack of activity), and the active work being characterized by a vertical position. The concept of *vertical position* and *activity* belong to different cognitive areas.

Vertical position is the location in space (the category of the base domain of SPACE); and *activity* refers to the cognitive domain *psychological state that supports physical activity*, associated with the mental space of the abstract nonmaterial sphere and does not have its pre-conceptual structure. The abstract concept of *activity* is the quality of personality, which appear in the inner readiness for purposeful activity (purposefulness, perseverance, energy, initiative).

The comparative frame is activated to connect the abstract concept of *activity* with the physical experience of *vertical position*. The comparative frame is formed by the interspatial relations of identity, similarity and resemblance. Qualitative scheme SO is the basis of similarity. The comparative frame unfolds against a backdrop of a component of actional frame METHOD OF ACTION–SO.

As we see, the metaphorical matrix involves two domains (AGENT and PATIENT/OBJECT), which are connected by an actional frame TO SUPPORT, that unfolds in two aspects: PURPOSE and SO (mode of action). Because we understand the active state as being in a vertical position (spatial orientation), they are connected by a scheme of similarity of the comparative frame.

Unlike other metaphors, where the physical basis of similarity is a physical action or state, the orientation metaphor is based on the physical experience of orientation in space. In this conceptual metaphor SOMETHING-correlate is VERTICAL POSITION; SOMETHING-referent is an abstract concept ACTIVITY. Accordingly, SO-referent (ACTIVITY) is like SO-correlate (VERTICAL POSITION).

The gestalt of the event-related frame is the physical action of *vertical position* that causes a systemic association of activity like vertical position according to the context of the use of this metaphor. The gestalt does not

change, but the focus of attention goes beyond the matrix, changes and strengthens the meaning of the statement.

Building examples of conceptual metonymy

4. Metonymy part-whole:

Chekhov will be represented in the dramatic theater (the author instead of his work).

To create the matrix of this metonymic expression it is necessary to develop it, to construct to syntactically complete sentence: *The director represented the play by Chekhov in the theater*. There are three domains: DIRECTOR, THEATER and CHEKHOV'S PLAY. The domain CHEKHOV is developed by the partitive scheme of the possessive frame and the scheme *class-type* of a taxonomical (identification) frame in the subject frame where the domain CHEKHOV is primary IN RELATION to the secondary domain WORK.

The domain DIRECTOR is connected with the domain WORK by the contact scheme of the actional frame and participates in metonymic expression implicitly.

If we speak about the representation of works of Chekhov in the theatre, then we usually mean his plays, but not other kind of his work. So, the domain PLAY also is present at this metonymic expression implicitly.

The metonymic cognitive model is the structured concept where, between its levels, the replacement relations take place. From the matrix of this metonymic expression it is clear that the concept CHEKHOV is structured by the domains WORK and PLAY. Between the domains CHEKHOV and WORK, which are connected by possessive frame, there are relations of the whole and its parts, which, according to the principle of metonymic cognitive model, are in the relations of conceptual adjacency and can replace each other. So primary domain CHEKHOV replaces the secondary domain WORK (class) as domain PLAY (type).

The actional frame, which connects central domains, is not expanded. The subject frame is expanded by the partitive scheme of the possessive frame. The gestalt WORK as part is replaced by the gestalt CHEKHOV as the whole.

5. Causal metonymy:

*Stocks survive—and thrive—a year after **birth** of Fed 'paper' talk.*

We construct an event frame: *Childbirth as an event of the birth of a child*. The metonymic concept is based on this event frame. The concept sphere in this case is the BIRTH of the CHILD, which will be a network of related domains OBSTETRIC INSTITUTION, the medical STAFF, a PARTURIENT WOMAN, the BIRTH PROCESS, the BIRTH of a child, the CHILD (as a result of childbirth), etc.

On the basis of this concept sphere such domains as the process of CHILDBIRTH and the BIRTH of a CHILD that make up the matrix will be profiled. Two domains participate in the conceptual matrix of this event frame: the domain of AGENT (CHILDBIRTH) and the domain of PATIENT (CHILD). These domains are connected by the contact scheme of the action frame, which is deployed by one component RESULT (BIRTH of a CHILD).

Considering the fact that the related domains the PROCESS of CHILDBIRTH and the BIRTH of a CHILD belong to the same conceptual sphere, they are related concepts. The concept of the PROCESS of CHILDBIRTH is seen as a whole (reason), and the concept the BIRTH of a CHILD is seen as part of this process (consequence). The metonymic cognitive model is a structured concept between the levels of which there are substitution relations.

Thus, the concept of the PROCESS of CHILDBIRTH and the concept of the BIRTH of a CHILD in various language expressions replace each other. When constructing a metonymic concept on the basis of this event frame, CHILDBIRTH as a background (whole) is shaded, and the component of the action frame is profiled—the BIRTH of a CHILD.

6. Detailed metonymy:

Bullets whistled past (method of action instead of the action itself)

In this phrase, the verb *whistle* creates a conceptual metonymy—one of its meanings is to sweep with a whistle. To analyze this metonymic expression, we construct an event frame: *the bullet flew with a whistle*.

One domain takes part in the event frame: domain SOMETHING-AGENT (bullet). The action frame expresses an action as a state and is a state/process model of an action frame. The action frame is unfolded by one component METHOD-SO (with a whistle). The domain SOMETHING-AGENT (bullet) is not deployed (not structured by the subject frame).

The domain matrix unfolds only the action frame scheme MODE of ACTION (SO)—with a whistle, which gives us an understanding of how the action *fly* is carried out—expresses the fact of the action.

A metonymic cognitive model is a structured concept, and between its levels there are substitution relations. The metonymic model is a cognitive reflection of some part of reality on the basis of syntagmatic relations between the whole and its parts (in this case, the whole is the action *fly*, and its part—one of the ways of flight—with a whistle).

When constructing a metonymic concept based on a given event frame, the action frame to FLY as a background (whole) is flagged, and the component of the action frame METHOD-SO (with a whistle) is profiled.

Thus, this conceptual metonymy lies in the fact that the component of the action frame METHOD SO (with a whistle) substitutes for the whole action frame (to FLY).

7. Container-content metonymy:

You should drink at least 8 glasses of water in a day.

To analyze this metonymic expression, we should expand it into an event frame: *Someone drinks water, which is 8 glasses.*

The domain matrix consists of three domains: domain AGENT (SOMEONE), OBJECT (SOMETHING)—CONTENT (WATER) and SOMETHING as a CONTAINER (GLASS).

The domain OBJECT—the CONTENT (WATER) turns into the subject frame with the help of the inclusive scheme of the possessive frame that connects the domain OBJECT—CONTENT (WATER) with the domain SOMETHING as a CONTAINER (GLASS).

The domain SOMEONE—AGENT is connected with the OBJECT—CONTENT (WATER) by the scheme of the contact of the action frame DRANK.

When constructing a metonymic concept based on this event frame, the domain OBJECT (SOMETHING)—CONTENT (WATER) is flagged, and SOMETHING-CONTAINER (GLASS) is profiled. The gestalt WATER is replaced by the gestalt GLASS.

Conclusion

As a result of this reasoning we can say that gestalts depend on the categorical level of the idealized cognitive model. Each level of categorization of the idealized cognitive model is associated with a certain

character of gestalt for a particular type of concept. At the level of perception and organization of the prototype, the gestalt is an holistic image fixed by the word, combining imagery, sensuality and rational aspects.

The character of the gestalt in metonymic processes is based on the ability to replace adjacent (related in the sense of uniformity and pragmatics) images and related associations. The gestalt in metonymic processes is the movement of the point of view within the adjacent concepts.

At the level of metaphor, gestalts form the semantic content of the so-called abstract vocabulary. In metaphor, the use of gestalts is explained by the physical action and the emotional and psychological characteristics (sensory).

When considering the constructions of metaphorical and metonymic statements based on literal ones, the emphasis is placed on the basic action frame, because metonymic and metaphorical characteristics are associated with its certain parameters. These parameters are so different that it becomes obvious: the action frames functioning within the matrices in metonymic and metaphorical processes have different origins.

To sum up, it can be concluded that various approaches to the description of the cognitive mechanisms of metonymy cannot be considered as contradictory. It is obvious that the discrepancies between the stated approaches are mostly due to difference in terminology, and partly due the point of view and level of abstraction. Gestalts are associated with categorical levels of the idealized cognitive model. The gestalt is changing, increasingly abstracting from perception to metonymic, and then to metaphorical models of the concept. In the simulation of the domain matrix of the ontological metaphor and the domain matrix of the adverbial metonymy, it is possible to build a domain matrix with a single domain.

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CHAPTER ELEVEN

IDENTITIES IN RECONSTRUCTION: WALLS IN THE 20TH AND 21ST CENTURIES

NATALIA IUZEFOVICH

Introduction

“Reality exists, but so does the unconscious system of metaphorical thought that we use without awareness to comprehend reality”

George Lakoff and Mark Johnson. (2003). Metaphors We Live By

Walls have been constructed since time immemorial and their primary function was that of security, warding invaders off a certain territory. The oldest defensive barriers known are the Great Wall of China and Hadrian's Wall; both became World Heritage Sites in 1987. The Great Wall of China is not a single monolith but a series of walls and fortifications; its Chinese name *Ischáng Chéng* meaning ‘Long City’ or ‘Long Wall’:

“The word Chéng covers both 1. city; and 2. city wall. The Wall is rather more than a city wall, so Chinese add an adjective ‘long’” (Man 2008).

The dimensions of the structure were very important as a colossal solid structure was meant both to protect the people of the country and also to unite them as one nation. Due to this second function, the Chinese national identity was created. China is deeply-rooted, and self-centered, which is not unique, but from what I know it is only China that officially announces the superiority of the state in the name: *Zhongguo/Zhong Guo* means “Central Kingdom”. Such a huge construction as the Long Wall emphasizes the notion of a unified Chinese nation. Thus, both the name “Wall” and the physical object itself created the concept of Chinese superiority; and superiority of the state implies superior national identity, i.e. a feeling, a sense of belonging to the state and the nation as a whole, so personal identity implies a sense of belonging to a certain group, which is represented in

values, cultural and ethnic traditions, language and politics. Thus, political discourse is most representative of the way that identity is being formed, structured and changed.

It should be noted that city walls, as protective barriers, are not uncommon in many cultures; in medieval Russia, for example, a city-wall was called 'kremlin' ('city-citadel'). Fortification of countries and cities was necessary to be protected from invaders and barbarians; and residents walled themselves off from the outer world for safety reasons. Both functions, that of protection and unification of a nation or a country as a nation were of great importance, politically, economically. The residents of a city-wall got a sense of belonging to a community, so national identity was formed; the construction of a city-wall meant that people were both walled in (as a unique community, as "US" versus "THEM") and walled off as a means of security. Being walled off meant that the people were united and stronger as a nation; they were not scared of the "others" as they trusted the wall, their protection.

Obviously, in time out of mind, walls did provide reliable security but, due to the invention of sophisticated weapons, they were gradually losing their security qualities. However, they were not completely deprived of their capacity, on the contrary, as since the mid-20th century they have been getting more and more power, becoming even more functional: nowadays politicians insist on walling off their countries to keep out immigrants, aliens, and others, 'them', who are to be walled in and live within the so-called 'gated communities', in other words, walls protect countries from people looking for help.

And, most importantly, as the walls are getting more and more metaphorical power, they are constructing, reconstructing, and changing our mentality, and our mind. These mental walls turn out to be much more powerful than physical solid structures. Mental walls alter a human identity and not necessarily for the better: human values like tolerance, empathy, etc., seem to be now disappearing while such emotions as anger and hatred take an upper hand.

The given chapter presents some results of an ongoing research project on the "wall phenomenon" which is viewed as a marker of identity, both national and individual. Our globalized world is in constant movement, people are migrating, though not necessarily voluntarily; frontiers are being changed and a person is losing a sense of belonging to a community, i.e. identity while trying to belong to a new community. As language is one of the main tools of communication it is urgent that linguists' study linguistic properties within political discourse which is very manipulative and thus causing identity variation.

In this chapter, I argue that 1) the most crucial changes of identities have been observed since the middle of the 20th century up to the present date and these changes are revealed at large in the border wall issue; 2) the “wall phenomenon” as a marker of a human identity is very controversial and reflected mostly in political discourse; 3) no study on the issue “wall and identity” can be fully integrated without a socio-cognitive perspective; 4) the conceptual structure of “wall” is variable, dynamic, and it has been changing much due to political and socio-cultural context.

I claim that “wall off” implies an active role: we construct border walls with the intention to keep out others, ‘them’, strangers and enemies. If they manage somehow to get through the wall or come too close to us (not necessarily to attack but, as it does happen today, most often for help!) we, intentionally, wall ourselves off. And if they manage somehow to come too close we wall them in, create “gated communities” of outsiders labelled ‘aliens’ or ‘illegal aliens’. As we do not trust them we wall them in against their will or desire. And we do not think about the repercussions that will come next: constructing border walls in Europe for our security and protection in the long run promotes a ‘walled in’ identity of “us”. In other words, being walled off makes us mentally ‘walled in’, we do not recognize other cultures as human. Limited or no communication with peoples of other cultures make US view THEM not just as ‘others’ but more like enemies, terrorists, strangers threatening our happy homes. And, in the long run, our global world turns to be more hostile and aggressive, which is not beneficial for the life style of humanity.

To find out what is the impact of the “wall phenomenon” on human identity the following research questions were formulated:

1. What verbal means of representing the conceptual structure “wall” can be singled out from dictionaries and political discourse”? How are they interrelated?
2. What associations do these names make: positive, negative, neutral? Which predominates? Why so?
3. What promotes human identity variation?
4. What changes, in intercultural and intracultural relations, does the “wall phenomenon” cause?

The discussion of the aforementioned issues is really pressing today as we have been witnessing more and more antagonism, lack of tolerance, and cruelty in our contemporary world since the beginning of the 21st century. From the state of euphoria of post-wall Europe (1989, tearing down the Berlin Wall) we have moved to the stage of fear and anxiety, from “we-

identity” to “us vs. them identity”. Frontier walls create “walled-off” states and promote “walled-off” identity, “us”, while people seeking help are locked in gated communities and so “walled-in” identity is being formed.

Literature Review

It is important to specify the notion of identity as understood in this research: Our identity is being formed all our life. It reflects the way we see the world around us and feel about ourselves; how we relate to people within our community and of other cultures and our values. In the past several decades the interest in the “wall phenomenon” has been growing fast due to geopolitical and socio-cultural changes.

Recent theoretical developments have revealed the cognitive structure of the metaphoric nature of walls, vivid mostly in political discourse: *Walls as Political Metaphors* (Anastassov 2016), *The Metaphorical Wall* (Harrington 2005), *Britain as a container: immigration metaphors in the 2006 election campaign* (Charteris-Black 2006). The pragmatic force of metaphor, and its cognitive power, is central to critical discourse analysis, especially of political discourse as it is “concerned with forming a coherent view of reality” (Charteris-Black: 28). Politicians favor metaphor as it aids in forming the conceptual structure and content they need to impress their people: *Metaphor and ideology: Conceptual structure and conceptual content in Spanish political discourse* (Diaz-Peralta 2018); *Ideological and non-ideological metaphors: A cognitive-pragmatic perspective* (Maalej 2011).

Walls as barriers are most commonly associated with the reshaping of the world, reconstructing of frontiers, which is rather controversial: on the one hand it provides some opportunities for the restoration of national self-determination and, on the other hand, ethnic instability. Conflicts within post-communist states and beyond their borders are on the rise, as analyzed by Berg and van Meurs (2002) in the article *Borders and Orders in Europe: Limits of Nation- and State-Building in Estonia, Macedonia and Moldova*.

The examination of the EU external and internal frontiers shows that no integration seems possible, as discussed in *The Frontiers of Europe* (Anderson and Bort 2001). The issue of frontiers is strongly connected with identity. Though the Scottish referendum of 2014 voted “No” to independence, the threat of Irish secession showed “the failure to establish British Isles identity” (Op cit.). In the book “Divided Cities”, Calame and Charlesworth (2012) explain the social impacts of physical partition, and how political and social context changes the significance of walls in the mind of political actors.

The studies of the impact of the Berlin Wall, constructed and then torn down¹, shows most vividly how German identity (values, tradition, and, strange as it might seem, the language) was being transformed: *National identity in divided and unified Germany: continuity and change* (Ekman, 2001); *Separation after Unification, The Crisis of National Identity in Eastern Germany* (Staab 1996). The German language of the German Democratic Republic was under the impact of Soviet ideology and had to adopt many Soviet politically loaded words. The two German languages and divided identities of once united German identity are analyzed by Stevenson in *Language and German Disunity: A Sociolinguistic History of East and West in Germany 1945–2000*; he also presents some political loans:

“*tshekist* (a KGB member) in peoples’ minds represented the concept of an enemy” (Stevenson 2002; 63).

The feelings of many Germans towards the Berlin Wall during the Cold War period are summed up in the “Wall of Shame” metaphor (Braun 2011). From a divided Germany and, thus, divided identity they came to a united German identity but the reverse process turns out to be not less painful than division, especially for elderly people. The Wall did not just divide the country into ideologically opposing territories but, worst of all, it promoted serious psychological problems, similar to that of Korea’s division. The issue was discussed at large at the Congress on the German Unification of the Korean Psychological Association in Seoul (Kohr 1993).

Crucial changes in European identity of the post-Second World War Europe started in the second half of the 20th century due to geopolitical changes marked by the Berlin Wall. The impact of the Berlin Wall on the world is most often discussed in the terms of identity variation in research books by many scholars: *Separation after Unification, The Crisis of National Identity in Eastern Germany*: (Staab 1997), *National identity in divided and unified Germany: continuity and change* (Ekman 2008), *German Unification: A Nation Divided* (Bangel 2014), etc.

The experience of the division of a nation, like the case of Germany, proves that the “wall phenomenon” made a strong impact on the language, see, for example, *Language and German Disunity: A Sociolinguistic History of East and West in Germany 1945–2000* by Stevenson (2002); the variability of the German language in the cold war period was one of the most popular research topics of Russian and German linguists.

¹ “Tear down this wall!” said U.S. President Ronald Reagan in West Berlin on Friday, June 12, 1987, calling for the leader of the Soviet Union, Mikhail Gorbachev, to open up the barrier which had divided West and East Berlin since 1961.

Nowadays in the context of Trumps' border wall and Brexit turmoil the issue of identity is one of the most urgent: it looks like we must give credit to Trump for it was he who activated the issue of walls. His rhetoric is a never-ending research topic of prominent scholars: for example, articles *Understanding Trump* (Lakoff 2016), *Trump has turned words into weapons. And he's winning the linguistic war* (Lakoff and Duran 2018). Trump's aggressive rhetoric is demonizing the "wall phenomenon" turning it into 'hate speech': *A great and beautiful wall. Donald Trump's Populist Discourse on Immigration* (Demata 2017) and populist though: *Donald Trump and the language of populism* (Hunston 2017); *With wall, Trump tries turn metaphor into reality* (Gerson 2019); *Is Donald Trump's wall is a physical wall or just a metaphor?* (May 2017).

It is crucial for this project to emphasize that the "wall phenomenon" as a marker of identity reveals its metaphoric power mostly within political discourse which, in its turn, is interrelated with all spheres of our life, though we are not always eager to understand it. Politicians, by means of their language, do have a strong impact on our everyday life, on our mentality, mapping the world and our conceptual system. The "wall phenomenon"—whether it is a real wall, a border frontier wall, or a metaphoric wall in the head, constructed by laws, like Brexit, it crushes identities, languages and cultures: *Europe's New Identity: The Refugee Crisis and the Rise of Nationalism* (Postelnicescu 2018).

As Lakoff and Johnson emphasize in *Metaphors we live by* "our conceptual system is not something we are normally aware of. ... Since communication is based on the same conceptual system that we use in thinking and acting, language is an important source of evidence for what that system is like" (Lakoff and Johnson 2003: 4). Through linguistic expressions we can get, to a certain extent, of course, inside our cognition to understand how concepts are being structured, and which metaphors make up the base of our conceptual system. There are "structural metaphors, cases where one concept is metaphorically structured in terms of another" and orientational which "organize a whole system of concepts with respect to one another" (Op cit., 7).

The linguistic science of the last decade has been marked by a social turn approach; the usage-based studies have always been recognized but they were limited to a certain extent methodologically and the usage was not always understood as authentic real discourse. A social turn announced an integration of cognitive linguistics, sociology, psycholinguistics and other related sciences into cognitive sociolinguistics also called 'social cognitive linguistics'.

In the context of cognitive sociolinguistics, it is most important to single out axiological conceptual properties that, as a rule, are not usually found in dictionary definitions, thus, the usage-based analysis implies a turn to natural speech, to discourse. The discourse of the “wall phenomenon” most often foregrounds negative emotive feelings such as anger and hatred. The higher the level of hostile feelings an individual reveals, the more likely it will result in aggression, as is described in the paper of Wilkowski and Robinson (2010), *The Anatomy of Anger: An Integrative Cognitive Model of Trait Anger and Reactive Aggression*. The physiology of human emotions is one of the source domains of metaphor (Kövecses 2003), thus considering emotive adjectives specifying feelings is relevant for the metaphor research.

The metaphoric power of the “wall phenomenon” reflects the variability of socio-cultural context; we can understand and experience geopolitical changes, as well as identity variation in terms of the walls. Ideologies formulated by politicians in the context of political discourse can be considered complex cognitive systems, which prioritize our way of thinking and values. As Scharts and Gutiérrez-Rexach (2002) argue in *Conceptual Structure and Social Change: The Ideological Architecture of Democratization*, it is a cognitive-based model that accounts for the ways in which ideology accounts for social changes in current contexts.

Cognitive modelling has become one of the major issues of studies by contemporary scholars, and the cognitive turn started decades ago has proved to be very efficient in studying language and its role in society. Cognitive modelling aides to better understanding various cultures which is relevant for efficient communication in our diverse world. For example, in *Cognitive Modelling in Language and Discourse across Cultures*. Baicchi and Pinelli (2017) analyze the interrelation between idealized cognitive models and language across fourteen European and non-European languages thus making it vivid that conceptual metonymy and metaphor models can be imported as the tools for the production and interpretation of multimodal communication.

The cognitive aspect of identity transformation due to the impact of a wall as revealed in political discourse has not been discussed at large so far in Russian linguistics (Iuzefovich 2018; 2019) and that makes the research relevant.

Material and Methods

The research is based on the paradigm of cognitive sociolinguistics: sociolinguistic reality is represented in discourse which reflects world view, culture, and social frameworks; the “representation of the world and

perceptions of social relations are processes of a cognitive order” (Moreno-Fernández 2017: 59).

The corpus of the empirical data is composed of the material selected from monolingual dictionaries, both English and Russian, media political publications, including both elite and non-elite discourse (van Dijk 1993) discussing the “wall phenomenon”, and the data of social cognitive psycholinguistic experiments (word associations). It comprises dictionary definitions, transcripts of political speeches, Forum discussions, follow-ups, twitters, interviews, functioning in the English-speaking community (both of native English speakers and the speakers of English as a second language), and also Russia’s community of the period of 2014–2019.

The validity of the research is grounded by a composite methodology and the variety of genres of the empirical material collected from elite and non-elite discourse. Contemporary political discourse includes not only speeches, interviews, and twitters of public figures but also the genres of the non-elite: commentary, letters to the editor, and follow-ups. Follow-ups are understood as

“Communicative acts in and through which a prior communicative act is accepted, challenged, or otherwise negotiated. The discourses under investigation comprise political discourse across spoken and written genres considering the discourse domains of political interview, editorial, op-eds and discussion forum” (Fetzer 2015: XIV).

It is mostly from follow-ups that we learn what common people think, how they feel about identity, security and the wall, thus, we can understand if the ideas of politicians are really supported by the community:

“Follow-ups recontextualize an object of discourse from its prior context to an ongoing context. A follow-up involves a stance-taking, positioning, and negotiation of meaning. ... writers express their stance through axiological adjectives, explicit positioning, and various communicative acts, as well as by affective, and ironic expressions” (Johansson 2015: 83).

As an interdisciplinary and intercultural study, the chapter employs a compositional methodology, combining the methods of social cognitive linguistics, psycholinguistics and corpus linguistics, employing both quantitative and qualitative analysis of the corpus of empirical data: cognitive dictionary definition analysis, cognitive-discourse analysis, contextual analysis. Social cognitive linguistics methods include word association experiment and face-to-face interview (Moreno-Fernández 2017: 145–178).

One of the approaches to the analysis of a conceptual structure of the “wall phenomenon” as the central concept in modelling US vs. THEM concept, as well as interconnected concepts like FEAR, SECURITY, ANGER, etc., is the Trajector vs. Landmark approach based on Ronald W. Langacker and discussed at *Foundations of Cognitive Grammar: Theoretical prerequisites* (Langacker 1987). The terms Trajector and Landmark describe the semantics of such linguistic names that denote simple and complex events: the Trajector is moving, either literally or metaphorically, and undergoing changes in relation to another object, the Landmark. So far this methodology has not been considered in this research and it will be employed at the next stage of the given project.

Following the approaches of some contemporary scholars’, dictionaries are considered as a mini-corpus which registers the words known to the community in question and represents the so-called naive world mapping: as dictionaries do not provide encyclopaedic knowledge, the definitions map most common knowledge (Mascot 2017). Cognitive analysis of dictionary definitions makes it possible to single out the means of representing the concept “wall”; its main conceptual characteristics, pragmatic value, and character as static or dynamic, thus adapting to political changes. Socio-pragmatic analysis is employed to regard communicative elements (context, speakers’ age, education, implications) which have an impact on the meaning of the word used and reveal to a certain extent the essence of the identity of the speaker. Discourse analysis specifies the genre of the empirical material under study. Social cognitive and psycholinguistic methods, such as word association experiments and face-to-face interviews provide the basis of emotive association data. To find out the frequency of emotive connotations associated with the “wall phenomenon”, corpus linguistics analysis, viz. Concordance (AntConc) was used.

As definition analysis of both English and Russian monolingual dictionaries reveals, the key conceptual feature of the lexical unit “wall” is ‘a solid dividing construction meant for safety or for enclosing something’. An identical concept is also named a *barricade, barrier, block, fence, hedge, line, restriction, obstruction*, etc. or, similarly in Russian, *barier, zabor, zhivaia izgorod*, etc. English Dictionaries provide more lexical variants naming the concept ‘dividing surface meant for safety’, than the Russian ones, for example, the name *line* meaning ‘border barrier’ is not registered in Russian dictionaries (*Maginot Line, Siegfried Line*).²

There is another interesting cultural difference in definitions: English

² English Dictionaries give the information considered encyclopedic in the Russian lexicographic tradition

dictionaries do specify the function of ‘protection’, while Russian dictionaries define *walls* mostly as buildings or fences but no specific security function is mentioned. For centuries the main function of all the aforesaid structures used to be that of protection from invaders but in a contemporary world other dominant functions are revealed: protection from immigrants and control. The function of ‘control’ is specified by *Longman Dictionary of Language and Culture*, this new meaning appeared due to the ongoing geopolitical changes and which proves that meanings reflect the reality; the word ‘*barrier*’ means

“Something that is used to keep people apart or to prevent or control their movement” [Longman 1998: 88].

Also, in English the concept ‘wall’ implies territories and places meant for isolation: *enclosure* (keeps wanted animals in), *exclosure* (keeps unwanted animals out), *sanctuary*, and *reservation*. These names function either in a positive way: good purposes, like a sanctuary,

“*For animals to live unharmed*” (Op.cit, 1132),

or pejoratively: freedom deprivation as in a *reservation*,

“In the US a piece of land set apart for Native Americans to live on” [Op cit.].

There are metaphoric terms in English dictionaries and they give more insight into the “wall phenomenon”: *Iron curtain* (the barrier between the West and the Soviet Union), *Bamboo curtain* (the barrier between the West and the East), and “*Cold war*” (the war of ideologies). These metaphors reflect the processes of the ideological war known now as the information war: the atmosphere of mistrust is being created by politicians, which leads to intolerance and hate reflecting our identities.

In political discourse the word ‘wall’ is not as popular as it used to be: considering the negative emotions some people feel about the border wall, Trumps introduces variations of the name assuming they will make people more positive: *steel slats*, *steel slats wall*, *steel slats border wall*, *steel slats fencing*, *steel slats wall border fencing*, assuming that by changing the word he might get more supporters.

The “wall phenomenon” is revealed through diverse discourses: *financial and economic (money to build but no immigrants—more jobs)*, international relations (some people would not be let in—bad people, but

somebody good too), *human core values* (family separation, democracy), *cultural* (the American nation is not unified). All the named spheres are coordinated by and within *political discourse*; new terms are formed or updated to reflect the reality. One of the recent events is the longest in history, the US government shutdown, and the reason—no consensus on the money to pay for the wall construction. Political diversity is seen in the terminology:

“Republicans demanded more money for Border Patrol agents and necessary fences. Democrats argued for better surveillance technology and more resources at the ports of entry.

Senators from both parties also agreed on money for technological improvements along the border. The bill allocated \$3.2 billion for drones, infrared ground sensors and long-range thermal imaging cameras to give Border Patrol agents advance notice when migrants cross illegally, especially at night. It also included money for an electronic employment verification system for all employers and upgrades at airports to catch immigrants who overstay their visas.”³

In the quoted example, the conceptual structure ‘wall’ is represented by such notions and their respective names as *Border Patrol agents, fences, better surveillance technology, technological improvements, drones, infrared ground sensors, long-range thermal imaging cameras, an electronic employment verification system*. The essence of the notion ‘wall’ is to block the way and not let anybody in, so Border Patrol agents and all the technical devices do perform this function. Qualifying adjectives are used to feel positively about the wall; it is described in an appealing way as a human being: *beautiful* (very popular with Trump), *nice*; or as a real protection: *tall, massive, concrete, precast concrete going very high*; the adjective *great* reminds all of a popular slogan “Make America great again”, appealing to patriotic feelings.

A recent feature is now put forward: artistic:

“We are not building a Concrete Wall, we are building artistically designed steel slats... Our Steel Slat Barrier which is totally effective while at the same time beautiful!”⁴

³ Retrieved from: <https://www.nytimes.com/2019/01/23/us/calexico-border-wall.html/> Accessed March 10, 2019.

⁴ Retrieved from: <https://www.npr.org/2019/01/11/683920624/once-a-fence-later-slats-almost-always-a-wall-trumps-border-wall-contradictions/> Accessed March 10, 2019.

All of the language, singled out from dictionaries and political discourse, represents various constituents of the conceptual structure “wall”. They are all interrelated; the dictionaries very seldom mark the words pragmatically, like, *offensive*, or *derogatory*. Cultural notes are found only in the Longman Dictionary of Language and Culture (Longman 1998), so the emotional evaluation much depends on a reader’s background knowledge, like about the words ‘reservation’ or ‘enclosure’—keeping in to be unharmed to control.

Summing up: the central notion of the conceptual structure “wall” is that of ‘creating a barrier, a physical object of various size and shape, thus, the variety of names are registered; some barriers are not seen, they are physical objects and they might be more powerful as the identity marker, as they show your worldview (Iron Curtain—which side are you at?). It seems that the major function is that of protection, walling off the enemy; but not least important, though not as much vivid, is the function of control: not letting people out. Like the Iron Curtain which actually walled the citizens of the Communist country in not giving them an opportunity to travel to the other side of the Curtain.

The English language is changing fast and no dictionary can be fast enough to reflect the recent changes, especially of associations and connotations which are very important characteristics of the “wall phenomenon”. Obviously, to understand the true meaning of a word is not possible unless we consider the context of its usage following a textbook aphorism “the word is known by the company it keeps”. The analysis of the meaning of the “wall phenomenon” is represented in the discourse under study is presented in the next part.

Discussion

Considering the world geopolitical context of to date, as well as our past, we have to admit that the “wall phenomenon” has been grounded through differing historical periods reflecting time, society issues (political and social), ideology and, most importantly, identity, both individual and national. Walls as phenomenon do strongly affect our mentality, our world mapping, and to a certain extent most spheres of life in our contemporary world. It is the walls that have made the questions of identity really crucial; a person is viewed as “self”, “other”, “strange”, “foreign”, “different” or “alien”.

The best proof supporting this statement is the Berlin-Wall in Europe. The construction of the Berlin Wall was politically grounded: cutting off East Berlin separated ideologies that led to the changes of values, goals, way of life and identity. Watching Berlin Wall documentaries on YouTube we

learn the associations most Germans remember about the Wall when they were deprived of freedom, choices, and individuality: *Rise and Fall of the Berlin Wall*, *East Berliners Jump to freedom and Cross the Berlin Wall*, *The Wall That Shook the World*⁵, etc. That period was crucial for Eastern Germans: they were to adapt their individuality to survive.

Cutting off East Berlin created a Soviet zone to **wall in** East Berliners who were not allowed to move to the West, as Communist politicians claimed the citizens were protected from the harmful impact of bourgeois ideology. Thus, the main function of the wall was that of control, not letting people out. YouTube provides many documentaries of the time: the wall constructions started at night, some people did not hesitate to jump down from their windows, and some died trying to escape. In the commentaries and following up documentaries, people share their emotions and the younger generation learns about this page of their history.

In follow-up commentaries to *Rise and Fall of the Berlin Wall*, the viewers discuss their countries', not necessarily Germany, past and present and find connections; all the further quotations of follow-ups are retrieved on February 15, 2019 from <https://www.youtube.com/watch>⁶:

1. *Artemis Arrow 8 months ago*: Capitalism: build walls to stop people from coming in. Communism: build walls to stop people from getting out.

2. *Paul han (sic!) 4 months ago*: As a Korean, I wonder whether my country can be reunified like that again. After the fall of the Berlin Wall, we were also very enthusiastic and optimistic that same thing will soon happen in Korea's DMZ as well, but no luck. Tensions only getting worse. Always makes me sigh when I think about this.

What is very special about follow-ups is human support; reading some sad commentary, other readers are eager to give advice, say something friendly in their responses, like the one quoted above Paul han (*sic!*) follow-up⁷:

1. *Bootyful giraffe 2 months ago*: Paul han i wish the complete best for you. I have research a lot into south and North Korea and i can only say how much i wish the best can happen for the North Koreans.

⁵ Allusive title, cf., John Reed *10 Days that Shook the World* (about Russian Revolution of 1917)

⁶ The spelling and grammar of the follow-ups is not changed; it is exactly like in the original

⁷ All follow-ups are retrieved from <https://www.youtube.com/watch/> Accessed Feb 15, 2019.

2. *Carter Smith 1 month ago*: As an American, I wish you luck and hope that your country will reunite soon and I hope you'll remember that a lot of our greatest changes came through times of hardship. Just because times are hard doesn't mean you should give up hope. If anything there's a greater chance that people will be fed up with the bad and have that much more drive to do what's right.

Followers also come to a very important conclusion: that history, the events of the past and the events to date are interrelated, if you forget your past, it comes back. The following quotations of follow-ups are randomly selected from various documentaries on the topic, each retrieved from February 15, 2019 from <https://www.youtube.com/watch>:

1. "History repeats itself. Now Trump wall. Humans are silly".
2. "We need to do the same to that wall in Israel/Palestine".
3. "That's what the other side of the wall looked like. I've only ever seen it in videos and pictures from the west side, not the east".

Gradually, East Berliners adapted to their walled in life, some of them joined the Socialist Unity Party which they trusted and really believed in the ideals of socialism, and, for them, tearing down the Wall turned out to be the most crucial event of their life. There were East Germans who were happy with the Wall as they associated it with a better life, like the mother of Norbert Polster who was happy with the wall, unlike her son, a 37-year-old East Berlin native, who spent his first 16 years in an apartment facing the Wall. His mother was faithful for East Germany's ruling Socialist Unity Party and loved her country so after the Wall her life was crushed:

"She was very sad. With the wall gone she lost her beliefs, her life, and her job" (Braun 2011).

Looking for the associations German people still have, or used to have, about the Wall in a face-to-face interview is not really possible for a Russian scholar. It is still a touchy issue for the elderly people in Germany. The same is true about some Russians who have lots of anger and hatred to Nazis. It is very controversial, as anger does not prevent some people from getting the benefits from the enemy; thus, the wall is still inside their heads. And there is still a wall, a very solid *unbreakable mental wall* which is constructed by politicians, and propaganda brainwashing.

However, the younger generation is quite different; they never witnessed any of the tragic events of the 20th Century. Those Russians who spent their childhood in East Germany because their parents were serving in the military recollect that time with pleasure but it was quite different during

the events of the demolishing of the Berlin Wall. Russians recollected their childhood feelings of getting really scared watching some Germans burning Russian textbooks, celebrating the “death” of the Wall. For Russian kids it was shocking, they could not comprehend what was happening to the people who used to be so friendly. It was like a wall of hatred created by the Berlin Wall become physical; luckily this wall of hatred was soon broken.

“No Berlin-Wall” Europe led to a state of euphoria, a new geopolitical space, no borders, Schengen zone, freedom of movement, and, thus, quite a new identity. Walls are disappearing; everybody was optimistic about this new Europe named *post-wall Europe*, as it was specified by President of the European Council, Herman Van Rompuy, in his speech, *Post-Wall Europe–Nach-Mauer Europa* (van Rompuy 2013).

Humans cannot live in isolation long. Like words, humans are known by the company they keep, their life style, and family. Living in society one cannot ignore the laws and rules of society whether you support them or not. Any social or socio-political changes will have a strong impact on the identity of an individual. The Berlin Wall stage is one of the best examples of the preceding statement. The construction of “No Berlin-Wall” Europe was very painful; and one of the powerful clichés of political discourse of the cold war period was still important: *A Nation Divided*. Previously, it meant East-West Germany (the Berlin Wall division), and in the 1990s it was claimed that the Unified Germany was mentally still divided into East and West. The issue was discussed at large by media as for example, in the following announcements of publications:

1. “German Unification: A Nation Divided. 19.11.2014. In the early euphoria following the fall of the Berlin Wall in 1989”.⁸
2. “Germany: Still a Divided Nation? 09.11.2016. The wall between East and West Germany disappeared 27 years ago, but when it comes to everyday life there are still considerable differences”⁹

Building of a common European identity: one of the main difficulties of creating a new Europe was the mental wall that had become very strong and powerful. To live in a common European home, you need a new identity: cosmopolitan, tolerant, able to choose, respecting law and freedom. And, not as fast as people had been hoping for, post-Wall Europe started

⁸ Retrieved from: <http://www.zeit.de/> Accessed March 10, 2018.

⁹ Retrieved from: <http://www.dw.com/en/germany-still-a-divided-nation/> Accessed March 10, 2018.

changing to Europe for all, multiculturalism was pronounced as one of the important human values, and a new identity was being formed.

The 21st Century came and brought more troubles: terrorist attacks, immigrants' waves, etc. From the state of euphoria of post-wall Europe (1989, tearing down the Berlin Wall), we moved to the stage of fear and anxiety, to walled off countries and gated, walled-in, communities of people looking for help.

The phrases *The Nation divided* and its variation *A/the divided nation* turned out to be key words during the presidential campaign in the US, the Brexit referendum, and the going on debate on border wall issue in the US. These phrases have become names for the metaphoric walls separating people within each country. *The Nation divided* is understood as the wall of discontent between people, residents are separating within each nation into US and NOT US.

The American presidential campaign of 2016 seemed to be just a divide between Republicans and Democrats, and their supporters: both Hilary Clinton and Donald Trump were said to be engaged into crimes, like tax evasion. Thus people voted not so much for the candidate but against the candidate they liked least. The campaign got Americans *strongly divided*:

“25.10.2016. Poll Shows a Nation Divided. A new poll portrays America as a deeply divided nation with a sizable number of citizens who think its best days are behind it.”¹⁰

The results of the election turned out to be so unpredictable and, for many, the US got even more divided:

“CNN: A nation divided. 27.11.2016 CNN/ORC poll: A nation divided, and is it ever.”¹¹

It is the walls debate initiated by Trump in his running for president campaign that made the American nation divided.

Not once did then candidate-for-President Trump pledge to build “a great and beautiful wall”. This started a wave of discussion, whether he really meant, a real wall or a metaphor; the debate is still going on. There are, of course, those who take his words literally: *It is a real wall*:

¹⁰ Retrieved from www.usnews.com/.../ahead-of-election/ Accessed Feb 10, 2018

¹¹ Retrieved from: <https://edition.cnn.com/2016/11/27/politics/cnn-poll-division-donald-trump/index.html> Accessed Feb 10, 2018.

7 April 2017: “Other GOP members of Congress are taking the president at his word literally and are expecting Trump to deliver on his commitment to the wall. “When you say a wall, you mean a wall. You don’t use it a euphemism”.¹² (Retrieved from: www.salon.com/)

Some of his supporters, though, are sure he means a metaphor:

A Trump Official Explains **The Border Wall Metaphor** 27 April 2017¹³

2. “**Border Wall is A ‘Metaphor’ according to GOP Senator.** 26 April 2017 Republican Senator Ron Johnson said that a continuous *wall* along the U.S.-Mexico border may not be necessary as long as the Trump administration approaches border security in a “thoughtful manner.”¹⁴

So far Trump’s pledge is still a dream, while his opposition is getting stronger. The protesters say that the border wall is contradicting the values of democracy and the traditions that Americans are so proud of. The coalition of US organizations opposing the border wall is growing: saying it would not protect their friends, colleagues, families, and themselves, but makes all live in fear. The values and characteristics of the American nation and identity are being changed under the pressure of contemporary political discourse, the discourse of fear, anger, and hate. And this is happening due to Trump’s rhetoric impact, whether in public speeches, or twitters (his favorite genre), and follow-ups where he and his supporters provide more variations of conceptual characteristics of the “wall phenomenon” and more qualifying attributes. Trump admires his border wall and calls it a “great and beautiful wall”, while Senator Warren, Massachusetts, calls the wall “stupid”. Thus, the associations the names make depend much on the individual worldview and on the political identity: they range from neutral, indifferent to negative and hateful, or they are just positive. Human identity changes with the worldview change and mentality change or, sometimes due to the need to become adapted to the changing surroundings.

Trump is very innovative also in compiling a string of synonyms for the word ‘wall’, assuming he gets so much obstruction in getting finance just because they do not like the word itself. So, he uses such words as *barriers*, *fences*, *fencing*, *slats*, *bollard fencing*, *electrified border fence*, *lethal fence*, *a fortified wall*, *steel slats*.

¹² Retrieved from: <http://www.salon.com/> Accessed Feb 10, 2018.

¹³ Op cit.

¹⁴ Retrieved from: <https://thelibertarianrepublic.com/border-wall-metaphor-senator/> Accessed Feb 10, 2018.

He tweeted a new rhyming slogan that is supposed to help getting finance to have his dream realized: “*Build a Wall & Crime Will Fall.*” One of his recent innovations, journalists are mocking at, is “peaches” as another name for the wall:

ABC News

✓@ABC Jan 12 2019

“Pres. Trump says Democrats can call the proposed border wall whatever they want. ‘Name it ‘peaches.’ I don’t care what they name it. But we need money for that barrier.”¹⁵

Donald Trump’s zero tolerance policy is opposing Angela Merkel’s “open border migration policy”, a very human policy which has almost failed because of spreading terrorism. People are getting more and more anxieties and fears. And, because they are scared they want more walls, so we are losing our “we-identity”, the identity of friendliness, compassion, and empathy. We are afraid, so we do not want any them in our place, we *wall ourselves off*, so our mentality, our identity changes for *walled in*, we become egocentric, we want learn nothing about cultures, we are angry and scared:

“The walls erected at borders protect people not from barbarians, but from anxieties and fears” (Bradatan 2011).

The “wall phenomenon” is strongly connected with the increase of racism, violence and hatred, xenophobia: the first country to be represented as an enemy is Mexico:

“I will build a great, great wall on our Southern border. And I will have Mexico pay for that wall. Mark my words.” It didn’t take long for crowds at his rallies to chant, “Build that wall, build that wall!”¹⁶

And, most importantly, the conceptual structure of the ‘wall phenomenon’ includes the notion of people, especially migrants, immigrants, and asylum seekers, who are represented as a danger to any country where they go for help. New names for the wall replica often create negative feelings, and were noted in the previous part, there are scientific studies proving that negative emotions might lead to aggression:

¹⁵ Retrieved from: <http://abcn.ws/2D1JcTW/> Accessed Jan 16, 2019.

¹⁶ Op cit.

It's Not a Wall,' but Steel Slats and Barbed Wire Roil a Border Town: "This is not a war zone," Ms. Hurtado said from her tax and immigration consulting office in downtown Calexico, from which she can peer into Mexico. "I've had a business here for 30 years and we've never needed the barbed wire. Why now? To me, it feels as if I'm enclosed."¹⁷

As the studies show, walls might intensify the problem of security instead of solving it: scared people would not listen, the feeling of fear is dominant. Sociologist Douglas Massey and his colleagues discussed the case of the United States-Mexico border militarization from the 1980s and found that the militarization did not prevent migrants from making an undocumented cross:

"What the added security—and thus added risk of additional trips—did do ... was reducing their likelihood of making the return trips, which had been a regular part of migrant behavior in previous decades. In other words, a wall designed to keep migrants out might very well end up keeping more migrants *in*" (Vanderbuilt, 2016).

From the aforesaid, it follows that those migrants who come to earn money and then go back could not do it, because the border walls keep them from getting out so they end walled in. The controversy of the security wall has been singled out in many cases by many scholars. Consider, for example studies on crime rates: some are establishing that crime rates might be even higher in walled communities, like the study of police reports in a Durban suburb by a South African criminologist Monique Marks¹⁸:

"Where anxious homeowners had gone on a spree of wall building, crime rates were higher than in a neighboring, largely unwalled suburb ... High walls hide the house from the view of criminals, but also hide criminals from the view of police. There can be no "eyes on the street" when no one can see the street" (Op cit.).

Trump's wall policy is crushing not only human identities; it is disastrous for the ecology, the aftermath of such a huge construction is destroyed animals' habitat, and forestry. Human relations, and thus identities, are being changed: we see not people but asylum seekers and refugees who, in our scared mentality, become terrorists, criminal aliens,

¹⁷ Retrieved from: <https://www.nytimes.com/2019/01/23/us/calexico-border-wall.html> Accessed Feb 20, 2019.

¹⁸ <https://www.nytimes.com/2016/11/06/opinion/sunday/the-walls-in-our-heads.html>

and the like. The US and many countries are more and more divided because of Trump's rhetoric of hate and racism, people with disabilities, or transgender. His sexual derogatory slurs started Women's marches not only in the US but nearly everywhere in the world, women and men participants, people of many races and ethnicities marched together, almost everyone wearing a 'pussy hat'¹⁹.

Another wall, the repercussions of which are also tragic for the British nation, is the Brexit division, or Brexit wall. Pro-Brexit results of the election might have happened because so many young people and educated people did not take part in the elections, while the elderly generation was brainwashed with promises of a better economic situation. Strange as it might seem for a Russian audience, anti-Brexit protest marches of the UK residents were supported by many European countries (as protest marches in the US). People in Europe and the US, common people and celebrities, know we all make up a part of one whole world, another reason is quite practical: Brexit will limit free movement within the Shengen zone. Young British women were seen with the posters "My boyfriend is German".

Media announcements reflect vividly the UK division, another nation divided:

1. The UK is now two nations. 23.06.2016 The UK is now two nations, staring across a political chasm. John Harris ... EU referendum: welcome to the divided, angry Kingdom.²⁰
2. UK votes to leave EU after dramatic night divides nation.²¹
3. A disunited Kingdom... 26.06.2016 why Brexit Britain is as divided as Europe in 1914. This weekend, Britain is more disunited than at any point in living memory. ... The Brexit reveals how deeply divided our supposed 'One Nation'.²²

¹⁹ Pink pussy hat is a symbol of solidarity and support for women's rights and political resistance. The Pussy hat project is a social movement which aim is to raise awareness about women's issues and human rights.

²⁰ Retrieved from: <https://www.theguardian.com/commentisfree/2016/jun/23/united-kingdom-two-nations-political-chasm-left> Accessed Dec. 10, 2018.

²¹ Retrieved from: <https://www.theguardian.com/politics/2016/jun/24/britain-votes-for-brexit-eu-referendum-david-cameron> Accessed Dec. 10, 2018.

²² Retrieved from <https://www.telegraph.co.uk/men/thinking-man/a-disunited-kingdom-why-brexit-britain-is-as-divided-as-europe-i/>. Accessed Dec. 10, 2018.

Because of the dynamic character of the conceptual structure “wall” it is not really possible to establish the exact quantity ratio of ‘pro-wall’ and ‘anti-wall’ people. The ratio is constantly changing, mostly due to some negative events, like building explosions, or intruders. The same is true about establishing the ratio of the contexts of “border wall is a metaphor, a symbol of a better protection but not a physical object” and “border wall is a real construction, a barrier.” Much depends on the knowledge structures that are changing due socio-political changes. Thus, safety and protection should not make us separated and isolated from other cultures, when the mentality of an individual is ‘open to the world’ s/he reveals the identity of tolerance and respect to other cultures.

Trying to get inside people’s minds is done by means of word association experiments followed by face-to-face interviews which are considered method of socio-cognitive linguistics (Moreno-Fernandez 2017). A word association experiment was conducted in Germany (November 2016–January 2017) and Russia (October 2016; February–March 2017), the participants were bachelor students (18–19 years old) and master students (24–27 years). The age was considered important as a marker of a social experience. The respondents were asked to write several words that come to mind seeing such lexical units *as wall, fence, barrier, line, fort* and respectively, in Russian, *stena, zabor, ograda, barrier, fort*. Then the issues were discussed in the face-to-face interview. Most of the respondents were my students so the atmosphere was friendly relations and relaxed.

The younger respondents said that solid structures such as walls give them the feeling of safety. Master students already knew that walls would not save them but walls do give them the feeling of danger, “if there are walls, the danger is close” ... Russian students, unlike Europeans, did not have many troubles with asylum seekers so they see walls mostly as protection of their houses, and territory.

The knowledge structures activated obviously come from collective memory, and individual experience: in the 20th century, Soviet broadcasting propaganda told a lot about new Soviet weapons that would protect Soviet people from the enemy (i.e. the capitalist world); the more they talked of safety, the more scared the young people became, we did not feel secure, even children would ask questions about the third world war. Nowadays in Russia, many fences of various types are being created, for protection, as they say. These walls are only around expensive buildings, where affluent people live. You cannot get inside through the gate, it is locked, you must be invited, and your kids cannot get to their yard to play with their children, unless invited.

Such structures show vividly a very sharp division of Russian society of to date: those who have and those who have less or nothing at all. I presume we might single out collective identity, the collective identity of Russian affluent people and the collective identity of Russian not-well-to-do people, and the antagonism between these social groups increases.

As a spatial metaphor, the wall is represented in media through physical properties: “high”, or “massive”, the size is important to protect the territory; those who want to get to another territory are supposed to be scared away, thus the concept of fear is being created.

The “wall” metaphor is a container metaphor of identity as it contains the concepts relevant to the understanding of how a person feels about himself/herself, how they relate to the community; how they relate to a variety of physical objects meant, like the wall as a physical body limiting the territory, to urgent socio-political issues. Representing migrants as illegal aliens, or as unwanted migrants, etc. brings to mind knowledge structures of terrorism, and aggression. The wall concept is changing and gradually it started to contain more and more concepts: migrants as job seekers depriving Americans of job. Then, migrants as Muslims, hence terrorists (the violence is on the rise). Not all migrants are Muslims and not all Muslims are terrorists but that is how they are represented in the media creating concepts of Fear and Anger.

This chapter investigates the role of the “wall phenomenon” in contemporary political discourse viewing the wall as a metaphor representing identity in a domain of societal importance: political and socio-cultural policy of security and human relations. The wall metaphor, through its synonymous names used in political discourse, is shaping that understanding and reasoning that is relevant to politicians.

Obviously much depends on the identity of the person whose knowledge structures are activated, and too many pejorative words create pejorative images and the like meaning.

Due to its radial structure, the wall metaphor includes relative concepts which are interrelated; the conceptual characteristics and associations of the “wall phenomenon” have been changing under strong impact of geopolitical changes; and the role of politicians, public figures cannot be underestimated. “We-identity” of a “common European home” period has not survived global political changes: “remapping” of Europe made some people move to other places, military conflicts and terrorist incidents are increasing. “Open border politics” of tolerance is also gone: multiculturalism seemed to be a proper human idea but not all cultures were eager to adapt to it, so refugees and asylum seekers are viewed most often as terrorists, or criminal aliens.

Human identity is viewed in the terms of *us*, *good people*, and *them—strangers, others, foreign*. The spread of terrorism leads to military campaigns, destruction of settlements and refugee or asylum seekers crossing the borders. Consequently, human values of democracy and freedom started to change making human mind, world view and identities different.

The epoch of the 1990s, when we were crushing the walls trying to create a common European home, is gone, and now we are facing the time of building more and more border walls everywhere: protecting our borders with other countries, protecting ourselves from migrants who turned from people into enemies. Crushing the walls, we also crushed isolated identities and created new, open to the world identities, but it looks like we are turning back.

The research on the topic is to continue to establish new means of making people more conscientious in case of danger; studying the real sources of danger we will get to the ways of getting rid of that danger, sometimes imaginable but not real. It is important to understand the cognitive mechanisms that make people view other people as “them”, deride “them” as migrants, asylum seekers, and displaced people, in other words, we should remember that “we” are “them” for some other cultures. Why not look for ways to make us all “we”?

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SECTION C.

**COMPUTATIONAL APPROACHES
TO MEANING CONSTRUCTION**

CHAPTER TWELVE

A LINGUISTIC ACCOUNT OF PUBLIC TEXTUAL CYBERBULLYING

AURELIA POWER

The Problem of Cyberbullying

Cyberbullying is one of the most common forms of online challenging behavior, affecting populations across many aspects, such as, age, culture, and religion (Hinduja and Patchin 2014), although it is more likely to occur among young Internet users (Livingstone et al. 2011; Livingstone et al. 2014). It has been shown that it adversely affects the emotional and psychological wellbeing of the victim(s), which, in severe cases can lead to serious pathological issues, such as depression, self-harm, suicide ideation, and suicide attempt (Sourander et al. 2010).

One of the most common types of cyberbullying is textual cyberbullying, achieved by means of text sent over a network. This type of cyberbullying has been associated with more severe effects, given that text can remain in cyberspace for an indefinite period and the negative effects are intensified by its pervasive nature (Lagos 2010). Additionally, in the case of textual cyberbullying that occurs in the public domain, a single offensive message can become an instance of public humiliation, since the audience can increase exponentially by being re-posted or re-tweeted numerous times.

Thus, addressing the problem of cyberbullying is not only of paramount importance, but it also faces many challenges. For example, identifying what constitutes cyberbullying is associated with many conceptual issues, authors are still debating as to what are the necessary and sufficient conditions of cyberbullying, although the widespread view is that cyberbullying must satisfy four necessary criteria: intention of harm, repetition, power imbalance between the victim and the bully, and the electronic medium (Hinduja and Patchin 2009). Nevertheless, some authors have questioned whether repetition is a necessary element of public cyberbullying (Dooley et al. 2010; Grigg 2010), while others have adopted a relaxed view of this criterion

(Langos 2012; Power et al. 2017, 2018), that is, repetition can be satisfied by a post or message simply being viewed multiple times by the victim.

The challenges are not, however, limited to what constitutes cyberbullying and an important aspect of textual cyberbullying that has been ignored is the linguistic aspect, despite that cyberbullying is in fact language interaction. Therefore, we argue that undertaking a qualitative analysis of the language used in cyberbullying is a necessary step in identifying those linguistic features that characterize cyberbullying and, consequently, the building blocks of an efficient detection system. Our linguistic investigation is informed by the same view expressed previously (Power et al. 2017, 2018) that the presence of explicitly rude or offensive terms (or expressions) does not suffice for categorizing a message as cyberbullying and it must contain additional linguistic elements that link them to a person or group of people. Moreover, some messages do not contain explicit rude or offensive messages, yet they still qualify as cyberbullying instances.

The Dataset

To carry out our linguistic analysis we used a dataset^{1,2} consisting of a total of 2038 messages that originate from ASK.fm among which 475 were instances of cyberbullying. The dataset was acquired from two sources: from Kavanagh's research (2014) on cyberbullying detection and from datasets from Hosseinmardi et al. (2014a) and Hosseinmardi et al. (2014b), from which we randomly selected a continuous portion. The resulting dataset contains the conversations of 16 users organized as pairs of questions and answers. These conversations are mostly characterized by flaming or online fight, where insults and hurtful messages are exchanged.

From a textual perspective, the dataset contains public textual cyberbullying instances that are representative of explicit (such as profane, insulting, and violent) forms, but also of negated and animal metaphors, and simile-based forms of public textual cyberbullying. We use this dataset to support our discussion of cyberbullying language at distinct linguistic levels: orthography and vocabulary levels where most changes are noticeable, as well as grammatical, semantics and pragmatics levels.

¹ We used the same dataset in two previous studies (Power et al. 2017, 2018).

² The examples from the present dataset that we provide throughout this paper were anonymized, that is, real names were replaced with fake ones, and any information that might identify the users, such as places or phone numbers, was removed.

sender's true emotions, in many present instances of cyberbullying, smileys do not seem to indicate the sender's true emotions, a fact also noted by Ptaszynski et al. (2014), in which case they may indicate sarcasm. For instance, the sentence *You r fucked up! :) x* contains a smiley that normally would express happiness or a kind smile - ☺, but here it is in total contrast with the intention of harm of the words; moreover, it contains a symbol that expresses a kiss—*x*—which, again, its typical function is to express affection, but here it is in contrast with the intended meaning of the words contained in the message.

Lexical Level

Internet language is said to continuously change and make a large contribution in terms of vocabulary additions such as neologisms, inflected forms, and variants, especially in the form of slang and playful adaptation that are related to specific areas of the Internet or dedicated activity websites (Crystal 2011). Accordingly, cyberbullying language is also subject to continuous change, and we found that neologisms and slang terms are good indicators of cyberbullying since they typically serve to avoid detection and/or to capture the speed and spontaneity of speech. This is also reflected by the multitude of online dictionaries and databases that attempt to index and to update terms related to cyberbullying such as profanities, offensive terms and expressions, hate and violent terms and expressions (Urban Dictionary 2019; NoSwearing 2019), as well as abbreviations, and acronyms (InternetSlang 2019). Because cyberbullies attempt to avoid detection by forming new words or attaching various harmful meanings to already established ones, it is difficult to obtain a true frequency of the usage of these newly formed dictionary entries, with redundancy and nonce use being some of the most common causes; as a result, they also tend to become obsolete quickly, making it even harder to identify certain neologisms and terms used only in online communication.

Nevertheless, several common word formation techniques can be identified in textual cyberbullying, such as affixation, substitution, and truncation. An example of affixation is the lexeme *UNCUT* which is the result of adding the cluster *un* before the lexeme *CUT* to form an adjective that conveys different semantic contents somehow related to the original root, that is, “intact, or not trimmed, or undiluted, or unedited” (Oxford Dictionaries 2019), or “not circumcised” (UrbanDictionary 2019), while a frequent example of substitution is the use of the digit 8 to replace the cluster *ate*, like in *L8R* which stands for *later*, or *h8* which stands for *hate*

(InternetSlang 2019). An example of truncation is TMRRW which is one of the shortened forms of the lexeme TOMORROW (NoSwearing 2019).

But the most common techniques found in our dataset are acronym³ formation and abbreviation. Acronym formation allows new lexemes to be formed by simply taking the initial letters of the words in a given expression, while abbreviation forms a new lexeme by taking a group of letters from a word or expression (Kracht 2008). For instance, *WTF* stands for *what the fuck*, while *ANON* stands for *anonymous* (InternetSlang 2019). One reason for the high incidence of this technique may be that acronyms and abbreviations allow online users to approximate to some extent the spontaneity and the speed that are characteristic of face to face communication. Another reason may be to avoid detection, for instance, deliberately acronymizing obscenities and insults.

Grammatical Level

Morphologically, we found no evidence of instances of inflectional morphology. However, there is a high incidence of words that are misspelled. This phenomenon may occur either deliberately, as a function of speed enhancement or as a function of avoiding detection, or accidentally, as a function of user proficiency. Errors commonly found were due to repeated letters (*killll*), or transposition (*prikc*), or missing/wrong characters (*fck*, *betch*). The use of informal variations, such as *ya* or *u* (which stands for the pronoun *you*), or *r* (which stands for the conjugated copula *are*, the present inflected form of the verb *be*) was also found to be quite frequent.

In terms of syntactic categories, a consistent feature of our dataset is the use of personal pronouns, such as *I*, *you*, *she*, *he*, *they*, *him*, *her*, *his* etc., as well as the use of proper nouns or names, which makes cyberbullying a clear personal attack. The use of personal pronouns can potentially make a message more offensive or hurtful when used in conjunction with profanities or offensive expressions, since it is explicitly directed at a person (Yin 2009). For instance, in the sentence *You are stupid*, the personal pronoun *you* is used as the subject of the sentence, while in the sentence *I will kill you*, the personal pronoun *you* is used as the object of a verb *kill*. Equally, by using someone's name/username the intention of harm or to cause offense is explicit. For instance, the sentence *Brendan is stupid* is more likely to be hurtful, since it identifies a certain person, unlike the sentence *Ugly business!*

³ We include initialisms as a subtype of acronyms.

Other syntactic categories that we found in the present dataset are nouns and adjectives used in copular and noun phrases constructions to describe persons, as well as intransitive verbs that apply to people and transitive verbs that take persons or personal characteristics as direct objects. This is especially the case of explicit forms of public textual cyberbullying. Some examples of how nouns, adjectives and verbs can be used to target a victim are shown in (1):

1. a. *You are a fat nigga* constitutes a copular construction in which the noun phrase *fat nigga* contains an adjective and a noun that together are meant to insult a person.
- b. *Stupid girl!* is a noun phrase that contains an insulting adjective, *stupid*, and a person referring noun, *girl*, which together are used to hurt the victim.
- c. *I hope you die* is a sentence where *die* is an intransitive verb that in online context applies to people, unless specified otherwise or used in a metaphorical sense; this is further underlined by the personal pronoun *you*.
- d. *I hate you* is a sentence in which *hate* is a transitive verb whose direct object is the personal pronoun *you* (and in an online interaction can only refer to a person).
- e. *Shut your mouth* contains the transitive verb *shut* whose direct object is the nominal phrase *your mouth* (again, in an online interaction, it can only refer to a person's mouth).

Additional characteristics of textual online communication apply to sentence structure. Particularly, the use of short simple sentences was found to be quite common in texting, tweeting, and chatting, which it is believed to be a function of length constraints in such settings (Crystal 2011). This phenomenon could be also caused by the need to capture some of the spontaneity and speed of speech. Moreover, the different levels of typing proficiency could constitute another factor for which sentences are shortened, as shorter sentences may allow slower users to keep up with general pace of the conversation in a chat setting (Crystal 2011). Similarly, we observed that in our dataset messages tend to be short. For example, many instances, such as *Dickhead!*, are one-word and can be in fact backed by copular constructions: *You are a dickhead*. We also noted a strong tendency to use imperative structures, since they allow discourse to be shortened. For example, the instance *Die!* is an imperative sentence that has no explicit subject.

Other features that we found to characterize public textual cyberbullying interactions are related to grammatical correctness. For instance, the lack of

agreement between the subject of a sentence and the verb, in terms of person and number (typically in English), is quite common in chat and discussions on social networks. Again, this may be explained by the lack of language proficiency, given that on such networks many users are not native speakers of English.

Semantic Level

In our dataset we observed instances of lexical ambiguity through homonymy and polysemy relations. For instance, the ambiguity in the sentence *I had a fag at the party last night* is ambiguous due to the word *fag* which can mean either *cigarette*, or *homosexual* (Oxford Dictionaries 2019). But ambiguity can arise due to the sentential structure also, such as in the sentence *I'll beat that bitch with the adidas bag* which can be interpreted either (1) "I'll beat that bitch who carries an adidas bag", or as (2) "I'll beat that bitch using the adidas bag as the weapon of beating".

This ambiguity is also reflected by the two different parse interpretations: (1) (S (NP (PRON(I))) (VP (will beat) (NP (that bitch with the adidas bag)))) and (2) (S (NP (PRON(I))) (VP ((will beat) NP (that bitch)) (PP (with the adidas bag))))^{4, 5}.

Moreover, vagueness or the lack of specificity (Birner 2013) is quite common in cyberbullying since it allows discourse to be shortened and, thus, increase communication speed. For instance, in the sentence *That nigga posted twice this week* the noun phrase *that nigga* is vague in the sense that it does not specify gender, that is, it does not say whether it is a female or a male.

Pragmatics Level

We investigated the role of pragmatics in cyberbullying language to understand additional stylistic meanings, speech act meaning and emotive meaning which supplement the conceptual baggage of a lexeme or the truth conditions of a sentence that are typically provided at semantic level (Kracht 2008). We thus focus on several pragmatic aspects: discourse, presuppositions, deixis, anaphora and cataphora, cooperation, and speech acts.

⁴ In this context, S represents sentence, NP–noun phrase, PRON–personal pronoun, VP–verb phrase, PP–prepositional phrase.

⁵ These parse interpretations can be further expanded; for instance, the prepositional phrase *with the adidas bag* can be further broken down into a preposition and a noun phrase: (P (with) NP(the adidas bag)), and so on.

Discourse

Discourse in public textual cyberbullying is the message or the conversation itself⁶, since the physical environment constituted by the actual surroundings of the conversational participants plays virtually no role in communication. Previous messages in particular are important in separating discourse-old information—already used earlier in or inferable from conversation, from discourse-new information—just introduced in a conversation, as well as in distinguishing between hearer-old—information believed by the speaker to be known to the hearer which does not need to be introduced in earlier discourse, and hearer-new information (Birner 2013; Prince 1981). For example, in the conversation fragment shown in (2) *Helen* refers to a new discourse entity, since it has just been introduced in the conversation, while the personal pronoun *she* co-refers to the old entity that has been introduced by means of the name *Helen*:

2. U1: I saw Helen.
U2: Really?
U1: She looks rotten.

But the contribution of discourse is also important in identifying inferable information introduced in previous discourse (Prince 1981). Accordingly, the meaning of some public textual cyberbullying instances can only be determined pragmatically based on antecedent instances, such as in the case of pronominal reference. For example, *Pig!* taken on its own cannot be labelled as cyberbullying since it is not clear whether it is directed at a person.

However, if previous discourse is considered, a decision can be made with regards to whether the instance should be labelled cyberbullying. Thus, if it was preceded by the affirmative sentence *You eat too much*, the message is most likely cyberbullying, since the implied referent can now be identified as the personal pronoun *you*. On the other hand, if it was preceded by the question *What animal says oink?*, the instance *Pig!* is an answer to the previous question, and it does not constitute cyberbullying.

⁶ We adopt Agne and Tracy's view on discourse (2009) who consider it in a broader sense as referring to entire conversations or dialogues, as well as single sentences.

Presuppositions

Presuppositions are important pragmatic elements of cyberbullying language since they allow implicit assumptions about the world, beliefs, attitudes in utterances for which their truth is taken for granted, and, allegedly, known by both, the speaker and the listener (Birner 2013; Kracht 2008), or, in cyberbullying context, by both conversational participants. For example, the sentence *I hope your mother will rot in hell* implies that the expression *your mother* has a referent and that the victim has indeed a mother.

Presuppositions are closely related to the shared background information and they are part of the common ground of discourse, which explains how they hold in some contexts, but not others (Stalnaker 1978), particularly in the case of Internet communication, where people from all around the world connect, but not necessarily share the same experience, knowledge or beliefs. For instance, many instances we encountered in online exchanges contain slang terms that become communicatively appropriate only when the slang terms are known by both conversational parties, such as *feck*⁷, which is a term used within Irish communities, and it is part of their shared common ground knowledge.

Deixis and Anaphora

Deixis and anaphora are pragmatic phenomena related to reference and they are relevant to cyberbullying detection since they help identify victims. Deixis is a linguistic function that ‘points’ to an entity or property found in a given linguistic context and which cannot be interpreted without reference to certain contextual features (Birner 2013). Examples of deictic expressions that we found in the present dataset are shown in (3):

3. a. Say it to my face!
- b. I bet you haven’t heard this crap before.

(3a) is an example of personal deixis and is relative to the person who uttered the sentence, while (3b) shows an example of discourse deixis through the demonstrative *this* which is relative to the discourse entity *crap*.

⁷ The verb *feck* was initially used as a synonym of *steal*, however, in time it became a frequent milder expression to replace the obscene term *fuck*.

On the other hand, anaphora⁸ describes the linguistic phenomena in which one expression co-refers with another expression that provides the referent, without which it would be difficult to determine what is the former expression referring to (Birner 2013). An example of anaphoric instance from our dataset is *Lena is stupid; she can't even spell*, where *she* is an anaphoric pronoun that has the same referent as the proper name *Lena*.

Cooperation

How language in cyberbullying is perceived as harmful, from the perspective of both the listener/hearer (corresponding to the victim or bystander) and the speaker (corresponding to the cyberbully), can be understood in relation to the Cooperative Principle (Grice 1989) which states that conversational participants are cooperative, and that effective linguistic interaction is governed by four maxims: (1) the maxim of quantity—by which enough should be said, but not too much, (2) the maxim of quality—by which only what is believed to be true should be said, (3) the maxim of relation—by which only what is relevant should be said, and (4) the maxim of manner—by which what is said should be clear, brief and unambiguous.

Very often, the language encountered in public textual cyberbullying violates or ignores at least one of these maxims. The maxim of quantity is violated by either saying too much or too little, like in the case of sending repeatedly unwanted information, or being in a chatroom without participating. The maxim of quality is commonly violated or ignored since cyberbullying is often associated with spreading rumors and lies. Violating the maxim of manner is the most common in our dataset being expressed as using offensive, aggressive and threatening language. Finally, the maxim of relevance is commonly found to be violated by sending messages having irrelevant content to deliberately annoy someone.

Speech Acts

Speech acts (Austin, 1962; Searle 1969, 1976) play an important role in cyberbullying detection, particularly the primary illocutionary force, which is the realization of the speaker or the user's communicative intent (such as stating, complaining, promising, demanding, etc.). Using Searle's taxonomy

⁸ A similar, but much rarer, phenomenon is cataphora: while in the case of anaphora the referent is provided earlier in the discourse, in cataphoric situations, the referent is provided afterwards in the discourse (Birner 2013). However, in our dataset we only found anaphoric instances.

of speech acts (1976), we found mostly instances of assertives, directives and commissives, but also few instances of expressives. On the other hand, we found no instances of declarations. Each of the four types of speech acts are exemplified in (4):

4.
 - a. *You are ugly.* (assertive)
 - b. *Fuck off!* (directive)
 - c. *I will box the head of you.* (commissive)
 - d. *I hope you rot in hell.* (expressive)

Identifying the illocution or communicative function of a given utterance, however, can prove to be difficult, due to several factors (Birner, 2013; Kracht, 2008). Firstly, an utterance can have many overlapping communicative functions, such as the utterance *There are too many people on this chat* which can be simply an assertion, or a request to leave the chatroom, or a warning. Secondly, identifying the illocutionary act may require knowledge of the context in which a sentence was uttered. Thirdly, a sentential grammatical structure can express many speech acts, and vice versa. An example of such ambiguity is the utterance *Give me a chance!* which, as an imperative sentence, can express a demand, a suggestion, or advice. Conversely, the speech act of demanding can be realized by means of a wide variety of grammatical sentence structures. Such sentence structure diversity is demonstrated in (5)⁹:

5.
 - a. I want you to leave this chatroom.
 - b. Please, leave the chatroom!
 - c. It's time you left this chatroom.
 - d. Why don't you leave this chatroom?
 - e. I hope you leave this chatroom.

Among the instances shown in (5), there is only one expressed explicitly as imperative—(5b), and that represents an example of a *direct speech act*, since it is the most obvious way (or the most direct way) of realizing a directive. The other examples are considered *indirect speech acts* (Searle, 1969) since they use a less conspicuous structure to demand *leaving*. The distinction between direct and indirect speech acts can also be seen in replying to such demand:

⁹ The sentences in (5) are adaptations of the sentence *There are too many people on this chat* for demonstration purposes.

6.
 - a. No.
 - b. I am chatting with someone.

While (6a) constitutes an explicit refusal to leave, (6b) conveys refusal by implying that the person is performing a behavior that excludes the behavior of *leaving*, that is, *leaving* is mutually exclusive or temporarily incompatible with the action of *chatting with someone*, and the two cannot be both performed simultaneously.

But, at the same time, the utterance *I am chatting with someone* also conveys the truth conditional meaning that someone is chatting with someone else. This poses the question of which meaning one should adopt, although they do not exclude each other. To address this issue, Searle (1969) proposed that an illocutionary act is, in fact, a function of the communicative intent (the illocutionary force¹⁰) of refusal, as well as the propositional content expressing the literal or the truth conditional meaning of the utterance, since both are essential components of the meaning and represent the necessary conditions for the realization of a speech act which can be formalized as follows:

7. $F(S, p)$ ¹¹

Accordingly, each type of public textual cyberbullying speech act can be formally described using general purpose predicates that capture the illocutionary force, as well as the proposition:

8.
 - a. Assertive: BELIEVE(B, p).
 - b. Directive: WANT(B, V does p).
 - c. Commissive: INTEND(B does p).
 - d. Expressive: $P(B, p)$.

¹⁰ Searle (1969) describes the illocutionary force in terms of seven components: the illocutionary point, the degree of strength of the illocutionary point, the mode of achievement, the propositional content conditions, the preparatory conditions, the sincerity conditions and, finally, the degree of strength of the sincerity conditions.

¹¹ F is the illocutionary force, S represents the speaker, and p is the propositional content.

In (8) *p* represents the proposition, *V* is the victim—the receiver¹² of the message, and *B* is the bully—the sender¹³ of the message, while *BELIEVE*, *WANT*, and *INTEND* represent the typical psychological states of the bully associated with assertives, directives, and commissives, respectively. For example, the instance *She is ugly* is an assertive that can be formally described as *BELIEVE*(*B, V is ugly*), where the proposition *She is ugly* can, at least in theory, be evaluated as true or false¹⁴. The directive *Shut up!* can be formalized as *WANT*(*B, V shut up*), whereas the commissive *I'll cut your throat* can be formalized as *Intend*(*B cut V's throat*). Finally, the expressive *I hope your mum dies* can be formalized as *Hope*(*B, V's mum dies*).

Interaction between Linguistic Levels

In practice, separating the linguistic levels of cyberbullying interaction proves to be quite difficult and the boundaries are often blurred, suggesting that they are in fact interdependent (Birner, 2013). A frequent case of interdependence is inferential reasoning¹⁵ in which, grammatically, the lexical use of a single constituent, such as noun phrase, can be inferred based on similar uses of that constituent; however, pragmatically, it can be argued that the inferential relation is the result of discourse-old information (Birner, 2013). An example of inferential reasoning is the verb phrase ellipsis in the sentence *You should go on a diet and your boyfriend too* where the verb phrase of the second clause is omitted since it can be inferred from the verb phrase of the first clause—*go on a diet*.

Another type of linguistic interdependence is pronoun resolution which is typically treated as an interaction of between syntax, semantics, and pragmatics (Huang, 2004). In textual cyberbullying, anaphoric pronouns are commonly used to co-refer to linguistic expressions that were encountered

¹² We replaced the term *hearer* with the term *receiver* since in the context of online communication it more accurately describes not only hearing, but also viewing messages.

¹³ Similarly, we replaced the term *speaker* with the term *sender* since in the context of online communication it more accurately describes not only speaking, but also typing and sending messages.

¹⁴ Whether the proposition *She is ugly* can be evaluated as true or false is dependent on many extraneous facts, such as whether one can identify who the pronoun *she* refers to, and what constitutes *ugliness*.

¹⁵ Inferential reasoning can occur at sentential or propositional level in the form of resemblance relations, cause-effect relations or contiguity relations which are realized by means of cohesion mechanisms such as ellipsis, anaphoras, substitution, or parallel structures in general (Birner, 2013).

earlier in discourse and a viable analysis would require further pragmatic information¹⁶ from the linguistic context provided by the discourse itself.

These interdependence phenomena indicate that the problem of cyberbullying cannot be effectively addressed using separate linguistic modules corresponding to isolated linguistic levels and, in fact, the cyberbullying problem may benefit from a monostratal linguistic approach that identifies textual cyberbullying patterns based on a unified view of grammar. Thus, we argue that separation and modularity should be sought elsewhere, in the stylistic forms of cyberbullying, where linguistic levels (orthography, morphology, syntax, semantics and pragmatics) are treated interdependently in terms of their contribution to each cyberbullying form.

Stylistic Forms of Public Textual Cyberbullying

Public textual cyberbullying can take various stylistic forms, the most common encountered in our dataset being explicit terms and idioms, negation, metonymy, metaphors, and similes. In the present dataset, profane, offensive and violent terms were used to hurt the victim in several ways: (1) by directly referring to that victim (*fucktard* or *idiot*), (2) by invoking sexual behaviours or demanding sexual gratification (*you sucked any random fucker* or *When can we fuck?*), (3) by asking uncomfortable questions about the victim's private life (*How often do you masturbate?*), (4) by invoking violent events (*I hope you burst into flames* or *You deserve to die*), and (5) by invoking violent threats (*I'll box the head off you*).

But explicit terms were also used in metonymic¹⁷, metaphoric¹⁸ and simile¹⁹ structures. For instance, explicit terms were often used within metonymies that describe the PART-WHOLE relation, specifically, the

¹⁶ In our view, pragmatic information from physical context is not relevant to cyberbullying interaction since it occurs in a virtual environment.

¹⁷ Metonymy is said to represent a 'stand for' relation between a source meaning and a target meaning within the same conceptual domain (Lakoff and Johnson 1980, 2003). Some conceptual metonymy relations include PART-WHOLE, PERSON-ROLE, and REPRESENTATION-REPRESENTED (Fauconnier and Turner 2002).

¹⁸ Metaphor, on the other hand, is said to occur when the conceptual structure from one domain (the source domain) is applied or mapped to a different domain (the target domain) (Lakoff and Johnson 1980, 2003). The relationship between the two conceptual domains is unidirectional in metaphor, mapping always occurring from the source domain to the target domain.

¹⁹ Similes can be viewed as metonymic or metaphoric copular structures that make use of the additional prepositions *like* or *as* (Sullivan, 2007).

BODY PART-PERSON relation, as shown in (9a) and (9c)²⁰, while in metaphors they were used typically to map from the BODY EFFLUVIA conceptual domain to the PERSON conceptual domain, as shown in (9b) and (9d), respectively.

9.
 - a. *You are a twat.* (metonymy)
 - b. *You are a piece of shit.* (metaphor)
 - c. *You look like a dick.* (metonymic simile)
 - d. *You look like crap.* (metaphoric simile)

However, metaphors were not restricted to explicit forms of public textual cyberbullying in which the source domain is typically represented by the BODY EFFLUVIA conceptual domain. In fact, the most common metaphor source domain that we observed in the present dataset is the ANIMAL domain which was used to ascribe animal characteristics and behaviours to the victim(s):

10.
 - a. *You are a skunk.* (metaphor)
 - b. *He looks like a donkey.* (metaphoric simile)

In (10) the conceptual source domain of ANIMAL is applied to the target domain of PERSON; this is achieved by mapping from specific animals, represented by the terms *skunk* and *donkey*, respectively, to people, represented by the pronouns *you* and *he*, respectively.

Grammatically, the most common types of metaphorical constructions²¹ we encountered were copular constructions (especially equations), where

²⁰ Because we subsequently use the WordNet lexical database where the BODY PART is represented as a distinct conceptual domain with a distinct semantic structure, we argue here that it is computationally more efficient to treat the BODY PART-PERSON metonymic relation as a mapping between the BODY PART and the PERSON conceptual domains. Thus, (9a) and (9c) can be treated similarly to conceptual metaphors, where mapping occurs from the BODY PART conceptual domain (the source) represented by the explicit terms *twat* and *dick*, respectively, to the PERSON conceptual domain (the target) represented by the personal pronoun *you*. Similarly, in (9b) and (9d) the mapping occurs from the BODY EFFLUVIA source domain, represented by the explicit terms *shit* and *crap*, respectively, to the that of PERSON target domain (*you*), leading to the conceptual metaphor A PERSON IS A BODY EFFLUVIA.

²¹ A comprehensive analysis of metaphorical constructions was advanced by Sullivan (2007), including simple constructions, such as domain constructions, compounds, predicate-argument constructions, prepositional constructions and

the head noun phrase evokes the source conceptual domain (PERSON), while the copula linked noun/adjective/prepositional phrase evokes the source domain, as demonstrated in (9a-d), and (10a-b). But predicating modifier constructions where the modifier (adjective, adverb, participial, or noun) evokes the source domain, and the noun/verb/adjective head evokes the target domain were also found, such as *Your shitty sister is fat*. Other constructions were predicate-argument constructions, such as *Your idea stinks*, and prepositional constructions, such as *Eewwww, that snout on your face*. In the former case, the target domain is evoked by the head noun phrase *your idea* which acts as the subject argument, and the source domain is evoked by the predicating conjugated verb *stinks*, while in the latter case, the source domain is evoked by the head noun phrase *that snout*, but the target domain is evoked by the noun/noun phrase within the prepositional phrase *on your face*.

Other common²² forms of cyberbullying in our dataset use negation and do not invoke the use of explicit terms or idioms, rather they use neutral or positive terms in conjunction with negation triggers to convey hurtful meanings. Some examples are shown in (11a-b):

11. a. No one likes you.
- b. You r not pretty either.

We also encountered few cyberbullying instances that use the comparative forms of positive connotations modifiers, as well as contrast. For example, *She is ten times better than you* is an instance of a positive modifier comparative structure that uses the positive characteristics of a different person to belittle the victim. On the other hand, *I think she looks like a man* is an instance that uses contrast to convey that the female person (denoted by the pronoun *she*) has masculine characteristics (denoted by the noun *man*).

A Linguistically Motivated Definition of Public Textual Cyberbullying

Overall, there are several linguistic predictors of textual forms of cyberbullying that our analysis uncovered. First, acronyms, abbreviations, substitutions, and slang neologisms, as well as misspellings and incorrect

copular constructions, as well as more sophisticated constructions, such as multi-source domain constructions, multi-target domain, etc.

²² These forms were in fact the second most common in our dataset.

grammar are very common in textual cyberbullying. Secondly, cyberbullying is more likely to identify victims using specific syntactic categories, such as personal pronouns or proper names. Thirdly, explicit forms of public textual cyberbullying are expressed using (1) profane/obscene language (for example, *cunt*), (2) insulting/offensive language (for example, *stupid*), and (3) violent language (for instance, *kill*). Fourthly, implicit forms of public textual cyberbullying tend to be associated with more complex literary devices and figures of speech, such as negation, animal metaphors/similes, the use of comparatives forms of positive modifiers, and contrasting. Finally, in both, explicit and implicit, forms, bullies target a specific person or group of people. Given these patterns, a definition that posits the necessary and sufficient elements of public textual cyberbullying can be formulated as follows:

12. **Definition:** *A given public textual instance can be classified as cyberbullying if it contains or can infer the following three elements: (1) the personal marker/pointer, (2) the explicit or implicit dysphemistic element, and (3) the cyberbullying link between the personal marker/pointer and the dysphemistic element.*

The personal pointer refers to the element that is used to identify or point to the victim(s), while the dysphemistic element refers to what has been defined by Allan and Burridge (2006) as the “word or phrase with connotations that are offensive either about the denotatum²³ and/or to people addressed, or overhearing the utterance” (p.31); finally, the link between the previous two elements refers to the element through which the dysphemistic element targets the victim(s) identified or pointed to by the personal pointer.

The characteristics of explicitness and implicitness are inherent characteristics of the dysphemistic element and, in this case, they refer to whether cyberbullying instances contain explicit (profane, offensive, or violent) terms/expressions or whether they use implicit techniques such as negation, animal metaphors, or animal similes. However, the three necessary elements need not be explicitly present in a given instance, once they can be inferred from the sentential structure or the previous online discourse. For example, in the sentence *You are a cunt*, the dysphemistic element is explicitly present and realized as explicit profane language, but, in the sentence, *You are not smart*, although the dysphemistic element is

²³ Here, by *denotatum* is meant what the speaker/sender refers to, while by *connotations* is meant the set of semantic meanings related to the denotatum and the contexts associated with the denotatum.

explicitly present, it contains no explicit cyberbullying language. On the other hand, the instance *You clearly are*, although it does not explicitly contain the dysphemistic element, was labelled public textual cyberbullying, and it was only when we considered the previous message *I am not pathetic*²⁴ that the dysphemistic element could be identified in the form of the offensive adjective *pathetic*. Thus, the instance can be resolved to the fully formed sentence *You clearly are pathetic*.

Other aspects of our definition that need to be further addressed relate to linking the conceptual underpinnings of cyberbullying in general—intention of harm, repetition, power imbalance between victim and bully, and the medium of the internet (Hinduja and Patchin 2009)—with the three elements of the present definition.

The first element, fundamental to any type of bullying (Hinduja and Patchin 2009; Olweus 1993), is the intention of harm and here we argue that the use of explicit or implicit dysphemistic language by itself does not guarantee that an instance is cyberbullying; to be considered cyberbullying, a given instance also needs to target someone specifically (the victim). Slang terms, swears, or rude expressions in general do not constitute public textual cyberbullying on their own²⁵. It is the combination of the (explicit or implicit) dysphemistic language, the personal pointer, and the fact that the two are linked that makes an instance cyberbullying, thus satisfying both the criteria of intention of harm and power imbalance²⁶. Take, for example, the instances in (13):

13. a. You are a piece of shit!
- b. Shit! I forgot to email him.
- c. Shit happens all the time.

All instances contain the word *shit* which is an example of profane language, however, only (13a) and (13b) contain personal pointers in the form of personal pronouns *you*, *I* and *him*, respectively. Moreover, only (13a) contains the link between the personal pronoun *you* and the word *shit*, since *you* is the subject of the verb phrase *to be a shit*. It, thus, follows that

²⁴ This message was posted by a different user.

²⁵ Although, one could argue that this could cause offense regardless whether it was intended or not.

²⁶ It can be argued that in that moment in time when the victim hears/sees the message (even in the case of online fighting when the roles of victim and bully can be often and quickly alternated) the victim may feel hurt and powerless (even for a brief moment), thus the power imbalance.

only (13a) is an instance of cyberbullying using the present definition of public textual cyberbullying.

In the same time, the fact that these criteria are discussed in relation to instances occurring in a public Internet domain, they implicitly satisfy the criteria related to the electronic medium (Hinduja and Patchin 2009) and that of repetition, since repetition in the public domain an instance can remain indefinitely in cyberspace, and, thus, a victim could potentially view it repeatedly (Lagos 2010).

The Personal Marker/Pointer

Personal pointers are terms that refer or point to a victim or victim's characteristics, family, possessions, ideas, either on their own, or part of a phrase. When explicitly present, they are typically expressed as personal pronouns, a notable exception being the first person pronouns (one cannot bully himself/herself), proper names, and screen names. At other times, cyberbullying instances contain only dysphemistic terms or expressions, yet they can still qualify as cyberbullying, because they can only refer to people. For example, the following instance *Retard!* can be labelled as cyberbullying, since the term *retard* can only refer to a person. Thus, certain common nouns that can only refer to people, such as *child*, *woman*, *idiot*, can also act as personal pointers. Additionally, the explicit presence of the personal marker is not required, once it can be inferred from other elements, such as the structure of the sentence. This is particularly the case of imperative sentences where the subject can be dropped²⁷. For example, in the sentence, *Rot in hell!*, the inferred subject is a person, since only people can be addressed in online conversations.

However, we encountered instances in which reference to certain people cannot be easily resolved, and the presence of the personal markers cannot be inferred solely from the sentential structure, but it requires additional information from previous discourse. For example, the instance *Ugly!* cannot qualify as cyberbullying in isolation, since its adjective typically can be applied (in a non-metaphorical manner) to a wide range of physical entities; however, if the previous message²⁸, *Did you see her face?* is considered, it becomes clear that the adjective *ugly* is applied to a person's face, and the instance should be considered an instance of public textual cyberbullying.

²⁷ This phenomenon is also known as *null subject*.

²⁸ The message is uttered by a different user.

Grammatically, personal pointers are most likely to be captured by the subject, complement and modifier functions: (1) the subject of a clause—*you are an idiot*, (2) the subject of a passive clause—*you are fucked up*, (3) the direct object of a verb or a verb phrase—*fuck Helen*, (4) the indirect object of a verb or verb phrase—*I'll give you such a box in the face*, (5) the object of a preposition or prepositional phrase—*I spit on you*, and (5) the possession modifier, either as a possessive pronoun, or as a proper name in the genitive case—*Your mom is a prostitute* or *Jane's mom is a prostitute*.

The Dysphemistic Element

In line with the definition proposed by Allan and Burrige (2006), dysphemisms²⁹ in cyberbullying are linguistic devices that are motivated by fear, distaste, hatred, and contempt, and are used to refer to people that frustrate or annoy them, or people that they want to humiliate or degrade, either directly, or by referring to their characteristics, possessions, ideas, or family. All explicit types of language that we observed in our dataset—profane/obscene, offensive/insulting, and violent—satisfy these dysphemistic criteria. These insults and maledictions are intrinsically dysphemistic and can target a person's physical appearance, mental ability, character, behaviour, beliefs and/or familial and social relations (Allan and Burrige, 2006). As such, specific forms of dysphemistic language include the following:

14. a. Comparisons of people with animals represent animal metaphors that can be insulting based on physical appearance, character, mental ability, gender, etc. For instance, *ape* may be used to target one's physical appearance, *snake* may refer to one's sneaky and sleazy character, and *sheep* may be used to target one's mental ability; addressing a woman using *cat* may be intended to reflect the vicious behaviours of a feline, however, addressing a man as *pussycat* can be interpreted as homophobic since it reflects the effeminate and sweet character of a pussycat.

²⁹ Euphemisms (e.g., *willy*) and orthophemisms (e.g., *penis*) are also included here, in addition to direct dysphemism (e.g., *dick*), since they can also be used dysphemistically. As Allan and Buridge (2006) suggest, it depends entirely on the context whether terms such as *penis* or *vagina* are used as orthophemisms or as dysphemisms; likewise, it depends on the context whether terms such as *poo* or *willy* are used dysphemistically or euphemistically.

- b. Epithets derived from tabooed bodily organs, bodily effluvia, and sexual behaviours are often used to refer to one's character, such as the terms *asshole*, *shit*, or *wanker* which are profoundly insulting.
- c. Dysphemistic epithets that pick on real physical characteristics treated as though they are abnormalities are very effective ways of insulting one's appearance, for instance calling someone *Four-eyes!* is a very offensive way of referring to someone that wears glasses. They can also extend to racial attributes such as skin colour.
- d. Imprecations and epithets invoking mental subnormality or derangement may include strong expressions such as *Retard!* or *Loopy!* but also milder forms, such as *Silly!*, which can carry meanings of helplessness or pity.
- e. Sexist, racist, speciesist, classist, ageist and other -IST dysphemisms are expressions intended to offend someone based on their sex, race, class, age, etc. For instance, *mick* is a derogatory term often used to refer to an Irish person, while the term *wrinkly* is often used to insult old people.
- f. Direct character slurs and ascriptions include disrespectful expressions such as *nerd* or *queer* which are effective ways to target one's character.
- g. Violent language has a special role in cyberbullying interactions and it includes aggressive, hate and threatening language, such as *die*, or *burn*.

Moreover, the literary techniques that tend to be associated with implicit public textual cyberbullying—negation, animal metaphors and similes, contrast and positive modifiers comparatives—also satisfy the dysphemistic criteria, since they are hurtful:

- 15.
 - a. You are not nice!
 - b. You can't even spell!
 - c. He looks like a donkey.

In (15a), the term *nice*, typically having positive connotations, was negated to hurt one's feelings, while the term *spell* in (15b) typically associated with neutral connotations was used to target one's mental ability. In (15c) the term *donkey*, an animal domain term typically having neutral connotations, is mapped to the personal pronoun *he* which denotes a person, and, as such, it becomes hurtful, because that person is regarded as having a donkey's appearance.

Additionally, as we already stated, the dysphemistic element does not need to be explicitly present in a given message once it can be inferred from previous discourse. Another example is the message *No!* which was labelled cyberbullying despite that it contains no dysphemism; but, based on the previous user's question *Is she pretty?*, *No!* can be viewed as a complete answer *she is not pretty* where the dysphemistic effect is achieved by negating the positive term *pretty*.

Grammatically, the dysphemistic element is usually captured by (1) the predicate function of a noun/adjective/verb—*Dickhead!*, or *Cunty!*, or *Fuck you*, (2) the adjectival complement—*She looked horrible*, (3) the clausal and open clausal complement—*You think you are pretty* and *you deserve to die*, (4) the adjectival modifier—*stupid child!*, (5) the adverbial modifier—*You barely have anything to dress with*, (5) the participial modifier—*fucking woman*, (6) the appositional modifier—*Sam, the dickhead, will be there too*, and (7) the noun modifier—*monkey face*.

The Cyberbullying Link

The link between the personal pointer and the dysphemistic element can be further discussed by inspecting closer some more examples of textual cyberbullying:

16. a. She's such a cunt!
- b. You are fucked up!
- c. Idiot!
- d. She looked rotten last night.
- e. Die!
- f. You deserve to rot in hell!
- g. You are not pretty.
- h. Your dad doesn't want you.
- i. Your skirt is very pretty, Jake!

We consider all the above examples cyberbullying instances based on the three dimensions of our definition. Firstly, they all contain dysphemistic language: explicit profanities such as *cunt* and *fucked* in (16a, b), explicit offensive terms such as *idiot* and *rotten* in (16c, d), explicit violent expressions such as *die* and *rot in hell* in (16e, f), or implicit dysphemistic language in the form of negations such as (16g, h) which negate the positive characteristic of being pretty and the paternal feelings of a dad, respectively, as well as in the form of contrast such as (16i) which implies that Jake has effeminate characteristics by contrasting the name *Jake* (a male name) with

the noun *skirt* (a female piece of clothing). Secondly, they all contain the personal pointers: explicitly present personal pointers such as the personal pronouns *you* (16b, f, g), *she* (16a and d), and *your* (16h), person-referring nouns such as *idiot* (16c), and proper names, such as *Jake* (16i), as well as inferable personal pointers as in (16e) whose intransitive verb *die* can only take as subject a person in the context of an online conversation. Finally, the two previous elements are directly linked using the explicit presence of a verb or verb phrase such as in (16a-i, except c), or the inferable copula *be* such as in (16c).

Grammatically, the linguistic element found to consistently act as the link between the personal pointer and the dysphemistic element in our dataset is the conjugated verb, typically expressed as the main predicating verb. In the case of intransitive constructions, the verb represents the same linguistic item as the dysphemistic element, thus the cyberbullying link is reflexive, since the link pointing to the dysphemistic element points, in fact, to itself.

For example, the sentence *Die!* satisfies all three criteria of our definition: (1) the personal marker which is inferable since it can only be directed at people in the context of an online conversation³⁰, (2) *die* which is an explicit violent term representing the dysphemistic element, and, in the same time, (3) *die* represents the link between the inferable personal marker and the dysphemistic element, since, as the predicating verb, it points back to itself. In the case of the transitive constructions, the main predicating verb can be the same linguistic item as the dysphemistic element (*I hate you*), but it can also be a separate linguistic item (*You always say stupid things*). In the case of copular constructions (*She is stupid* or *She looks horrible*), the conjugated copular verb is the cyberbullying link and always constitutes a distinct linguistic item from the dysphemistic element which is the complement of the copular verb.

At other times, there is no explicit link between the personal pointer and the dysphemistic element, but it can be determined from the underlying implicit copular structure of the clause, such as in *You twat!* which can be expressed as a full copular construction: *you are a twat*, and, thus, the inferable cyberbullying link is the conjugated copular verb *are*.

³⁰ Specifically, the pronoun *you* is dropped in the context of an imperative sentence which indicates a directive speech act.

Conclusion

The main purpose of this paper was to identify the linguistic parameters that characterize cyberbullying. Thus, we undertook a qualitative analysis of a dataset that contained public textual cyberbullying instances at orthographical, lexical, grammatical, semantics and pragmatics levels to qualify the most likely predictors of cyberbullying.

We then identified several stylistic aspects that were likely to occur in our dataset and they served as criteria for a taxonomy of cyberbullying: explicit cyberbullying achieved through profanities, insults and violent language, and implicit cyberbullying achieved through animal metaphors, negation, contrast and positive modifier comparatives.

Finally, we proposed an operational definition of what constitutes public textual cyberbullying that posits three necessary and sufficient elements: (1) the personal pointer, (2) the dysphemistic element, and (3) the cyberbullying link between the personal marker and the dysphemistic element. Each of these elements were discussed in terms of how they relate to the conceptual criteria of cyberbullying and how they are likely to be realized both stylistically and grammatically.

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CHAPTER THIRTEEN

DETECTION OF CYBERBULLYING USING TEXT MINING

DAVID COLTON, MARKUS HOFMANN

1. Introduction

The Internet technology boom has led to a proliferation of tablets, laptops and smart phones with high-speed internet access. This access, coupled with the advent of instant messaging, chat rooms and social media websites, has led to an Internet generation who think nothing of posting selfies, mood updates, their relationship status and all the minutiae of their daily life online. The traditional bully was the kid in school, or office worker, who got pleasure from watching their victims suffer as they verbally abused them or maybe even threatened them with physical violence. At least the victim knew who the bully was and, although not a solution, they could plan their day to avoid crossing paths with the bully and having to suffer further torment. However, now the bully has also moved on-line. This cyberbully has twenty-four-hour access to a potentially unlimited number of victims. Through their mean and harassing posts and comments, the consequences of their cyberbullying activity is too often read about in the papers following another tragic teen suicide. To prevent this new form of bullying, it is important that technology is used to detect these cyberbullying posts.

This chapter shows that text mining techniques can be successfully used in the automatic detection of cyberbullying text. The contributions of this chapter are many. A new classified cyberbullying dataset is presented. An in-depth analysis of several classifiers is undertaken before a novel approach of determining the best overall classifier using the recall values of both the positive and negative class is suggested. Finally, an evaluation of the best models is performed by simulating their evolution over time as new, previously unseen samples, are classified and then included as training data for subsequent iterations.

Bullying is not something new, some people might even consider it a rite of passage having either experienced it when growing up or knowing someone who was bullied in school, at work, when out playing or when socialising with friends. Traditional bullying, though never a pleasant experience, can only be inflicted on the victim face to face. By steering clear of the bully, or by leaving the environment where the bullying was happening, the intended victim could avoid the pain and suffering imposed on them. Now, however, with the advent of instant messaging and social media, the bully has moved on-line with twenty-four-hour access to their victims. This new on-line bullying is known as cyberbullying and, unfortunately, it's sometimes-tragic consequences are plain to see with headlines like "Third suicide in weeks linked to cyberbullying" (Cionnaith 2012), "Cyberbullies claimed lives of Five teens" (Riegel 2013) and "Hanna Smith suicide fuels calls for action on Ask.fm cyberbullying" (Smith-Spark 2013) becoming an all too depressingly frequent occurrence.

In the 2014 Annual Bullying survey conducted by a prominent anti-bullying charity "Ditch The Label", 45% of the respondents said they had experienced bullying of some sort and 55% of these said that they had experienced cyberbullying (Ditch the Label n.d.). Another report found that 88% of teens who use social media had witnessed other users being targeted by cruel or mean comments and that 67% also witnessed other users joining in with the harassment. 15% of users reported that they also had been harassed (Lenhart, et al. 2011). The same report also found that 41% of teens reported some negative outcomes resulting directly from their social media use including face to face confrontations that sometimes escalate to physical fights, strains placed on friendships and problems with parents or school. Some teens reported being nervous about going to school because of a social media incident.

Cyberbullying can negatively impact the quality of a teenager's life in many different ways. The victim of bullying can suffer physical stress and a range of emotional feelings including humiliation, isolation, powerlessness, feeling overwhelmed, depressed and even suicidal thoughts. These are feelings that the youth may not be emotionally mature enough to handle. This emotional turmoil can lead to a loss of appetite and an inability to sleep which can cause other more serious health problems. The perpetrator of the bullying could also be a victim of bullying or abuse, and their actions are a backlash against others for what they have experienced. However, if left unchecked, this bullying behaviour could escalate into other antisocial, abusive or criminal activities. By detecting and identifying the bully, intervention may be possible.

When considering cyberbullying, and the identification of cyberbullying content, there are two distinct properties to consider. The act of posting a cyberbullying message and the content of the message. The act or delivery of a cyberbullying post can come in many different forms including flaming, exclusion, outing, flooding and masquerading to name a few. Because cyberbullying is often anonymous it is difficult to automatically detect these types of actions. However, the content of a cyberbullying post is a rich textual goldmine where the cruelty of intention, the insidious and harmful nature of the bullying or the hurtful and antagonising tone is plain to see. The content could be overtly sexual or an attack against a person's sexual orientation, racially demeaning or disparaging against a person's race, nationality or skin colour, directly attack a person's appearance, weight, intelligence or their socio-economic status. Cyberstalking and grooming can both also be considered under the cyberbullying umbrella.

2. Objectives

The primary objective of this research was to develop a model that could be used to determine if samples from an unseen dataset should be classified as bullying in nature or classified as not bullying. To meet this objective, the following data mining milestones were set:

Construct a new cyberbullying dataset: The first objective was to create a new dataset for use in the development of a cyberbullying classifier. The lack of a standard cyberbullying dataset for use in a project like this is well lamented. To address this problem a new dataset was generated by scraping data from the Ask.fm social networking site.

Classify the new cyberbullying dataset: Once the raw data was sourced it was manually classified. The criteria to determine whether a sample should be classified as bullying or not was documented. Once these criteria were understood, the new dataset, that could be used in the development of a classifier, was generated by manually classifying each of the samples in the dataset.

Develop multiple classifiers: Multiple different classifiers were then developed using standard text mining techniques such as n-grams, stop word removal, feature selection, bag of words, and term frequency inverse document frequency word vectors. Naive Bayes and Support Vector Machine learner algorithms were used.

Identify top classifiers and evaluate: When modelling had been completed, the top models were identified using each models g-performance. Each of the top classifier models identified, was further evaluated with previously unseen samples in order to determine which classifier generalises best to new data. This testing attempts to simulate a real-life scenario by iteratively classifying previously unseen samples before appending these newly classified records to the master training dataset. The model is then regenerated, including these newly classified records, before more unseen samples are classified. This process of classify, append, regenerate was repeated multiple times.

3. Precision, Recall, Accuracy and G-Performance

When evaluating the performance of a model in predicting whether a question was correctly classified as bullying or not, precision, recall and accuracy was used. When predicting whether a question is bullying there are four possible outcomes:

1. **True Positive (TP):** A true positive is where the question is predicted as bullying and was also classified as bullying
2. **False Positive (FP):** A false positive is where the question is predicted as bullying but was also classified as not bullying
3. **False Negative (FN):** A false negative is where the question is predicted as not bullying but was also classified as bullying
4. **True Negative (TN):** A true negative is where the question is predicted as not bullying and was also classified as not bullying

The overall accuracy of a model is calculated as:

$$\frac{\text{Number of True Positives} + \text{Number of True Negatives}}{\text{Total Number of Examples}}$$

Positive Class Precision is calculated as:

$$\frac{\text{Number of True Positives}}{\text{Number of True Positives} + \text{Number of False Positives}}$$

Positive Class Recall is calculated as:

$$\frac{\text{Number of True Positives}}{\text{Number of True Positives} + \text{Number of False Negatives}}$$

Negative Class Precision is calculated as:

$$\frac{\text{Number of True Negatives}}{\text{Number of True Negatives} + \text{Number of False Negatives}}$$

Negative Class Recall is calculated as:

$$\frac{\text{Number of True Negatives}}{\text{Number of True Negatives} + \text{Number of False Positives}}$$

Precision and recall are inversely related meaning in that as precision increases, recall decreases and inversely where recall increases, precision decreases. When developing a classification model, the critical decision is whether to seek to have high precision and low recall or to develop a model that delivers a low precision value but has high recall. Consider a scenario where we are trying to classify questions as bullying. High precision and low recall values suggest that a high percentage of questions predicted as bullying will be bullying. However, a significant number of bullying questions will not be correctly identified. A high recall value implies that a large percentage of bullying questions have been correctly identified but, as a consequence, a large number of not bullying questions would also be incorrectly identified as bullying yielding low precision. Usually a trade-off has to be made between precision and recall depending on the situation and the preferred outcomes.

In addition to standard classifier performance measures, for example accuracy, precision, recall and F-Measure (Kubat and Matwin 1997), we describe another measure that uses the geometric mean of the accuracies measured separately on each class called the G-performance. The goal of this measure is to maximise the recall of both class but at the same time keeping them balanced such that a poor value for either the positive or negative class will give an overall poor performance for the classifier.

Equation 1 G-performance

$$g = \sqrt{\frac{TP}{TP + FN} \times \frac{TN}{TN + FP}}$$

4. A New Cyberbullying Dataset

In this section an outline of the steps undertaken to transform the raw HTML data, scraped from the Ask.fm website, into a dataset that was a suitable

starting point to undertake a text mining research project, is given. From the initial processing and data analysing steps, through to the final data cleansing steps, the progression from unstructured data into structured text is shown.

Raw data extraction and initial processing was the first step. Ask.fm is a social networking website that uses a question and answer format to allow its users to interact. Each post on a user's stream has a number of data attributes including:

1. The question that was asked.
2. The answer given to the question.
3. A time indication of when the question was answered.
4. The identity of the user that asked the question. Nothing is shown when the question is asked anonymously.
5. A report flag to report the question and or answer.

The first task was the extraction of user data from the Ask.fm website. The most significant criteria when selecting the data to be scrapped was that the predominant language used was English. Upon completion of this exercise, 109,312 questions and answers had been gathered. A cursory examination of the data showed that there was representation from users based in North America, Australia / New Zealand and Europe.

The questions and other data attributes, however, were all contained in a number of HTML files. This data was extracted using a Python HTML parser based on the Beautiful Soup module. Each extracted data record was then written to a file for storage. The final part of the initial processing performed on the data was to split the 109,312 sample records into three blocks of data. It was decided to divide the dataset into blocks of 10% for initial classification, model training and test, 80% to later simulate a stream of data arriving for classification and the final 10% for final validation purposes. Other processing included anonymizing both the identification of the user and the question such that it would not be possible to trace the question back to the original source. The details of how the data was classified, and the criteria used is shown in detail (Colton and Hofmann 2019).

The next step was to explore the data and get a better understanding of its contents and quality. It could be argued that an exploration of the data would have been better performed before it was classified. However, because of the simplicity of the structure of the data used in this research project, where only the questions were modelled, it was decided that there was nothing to be gained in performing the exploration first.

From a cursory review of the data it was immediately apparent that there were some issues with the text in the questions field which will be further investigated and handled later. These issues included:

- Questions with only images appeared empty
- Some records had only numerical answers
- Samples where part or all of the text was not English
- Samples where non-ASCII characters were used
- Slang words, emoticons and abbreviations
- Repeated characters

Table 1. Table showing distinct word counts for all questions and separately for not bullying and bullying questions

Word	Total		Not Bullying		Bullying	
	Word	Count	Word	Count	Word	Count
you	5,339	you	4,492	you	907	
your	1,759	what	1,520	your	370	
the	1,716	the	1,488	and	313	
to	1,701	do	1,422	to	283	
what	1,657	to	1,418	the	228	
do	1,573	your	1,389	are	223	
and	1,345	and	1,032	of	172	
is	1,114	is	986	have	158	
are	1,076	are	853	do	151	
like	895	like	753	like	142	
in	816	in	687	so	137	
of	772	on	612	what	137	
have	726	of	600	in	129	
on	714	would	571	is	128	
would	650	have	568	with	127	
so	632	that	517	me	126	
that	610	if	497	on	102	
it	569	so	496	ur	102	
now	561	who	489	how	97	
who	555	how	464	that	93	

The 10% corpus of samples that would be used for modelling was further examined, including an analysis of the corpus of distinct words, and a count of the number of times each word was used. Unique words, or tokens, that were at least 2 characters long were considered. There were 12,162 distinct string tokens that met this criterion with 85,988 tokens in total. The questions were also divided into not bullying and bullying corpora. Table 1

shows the twenty most frequently occurring words for not bullying questions and bullying questions. A quick glance at the table shows that when these words are considered there is no obvious discernible difference between the words in the not bullying questions corpus and the words in the bullying questions corpus. When comparing the top twenty words in the not bullying and bullying classes it can be seen that four in every five words, or 80%, appear in both lists.

Table 2. Table showing distinct word counts for all questions and separately for not bullying and bullying questions with stop words removed

<u>Total</u>		<u>Not Bullying</u>		<u>Bullying</u>	
Word	Count	Word	Count	Word	Count
like	895	like	753	like	142
would	650	would	571	ur	102
don't	349	think	307	would	79
think	344	don't	276	don't	73
know	327	know	260	pic	69
ur	323	love	258	know	67
love	302	:)	252	get	58
:)	294	favorite	245	post	56
you're	292	you're	238	f**k	56
get	285	get	227	you're	54
really	261	best	222	want	53
one	253	ur	221	i'm	52
favourite	250	one	220	really	50
i'm	238	people	213	see	50
best	238	really	211	go	50
go	238	what's	208	love	44
people	235	ever	194	old	42
ever	233	thing	189	bitch	42
what's	226	go	188	right	40
want	224	i'm	186	ever	39

This word count exploration was performed again. In addition to only selecting words that were at least 2 characters long, typical English stop words were removed. Whilst there are still 12,044 distinct tokens, overall there were now only 49,942 token instances, a 42% decrease. Although there was better differentiation between the not bullying and bullying questions, there are still 12 common words in the top twenty words of each category. This suggested that building a model to predict the class of

questions using word counts alone might not be predictive enough and that maybe additional strategies will need to be considered.

A common strategy used in text mining classification is the generation of term n-grams. N-grams have the effect of concatenating together two or more tokens to form new, hopefully, more predictive tokens. For example, the quote *“to be or not to be”* produces the following tri-grams:

- to_be_or
- be_or_not
- or_not_to

Bi-grams, two tokens, and tri-grams, three tokens, word lists were generated from the bullying and not bullying questions examined earlier. As before only words or tokens that were at least two characters long were considered. When examining the top ten most frequently occurring bi-gram tokens, some features were immediately apparent. The first most obvious thing to notice is that where stop words are not removed only three out of the ten not bullying tokens, 30%, also appear in the bullying list. When stop words are removed the number of common words fell to only two out of 10 or 20% of bi-grams.

Table 3. Table showing distinct counts of bi-gram tokens for not bullying and bullying questions with and without stop words

	<u>Not Bullying</u>			<u>Bullying</u>			
	With Stopwords	No Stopwords		With Stopwords	No Stopwords		
do you	959	would like	74	are you	93	right now	28
what is	344	would be	47	do you	72	wearing right	20
are you	342	don't know	42	you have	42	post pic	16
would you	318	one thing	41	you are	40	don't know	15
if you	259	last time	40	what are	40	old you	14
you like	246	what's favorite	40	how old	37	cut cut	8
is the	215	last person	33	want to	31	post picture	7
is your	198	right now	32	if you	30	would go	6
your favorite	184	best friends	27	of you	30	dont like	6
have you	179	best friend	25	pic of	29	look like	6

Also, of note is the use of *“you”*, the second person pronoun. When stop words are not removed *“you”* is prominent, appearing in six out of the top ten bi-grams in both the not bullying and word bullying lists. Another pronoun, *“your”*, also appears twice in the not bullying top ten list. However, when stop words are removed *“you”* does not appear at all in the

not bullying top ten and only once in the bullying top ten. This observation flies somewhat in the face of (Yin, et al. 2009) which mentioned that when reviewing their dataset, it was noticed that a lot of the posts classified as harassment contained foul language used in conjunction with pronouns, particularly second person personal pronouns such as “you”, “your” and “yourself”.

Table 4. Table showing distinct counts of tri-gram tokens for not bullying and bullying questions with and without stop words

Not Bullying			
With Stopwords		No Stopwords	
what is your	154	would like meet	74
what do you	153	people think you	47
do you think	133	favourite month year	42
what is the	132	many times day	41
do you like	128	gift would like	40
is your favorite	110	think people think	40
if you could	94	what's longest you've	33
what would you	86	last thing made	32
was the last	79	anyone right now	27
you like to	76	made happy today	25
Bullying			
With Stopwords		No Stopwords	
what are you	30	wearing right now	20
how old are	24	cut cut cut	7
are you wearing	21	last person kissed?	5
wearing right now	20	whoever likes thinks	4
you wearing right	20	see window post	4
old are you	13	window post pic	4
have you ever	11	slept ex bf	3
of you and	10	shannon slept ex	3
post pic of	10	likes thinks you're	3
do you have	9	ex bf max	3

An examination of the tri-gram tokens in all categories showed that the top ten most frequently occurring tokens were all unique. Expanding this type of comparison to the top fifty tokens, it was found that when stop words were included three out of every ten tokens, or 30%, appeared on both the bullying and not bullying lists. Expanding this to the top 100 tokens the repetition fell further to between 24% and 20% respectively. Examining next the tri-gram tokens, where the stop words had been removed, was even more revealing. Only two of the top one hundred not bullying tokens

appeared anywhere in the bullying list. In the other direction none of the top 67 bullying tokens appeared anywhere in the top one hundred not bullying tokens. The reason the top 67 bullying tokens were chosen is because after these first 57 tri-grams, all tokens only had a frequency of one. Expanding the search to include all not bullying and bullying tri-grams, where the stop words had been removed, showed that only 57 tokens appeared in both lists. This represents 57 out of 21.031 not bullying tri-grams, approximately 0.27%, and 57 out of 5858 bullying tri-grams or 0.97%. This finding would further support the suggestion that tri-gram tokens should prove to be very good predictors when it comes to developing the models. On the contrary, however, it could be argued that this tri-grams uniqueness could, in fact, lead to over fitting of the models to the data.

5. Data Preparation

With a better understanding of the data, the final step before modelling begins was to prepare the data. It would be possible to include some of the processing of the data described here within the modelling process, for example converting case of all characters to lower case. However, it was decided that performing these steps in advance would allow better control and give greater transparency of the data submitted to classifier models. Samples of the transformation steps applied to the data were:

- Convert text to lower case
- Convert text to ASCII
- Remove URLs
- Remove numeric data
- Remove punctuation
- Remove any repeating characters
- Fix common abbreviations and spelling errors and replace with full word

Finally, it was decided to process the dataset such that the corpus was consolidated into a single comma separated file with two attributes. The first attribute was the class where 0 was used to represent a bullying sample and 1 not bullying sample. The second attribute was the text of the question. For example:

- 1,"do you like horses"
- 0,"could you just like not breathe"

6. Data Modelling

The Natural Language Toolkit was used to produce some initial models that showed some promising results. It did not, however, offer much choice or scope for different lines of investigation during model development. The focus of investigation turned, instead, to the use of Scikit-Learn. Initially, some simple models were quickly developed and explored before attention was given to the more advanced fine-tuning operations that are available.

For the initial investigation, Naive Bayes and a Support Vector Machine learner were considered using the default model parameters. It was immediately apparent that neither learner performed well when predicting the positive bullying class. Both models returned good results predicting the negative not bullying class with the Support Vector classifier performing the better of the two. However, with Scikit-Learn it was possible to dig deeper into the model performances by analysing the confusion matrices for each of the datasets and models. It was seen that the Naive Bayes model nearly exclusively predicted all samples as negative and, although the Support Vector model managed to achieve better results, it still favoured the negative class.

Following the disappointment of the initial modelling, it was important to examine some of the additional advanced options offered by the Scikit-Learn TF-IDF implementation and also the Naive Bayes and Support Vector classifiers to determine if the model performance can be further improved. First the TF-IDF implementation was examined. The *TfidfVectorizer* object in Scikit-Learn performs two main tasks. The first is to convert a collection of text documents, in this case the array of training questions, into a matrix that is a sparse representation of token counts. It then transforms this count matrix into a term frequency inverse document frequency (TF-IDF) representation. In all, there are over twenty parameters that can be used to customise and fine tune the performance of this operator but for this research the only parameters examined were Stop Words, included or not, and N-Grams, in the range 1 to 3 inclusive. The Euclidean Norm parameter was also set to normalise the term vectors.

In total, six models of interest were examined. Three were based on the Naive Bayes classifier and three on the Support Vector classifier. The first model of each classifier type used the Stop Words parameter to remove frequently occurring stop word tokens. The second and third iteration of each model used the N-Gram Range parameter to specify the use of bi-grams and tri-grams. It should be noted that the Scikit-Learn learners retains all the n-grams in the range specified. For example, when *ngram_range(1,*

3)” is specified, this means that all uni-grams, bi-grams and tri-grams will be returned.

Comparing the results to the initial modelling attempt, it was clear that there was an overall improvement in the models. Though this improvement was especially seen in the models that utilised bi-grams and tri-grams, the improvement was attributed to the inclusion of uni-grams. This fact was borne out by testing these models again without including uni-grams, “*ngram_range(2, 3)*”. This yielded similarly disappointing performance results to the initial modelling.

Finally, it was observed that there was a class imbalance between the positive and negative samples in the datasets. This class imbalance can be compensated for by under sampling the majority class, over sampling the minority class or a hybrid approach (Colton and Hofmann 2019). Datasets with ratios of 3:1, 2:1 and 1:1, negative class to positive class, were generated by under sampling of the majority class and over sampling of the minority class and for the hybrid approach the negative class and positive class were sampled to ratios of 70:30, 60:40 and 50:50 respectively. A grid search approach was also used to fine tune the model parameters. Sample results from these model executions are shown in Figure 1. In Figure 1, the following abbreviations are used:

- **NB**: Multinomial Naïve Bayes classifier
- **SVM**: Linear Support Vector classifier
- **Maj.**: Majority Class [negative not bullying examples]
- **Min.**: Minority Class [negative bullying examples]
- **RUS**: Random Under Sampling
- **ROS**: Random Over Sampling

With just a cursory look at these charts, it is quite clear that over sampling of the minority class and hybrid sampling both significantly out perform under sampling of the majority class.

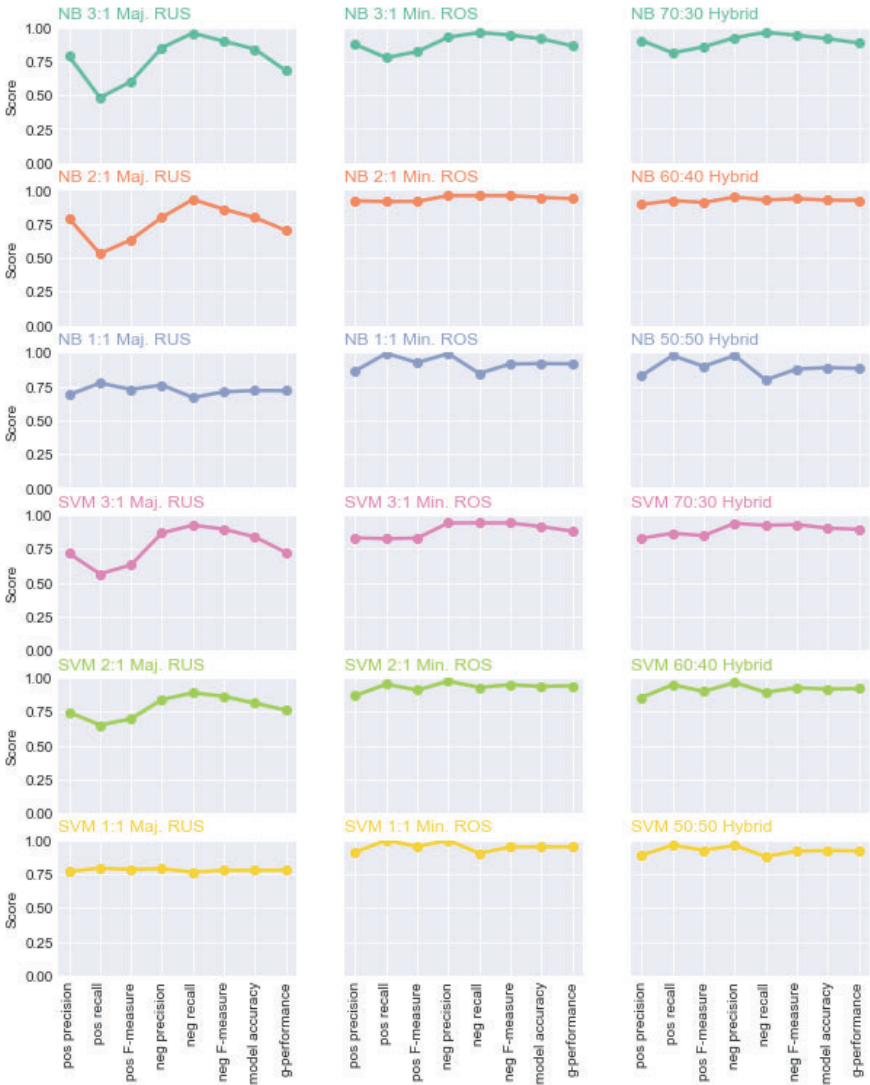


Figure 1. Graphs showing the performance results for grid searches using under, over and hybrid sampling

7. Choosing the Best Models

When analysing the performance results of each model, the nature of the research conducted, and its objectives, were the steering force giving guidance to determine which model best meets the criteria. The main objective of this research was to identify bullying questions such that they could potentially be flagged either before posting or before being read. The perfect solution would be one where all questions identified as bullying, the positive class, and all not bullying questions, the negative class, are correctly identified all of the time. Failing this, because of the potential harm that could be caused by a vulnerable teen reading a bullying question, the most important criterion is that as many bullying questions as possible are identified. This implies that maximising positive class recall is the number one criterion when classifying samples. However, simply over predicting samples as bullying would not be an acceptable solution. So, the second criterion, when evaluating these models, is to also maximise negative class recall. To this end the geometric mean, or G-Performance, of each model was calculated. An analysis of the model performances showed that classifiers developed using the support vector learner performed slightly better than the Naive Bayes learner. It is also clear that the best model performances achieved, during training at least, was when stop words were included in the dataset and when uni-grams, bi-grams and tri-grams were utilised. There was no sampling ratio that was an obvious best performer but over sampling of the minority class and hybrid sampling both performed better than under sampling of the majority class. A matrix of the top 8 models are shown in Table 5.

Table 5. Table listing the top performing models listed in order of their G-performance

Model Type	Sample Ratio	Stop Words	N-Grams	G-Perf
Support Vector Over Sampling	1:1	Included	1, 2	0.9508
Support Vector Over Sampling	2:1	Included	1, 2, 3	0.9399
Naive Bayes Over Sampling	2:1	Included	1, 2, 3	0.9357
Naive Bayes Hybrid Sampling	60:40	Included	1, 2, 3	0.9240
Support Vector Hybrid Sampling	50:50	Removed	1, 2, 3	0.9210
Support Vector Hybrid Sampling	60:40	Included	1, 2	0.9196
Naive Bayes Over Sampling	1:1	Included	1, 2, 3	0.9170
Support Vector Hybrid Sampling	70:30	Included	1, 2, 3	0.8945

8. Applying the Best Classifiers

A novel approach is now introduced to determine which of the top models actually perform best in a simulation of a real-life scenario. It was previously mentioned that the original data was split into three datasets of proportions 10%, 80% and 10% respectively. The first 10% of samples were manually classified and used to develop the models described above. The other two datasets were prepared for modelling following the same pre-processing steps described previously. The larger dataset, which contained 80% of the original samples, was used to simulate the arrival of new unseen data. The final 10% of samples were held back, never used in the training of any model, in order to evaluate the final models on totally unseen data. It was not feasible, at this stage, to fully evaluate all models. In order to reduce the number, an initial simple analysis was performed whereby all unseen samples in the simulation datasets were classified, and the percentage of bullying questions predicted was calculated. When manually classifying the initial first training data, the percentage of bullying questions identified was 15.17%. The models chosen were those whose percentage of predicted bullying question were closest to 15.17%. A cursory examination of the questions classified as bullying confirmed that this approach yielded expected results. In total, five models were chosen for a detailed analysis including two simple Natural Language Toolkit models not previously discussed.

- **Model 01:** Scikit-Learn Support Vector with 1:1 over sampling, stop words included and uni-grams and bi-grams
- **Model 02:** NLTK 1:1 Naive Bayes over sampling, stop words removed and tri-grams
- **Model 03:** NLTK 50:50 Naive Bayes hybrid sampling, stop words removed and bi-grams
- **Model 04:** Scikit-Learn Naive Bayes with 60:40 hybrid sampling, stop words included and uni-grams, bi-grams and tri-grams
- **Model 05:** Scikit-Learn Support Vector with 70:30 hybrid sampling, stop words included and uni-grams, bi-grams and tri-grams

The samples in the hold-back dataset were classified using each of the selected models and stored for comparison with the results produced after the models had “evolved” through the simulation dataset.

Each of the five models identified were then further exercised using the simulation dataset as follows:

- The simulation dataset, approximately 90,000 samples, was randomly divided into twenty separate datasets to simulate data arriving, for example, over a 20-day period.
- Then, for each of these 20 simulation datasets:
 - The training dataset was loaded, and the model generated.
 - Next, the portion of the simulation dataset to be classified was loaded and sampled as required by the model
 - This simulation dataset was then classified using the model generated in Step a. above
 - The newly classified samples were finally appended to the training dataset for the next iteration
- Repeat the previous step until there were no further simulation datasets

Once all the simulation samples are included in the final model, the hold back dataset was classified, and the results were written to file. This simple process was repeated for all models. In addition to writing the hold back classification results to file, each of the iterative results for the classification of the simulation samples were also written to file. The results of this batch processing and classification of the hold back data was then analysed.

The goal of this exercise was to determine which of the models, without any manual intervention, would continue to correctly identify cyberbullying in compliance with the same criteria used in the manual classification of the first dataset. There were three possible outcomes to be considered:

- As more samples, classified by the evolving model, are added to the training data it starts to under-predict cyberbullying
- The predictions from the model remain constant regardless of the number of classified samples added to the training data
- As more samples, classified by the evolving model, are added to the training data it starts to over-predict cyberbullying

Once the simulation had been run for each model the results were analysed. It was immediately obvious that both of the NLTK models started over-predicting samples as cyberbullying and were not considered further. The NLTK Naive Bayes model using 1:1 over sampling, stop words removed and tri-grams predicted 37.2% of the hold-back samples as bullying. The NLTK Naive Bayes model using 50:50 hybrid sampling, stop words removed and bi-grams predicted that 40.1% of the hold-back samples were bullying. These numbers are representative of a potential significant increase in the number of false positive predictions made by the model.

Taking a closer look at the number of samples predicted as bullying and not bullying, for each of the NLTK Naive Bayes models, we get the figures in Table 6. The column labelled Model 02 represents the over sampling model, with Model 03 representing the hybrid sampling model.

Table 6. Table showing the number of bullying, not bullying, changed and unchanged sample predictions for each of the NLTK models

Description	Model 02	Model 03
Total Samples	9,464	9,331
Before simulation		
Bullying	1,474	1,425
Not Bullying	7,990	7,906
After simulation		
Bullying	3,519	3,792
Not Bullying	5,945	5,539
Unchanged		
Bullying	1,401	1,364
Not Bullying	5,872	5,478
Changed		
Bullying to Not Bullying	73	61
Not Bullying to Bullying	2,118	2,428

Only 73 samples in Model 02, and 61 samples in Model 03, changed classification from bullying to not bullying. However, 2,118 and 2,428 samples respectively changed from not bullying to bullying. This confirms that samples reclassified as bullying, after the simulation was run, caused the increase in the percentage of bullying samples. Unless the cause of this large increase in bullying predictions can be fully explained, the use of these NLTK models, in the unsupervised scenario described here, would not be recommended.

In contrast, the Scikit-Learn models returned values more in-line with expectations. The first model, Scikit-Learn support vector with 1:1 sampling, returned a bullying percentage of 19.25%. Approximately 4% more bullying questions were predicted in the hold-back samples after the simulation was run, and this value does appear to be on the high side. The second Scikit-learn model, Naive Bayes learner with 60:40 hybrid sampling, returned 15.78% as the percentage of questions classified as bullying. This value, considered in isolation from all further analysis, appears to be the most realistic result achieved. The final Scikit-learn model, support vector with 70:30 hybrid sampling identified 8.03% of the hold back samples as bullying. This value appears on the low side. All three models were further examined, and the results of this analysis is shown in Table 7.

Table 7. Table showing the number of bullying, not bullying, changed and unchanged sample predictions for each of the Scikit-Learn models

Description	Model 01	Model 04	Model 05
Total Samples	11,193	11,193	11,193
Before simulation			
Bullying	1,750	1,614	1,594
Not Bullying	9,443	9,579	9,599
After simulation			
Bullying	2,155	1,766	899
Not Bullying	9,038	9,427	10,294
Unchanged			
Bullying	1,586	1,251	732
Not Bullying	8,874	9,064	9,432
Changed			
Bullying to Not Bullying	164	363	862
Not Bullying to Bullying	569	515	167

With a 44% reduction in the number of questions classified as bullying between the first run and the second run, after the simulation completed, the third Scikit-learn model, Model 05 was discarded and not considered further. Model 01 and Model 04 were then analysed further. To continue the analysis of Model 01 and Model 04, the percentage of change of these measures was calculated from the data in Table 7. Figure 2 shows the results of these calculations.

Figure 2 can be broken into two parts for further examination. The first analysis considers the “Increase: Bullying” and “Decrease: Not Bullying” columns. These two columns are representative of the change in the number of bullying classifications, and the number of not bullying classifications. The number of samples classified as bullying using both models increased. However, the number of bullying classifications made by Model 01 increased by over 23%. This represents 150% growth in excess of Model 04. Though the percentage decrease in the number of not bullying samples appears less significant, this is caused by an imbalance in the classes. The decrease in the number of not bullying classifications in both classes is reflective of the increase in numbers discussed.

The analysis of columns 3 to 6 in Figure 2, shows how stable the classifications made by each model are. Column 3, “Unchanged: Bullying” and column 5, “Changed: Bullying”, show the number of samples predicted as bullying by Model 01 in both executions. A value of 90.63% unchanged bullying classifications, and 9.37% changed, shows that this model is very consistent in the bullying predictions that it makes. On the other hand, model 04 shows a significantly lower value of 77.51%. This means that 22.49% of

the bullying predictions model 04 made in the first run, changed to not bullying after the simulation exercise. Columns 4 and 6, “Unchanged: Not Bullying” and “Changed: Not Bullying” are similar percentages for the samples predicted as not bullying. There is not much to choose from between the two models, with unchanged values of 93.97% and 94.26% respectively for model 01 and model 04.

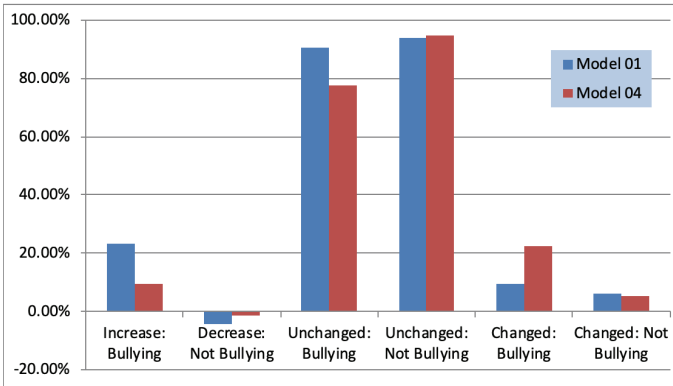


Figure 2. Change in multiple measures between the before and after simulation classification s performed on the hold back dataset

The final analysis performed on each model was a manual classification of a random sample of bullying and not bullying samples that did not change classification between the two model executions. The results of this reclassification are shown in Figure 3. Once again it is seen that Model 01, on the inside of each doughnut, has outperformed Model 04 by correctly predicting 92% of bullying questions, and 87% of not bullying questions.

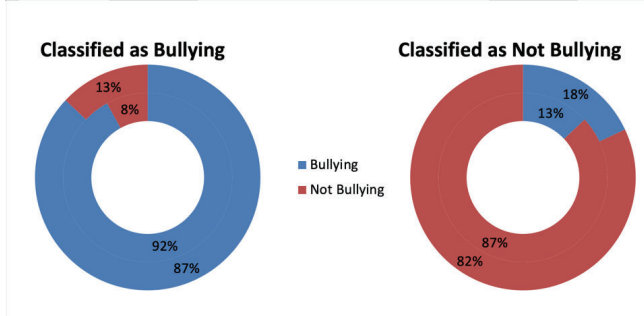


Figure 3. Percentage of bullying and not bullying questions that did not change classification

9. Conclusions

From the modelling and analysis activities performed it was shown that it is possible to develop a cyberbullying classifier using Python. This research contributes an extensive investigation into the area and is a valuable addition to the subject matter body of knowledge.

Of the models analysed, the model that appears to have performed the best is the Scikit-learn support vector model using 1:1 over sampling, stop words included and uni-grams and bi-grams. This model was also considered the best performer of the five models before the automatic evolution of the model using the simulation dataset. This is far from a definitive declaration of the best model. There is significant potential here for future work as discussed below.

10. Future Work

The work performed in this research effort has only scratched the surface of the possibilities offered by the use of text mining techniques in the automated detection of cyberbullying content.

When the classifier models were generated, only Naive Bayes and Linear Support Vector learner algorithms were used. There are many other types of supervised and unsupervised learners that were not investigated including the use of ensemble methods. It should also be possible to develop multiple classifiers that each individually specialise on identifying very specific bullying content attributes and then use a majority vote to classify each sample. The confidence of the prediction might also be utilised.

There is great scope for further investigation into methods to handle the class imbalance problem. For example, identifying a true cost-based classifier or the development of a classifier similar to the Weka MetaCost learner for use with cyberbullying text. Another avenue of investigation is the use of Synthetic Minority Over-sampling Technique (SMOTE), or the adaptation of this technique for use in a sparse TF-IDF word vector. A weighted approach to hybrid sampling, where the predictive power of each training sample is taken into account, is another possible research opportunity. Rather than randomly choosing samples, the positive and negative samples that are most predictive could be chosen ahead of other more generic samples. Though not directly related to class imbalance the inclusion of a cost for over or under sampling data at the model evaluation stage could prove both novel and enlightening. Further investigation into formalising such an approach is warranted. Part of speech tagging (POS), is the process of identifying the types of each word in a corpus. For example,

to tag all words in the corpus as being a noun, verb, article, or adjective based on its definition and relationship or adjacency with others in the sentence or paragraph. POS was not used in this research project, but an investigation to determine if its inclusion would positively impact the performance and stability of the models would be interesting.

The models developed in this chapter were simple binary classifiers where the sample was either bullying or not. It would be interesting to examine if the different types of bullying, for example sexual, racial, threatening, stalking, grooming, could be used to develop a multiclass classifier, maybe utilising Latent Dirichlet allocation for topic identification.

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CHAPTER FOURTEEN

MOTIVATING THE COMPUTATIONAL PHONOLOGICAL PARAMETERS OF AN IRISH SIGN LANGUAGE AVATAR

IRENE MURTAGH

Introduction

Avatars are life-like characters that exist in a virtual world on our computer monitors. Utilising these synthetic actors together with an appropriate computational model provides us with the potential to alleviate the communication barrier that Irish Sign Language users and members of the Deaf community in Ireland face on a daily basis. Like all other sign languages, Irish Sign Language is a naturally occurring indigenous, visual, gestural language without any aural or written form. Irish Sign Language is a very rich and complex language in linguistic terms.

Communication occurs using a visual-gestural modality, encompassing manual and non-manual gestures. Manual gestures make use of hand forms, hand locations, hand movements and orientations of the palm. Non-manual gestures include the use of eye gaze, facial expression, head and upper body movements. The visual-gestural realisation of a word in sign language involves the simultaneous and parallel expression of a varied number of manual and non-manual features, each with their own duration, orientation and relative configuration.

The question this chapter answers is how do we motivate the phonological-morphological interface in Irish Sign Language? It is envisaged that the avatar utilised in the development of this research will later be employed for real-time sign language visualisation for Irish Sign Language.

Since the discovery that Sign Language (SL) was a real human language (Stokoe, 1960) and the subsequent dawning of SL research almost 60 years ago, a wealth of research on the various linguistic phenomena associated

with the SLs of the world has been conducted. Irish Sign Language (ISL) is just one of these languages, and although considerable research has been carried out in the area, none has as of yet resolved the issue of the architecture of the ISL lexicon in computational terms. This chapter provides an account of the computational phonological parameters of an (ISL) avatar.

We provide a motivation of the phonological-morphological interface in ISL. This work lays the foundation in the development of a linguistically motivated computational framework for ISL. We use Role and Reference Grammar (RRG) (Van Valin and LaPolla 1997) as the theoretical framework of this study. Using RRG provides significant theoretical and technical challenges within both RRG and software (Van Valin 2005).

Prior to preparing a linguistically motivated computational definition of lexicon entries, sufficient to represent ISL within the RRG lexicon, we must first define the ISL phonological parameters in computational terms.

We propose a new level of lexical representation, which describes the essential (computational) phonological parameters of an object as defined by the lexical item (Pustejovsky 1995). Our proposed new level of lexical meaning: Articulatory Structure Level, caters specifically for the computational linguistic phenomena consistent with signed languages, in particular to this research ISL, enabling us to adequately represent ISL within the RRG lexicon.

Motivation

Unfortunately, even with today's technological advancements in both computer hardware and software, the Deaf community in Ireland are still overlooked with regard to the provision of public services in ISL (O Baoill and Matthews, 2000). Insufficient socio-economic opportunity occurs within the Deaf community as a result of lack of access to information and communication services.

While ISL is used by approximately 6,500 Irish Deaf people, with approximately 5,000 Deaf ISL users in the Republic and 1,500 users in Northern Ireland (Leeson and Saeed, 2012), it is estimated that some 50,000 people also know and use the language, to a greater or lesser extent. SL interpreters are used as a means of communication between the Deaf and hearing, however, in Ireland where the ratio of interpreters to Deaf people is about 1:250, they are often difficult to come by. ISL can be described as a minority language and therefore there is currently no real framework in place to describe its architecture.

The study of ISL linguistics is still in its early stages. Preparing a formal definition of a lexicon architecture for ISL has the potential to help alleviate the communication barrier for the Deaf communicate and ISL users. A deeper understanding of the underlying linguistics of this very rich and complex language coupled with development of a computational model will allow for the construction of synthetic sign generation for ISL using avatar technology.

To date, research in the area of human modelling and animation for sign language has reached the point where it is possible to construct a human avatar that is articulate and responsive enough to perform sign language. It is possible for sign language users to view onscreen animations and successfully interpret the movements of an avatar to understand its meaning. However, to date, there is no standard computational linguistic framework available to link the divide between the linguistic and the animation interface.

Irish Sign Language Realisation

Due to the visual gestural nature of ISL, and the fact that ISL has no written or aural form, in order to communicate an ISL utterance in computational terms we must implement the use of a humanoid avatar capable of movement within three-dimensional (3D) space (Murtagh 2011a).

In providing a definition of a linguistically motivated computational model for ISL we must be able to refer to the various articulators (hands, fingers, eyes, eyebrows etc.), as these are utilised to articulate the various phonemes, morphemes and lexemes of an utterance (Murtagh 2011a, 2011b). Figure 1 below provides an illustration of our avatar, which was developed using the 3D graphics and animation application Blender [Blender].

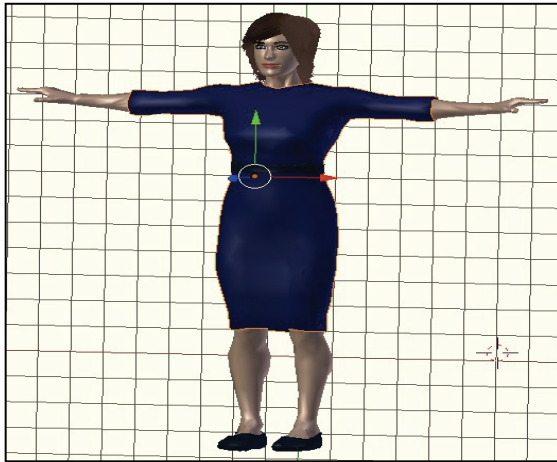


Figure 1. The completed avatar in Blender

Bridging the Linguistic and Animation Interface

The visual gestural realisation of a word in SL involves the simultaneous and parallel expression of a varied number of manual features (MFs) and non-manual features (NMFs). MF phonological parameters can be defined as location, orientation, movement and handshape or relative configuration. NMF phonological parameters can be defined as eyebrow movement, movement of the eyes and eyelids, mouth patterns, tongue movement, blowing of the cheeks and also include head tilting and shoulder movement.

In terms of the development of a linguistically motivated computational framework for ISL a list of ISL phonological parameters for both MFs and NMFs must be rigorously described and defined in computational terms. In order to adequately represent a grammatically coherent and credible SL utterance in computational terms, we must not only describe the computational phonological parameters that are used to represent the content of an utterance, but we must also consider the behaviour of these in relation to temporal information. Any given ISL phoneme, morpheme or lexeme may be realised simultaneously and in parallel along a timeline. The order or linear sequence in which these units are realised along a timeline is significant with regard to the syntax and semantics of SL. Due to the visual spatial nature of ISL various information pertinent to signed lexical items must be accounted for to accurately represent the language. The parameters that are required to adequately represent ISL can be described more easily if one uses the analogy of instruments playing together in an orchestra. The

capacity to generate a signed utterance can be likened to this analogy, where the various articulators would be represented by the instruments and each articulator will play its own part in producing an overall production or articulation, similar to the instruments playing their parts in an orchestra. Parameters relating to this temporal information must be considered at this point. Another parameter that must also be considered is the signing space parameter. O Baoill and Matthews (2000), describe the signing space as the space within which all signs must be articulated. The position of the hands in 3D space has consequences at a syntactic and also at a semantic level for ISL. Also, morphemes are articulated at particular points or loci in relation to the signer for pronominal and anaphoric reference.

In terms of the development of a linguistically motivated computational framework for ISL, the phonological parameters for both MF and NMF must be rigorously described and defined in computational terms. We leverage our avatar in this development. Consideration must also be given to temporal information. In order to adequately represent a grammatically coherent and credible sign language utterance in computational terms, we must consider the behaviour of the MF and NMF phonological parameters in relation to this temporal information.

ISL Manual Feature Phonological Parameters

The MF components of ISL include handshape, location, orientation and movement. We will begin by looking to the handshape parameter. Matthews (2005) defined to a total of 79 handshapes for ISL. These handshapes are used within ISL in the formation of signed vocabulary (Thorvaldsvottir, 2010). O Baoill and Matthews (2000) describe how signs are formed by applying a set of phonological rules to a combination of handshapes. Identification of these handshapes and permissible combinations provides us with an understanding of the building blocks of the formation of signs. With regard to our computational framework we now look to the various articulators used in the formation of the various handshapes. We define these articulators in relation to the right hand, however the theory applies to both the left and the right hand of the signer.

The handshape parameter refers to the position of the fingers and thumb of the hand in 3D space. This must include four separate x, y, z co-ordinates, each representing an Inverse Kinematics (IK) driver for the four fingers¹(f1, f2, f3, f4) and also parameters referring to the thumb and position of the

¹ f1, f2, f3 and f4 refer to the index, middle, ring and pinky (little finger) respectively. Please refer to Figure 1 to visualise these.

thumb. The IK driver is a node sitting above each finger, which allows us to drag the chain of bones within each finger similar to human skeletal finger movement. Within 3D space the thumb can rotate 360 degrees around a central axis. It may also be overlapped across a fist or sit at a point along a line in relation to the palm of the hand. It is assumed that the thumb has been developed and constrained within 3D space to reflect similar capabilities and constraints to a normal human hand thumb movement. The handshape computational parameters used to represent the thumb are: $\text{thumb}(x, y, z)$, $\text{tOverlap}(x, y, z)$ and $\text{tPalm}(x, y, z)$.

An initial default resting handshape will be defined to represent the default resting handshape in 3D space. Figure 2 illustrates the layout of the hand armature within 3D space, with the circular nodes on the tip of each finger and the thumb illustrating the IK driver, which is represented as a point (x, y, z) in 3D space. Table 1 provides an overview of the articulators and our proposed computational parameters within 3D space.

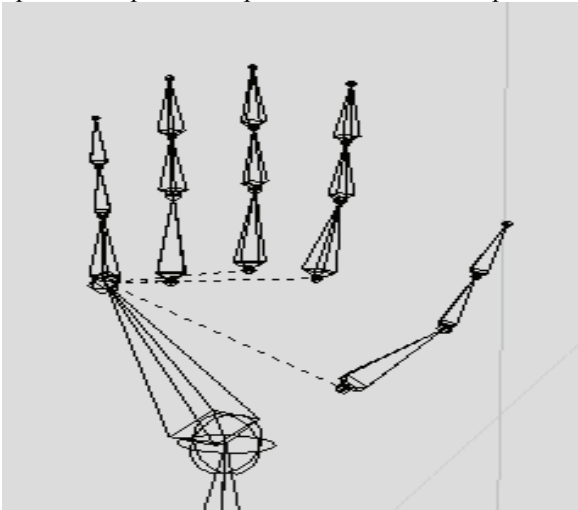


Figure 2. The armature hand in 3D space with IK driver nodes on the tips of fingers and thumb

Table 1. ISL articulator computational parameters

Articulator	Computational Parameter
pinky (little finger)	f4Shape(x,y,z)
ring finger	f3Shape(x,y,z)
middle finger	f2Shape(x,y,z)
index finger	f4Shape(x,y,z)
thumb	thumb(x, y, z) tOverlap(x, y, z) tPalm(x, y, z)

Further to this handshape parameter, parameters for hand movement, forearm, upper arm and palm orientation were also rigorously defined and described. The location at which a sign is realised within 3D space is significant with regard to the syntax and semantics in ISL. An example of this within ISL is for the minimal pairs MY and STUPID, where the only difference in terms of the articulation of these two words relates to the location. MY has the signer’s chest as a location, whereas STUPID has the forehead as a location. The handshape remains the same for both words. Taking this into consideration, and based on Brennan et al. (1984), our framework takes into account five different body anchored spatial locations: the head, the arms, the trunk, the hands and the spatial area around of the signers body.

For the purpose of computational modelling, we have divided the body anchored locations into a separate category to the spatial signing space locations. Each of the locations can be further divided into individual subcategories. Figure 3 illustrates our proposed hierarchical division for the first two levels.

Table 2 provides a list of the proposed subcategories of the body anchored and spatial locations for our computational framework. Due to the fact that within ISL an entity may be assigned a locus on the fingertips, with each fingertip then being activated as a locus that is co-referential with that entity, we must also consider these and assign the fingers of the hands as a subcategory of the hand tab category.

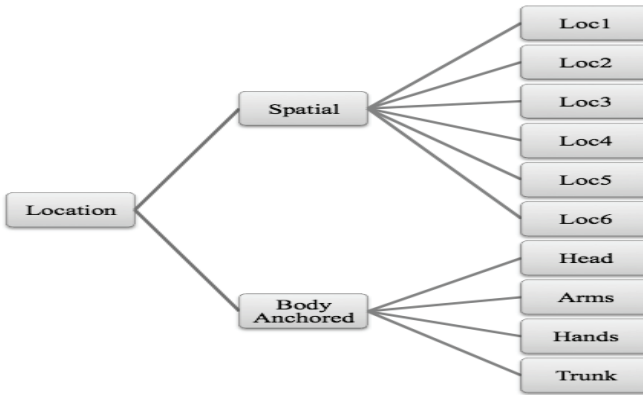


Figure 3. ISL location categories with subcategories

Table 2. Body anchored location categories with subcategories

Location	Subcategory
<BHEAD>head	hair, topHead, backHead, leftTemple, rightTemple, leftEar, rightEar, leftCheek, rightCheek, nose, chin, forehead, mouth, frontneck, backNeck, rightNeck, leftNeck
<BARM>arm	rightShoulder, leftShoulder, rightUpper, leftUpper, rightElbow, leftElbow, rightLower, leftLower, rightWristTop, leftWristTop, rightWristPalm, leftWristPalm, rightWristRightSide, RightWristLeftSide, LeftWristRightSide, LeftWristLeftSide
<BHAND>hand	rightBack, leftBack, rightPalm, leftPalm, rightIndexup, leftIndexUp, Lf1(x,y,z), Lf2(x,y,z), Lf3(x,y,z), Lf4(x,y,z), Lt(x,y,z), Rf1(x,y,z),Rf2(x,y,z), Rf3(x,y,z), Rf4(x,y,z), Rt(x,y,z)
<BTRUNK>trunk	chestCentre, chestHeart, tummy

In terms of location, it is proposed that our signing space will be subdivided into six distinct areas. Location1, location2, location3, location4, location5 and location6, similar to Marshall and Sáfár (2004). Figure 4 illustrates the division of the signing space as proposed by Marshall and Sáfár (2004).

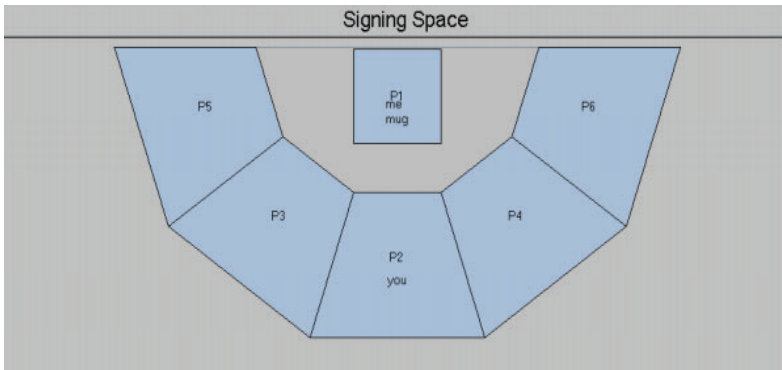


Figure 4. Signing space allocation map (from Marshall and Sáfár 2004)

Our framework proposes six subcategories for location, which are further applied across three distinct tiers within 3D space, an upper, a middle and a lower tier. Table 3 illustrates the 6 possible locations and the subcategories listed for these locations within ISL.

Table 3. ISL signing space categories with subcategory allocations

Location	Subcategories
Loc1	Loc1 up, Loc1 mid, Loc1 low
Loc2	Loc2 up, Loc2 mid, Loc2 low
Loc3	Loc3 up, Loc3 mid, loc3 low
Loc4	Loc4 up, Loc4 mid, loc4 low
Loc5	Loc5 up, Loc5 mid, loc5 low
Loc6	Loc6 up, Loc6 mid, loc6 low

The sub-division of signing space into these three distinct tiers or areas, will allow for the fact that it may be necessary to sign or point in an upper level, directly in front of the signer or in a lower level. Figure 5 illustrates an allocation map specific to our own framework.

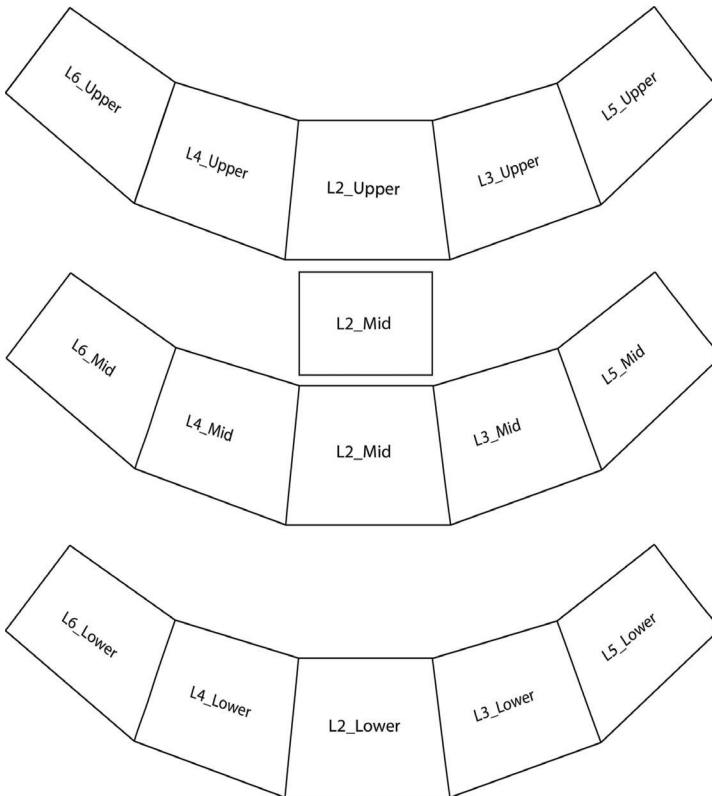


Figure 5. ISL computational signing space allocation map

ISL Non-Manual Feature Phonological Parameters

Table 4 illustrates the ISL NMF computational phonological parameters and the corresponding ISL phonemes relating to these. These ISL phonemes will be represented using morph targets, otherwise known as shape keys, within our computational framework. These shape keys for transforming our signing avatar mesh will be passed as arguments to the various phonological parameters, depending on the articulation being realised. Temporal information with regard to the duration it takes for each individual phoneme to be articulated in seconds will be also be passed across. Further to this, timing information with regard to the overall duration of the entire articulation will be passed across. This will describe the point in time that

the phoneme is articulated in parallel with other units of grammatical description.

Table 4. Computational phonological parameters for ISL NMF

ISL NMF Phonological Parameter	ISL NMF Phoneme
<HEAD>Head	nod, shake, tilt_left, tilt_right, turn_left, turn_right, chin_chest, chin_L_shoulder, chin_R_shoulder
<EB>EyeBrow (left and right simultaneous)	neutral, frown, arch
<EL>EyeLids (left and right simultaneous)	neutral, wide, squint, blink, closed
<EG>EyeGaze(left and right simultaneous)	neutral, left, right, up, down, left_up, left_down, right_up, right_down, locus, follow_r_hand, follow_l_hand
<CHK>Cheek (left and right simultaneous) Blow can be left or right singly	suck_in, blow
<MTH>Mouth	neutral, open_wide, closed_tight, smile_teeth, smile_teeth_wide, smile_closed, round_open, round_closed
<TNG> ² Tongue	in, out_pointed_1, out_pointed_2, out_pointed_3, out_round_1, out_round_2, out_round_3
<NSE>	crinkle, flare
<SHL>	neutral, up, down

ISL Temporal Parameters

The duration that it takes to articulate an event³ and also the point that which an event is articulated relative to the overall duration of an articulation is critical to the communication process. As a result, we propose two new parameters in relation to temporal information relating to the articulation of an utterance: *event duration* and *timeline* (Murtagh, 2015). The *eventDuration* and *timeLine* parameters will be used among other things, to resolve issues relating to timing and synchronisation of the various MF and NMFs during

² With regard to the Tongue phonological parameter, the values 1, 2 and 3 in relation to protrusion define the percentage of the tongue, which will protrude past the lips. 1 represents 10%, 2 represents 60% and 3 represents 100% protrusion.

³ An event refers to the articulation of any MF or NMF phonological parameter.

articulation. It is proposed that a parameter, henceforth termed *event duration* will be utilised in our linguistically motivated computational framework, as a meta-data repository pertaining to timing or temporal information. The event duration parameter will be utilised as an attribute within our framework in conjunction with every phonological parameter, both MF and NMF. It will function linguistically at the morphological/phonological interface, defining the duration or time taken for any given MF or NMF phonological parameter to be realised. The visual gestural realisation of an ISL MF and NMF phonological parameter is considered to be an *event* within our computational framework. The realisation of each event has a specific duration bound to it. This can be referred to as an *event duration*. This temporal parameter will play a central role within our framework in relation to the amount of specified time allowed for the various MF and NMF phonological parameters of ISL to realise various phonological and morphological content within an utterance.

A second temporal parameter, which must also be considered, is a *timeline* parameter. Not to be confused with the event duration parameter, which defines the time taken to realise any given MF or NMF phonological parameter within an utterance, the *timeline* parameter refers to a linear timeline representing the overall time taken from the moment an ISL utterance begins until the moment an entire utterance or articulation is completed or terminates. An utterance refers in this case to an ISL lexeme, phrase or sentence that communicates something meaningful. The timeline parameter will play a central role within our computational framework as it is responsible for keeping track of the sequence in which each phonological parameter event will be realised. The timeline parameter will track temporal information to every phonological parameter defining at which point along the overall timeline any given phonological parameter or event may be realised. This parameter will allow us to synchronise the order in which each parameter will be articulated and also allow for the concurrent or simultaneous articulation of parameters when this is necessary.

Due to the visual gestural modality of ISL within 3D space, the *event duration* and *timeline* parameters are central components of our computational framework, providing essential temporal information that is relevant and bound to every phonological parameter. These parameters will enable the realisation of a credible, plausible and comprehensible ISL utterance articulated in 3D space.

Lexical Meaning for ISL

Bearing in mind the computational phonological parameters necessary to represent an ISL utterance and taking into consideration Pustejovsky's theory of the Generative Lexicon (GL) (Pustejovsky, 1991), and the proposal that lexical meaning could best be captured by assuming four levels of representation, it is argued that in order to create a lexicon architecture which is sufficiently rich and universal in nature to capture the linguistic phenomena consistent with ISL, the number of levels of lexical representation available within the GL framework should be extended from 4 levels to 5. It is proposed that we must develop an entirely new level of representation for lexical meaning to capture the linguistic phenomena consistent with ISL in order to truly represent and accommodate ISL in linguistic terms.

The computational phonological parameters, which have been defined within this chapter, together with their respective subcategories must be represented within a new level of lexical representation for SL in particular to this research on ISL. This new level of information structure will be referred to as *Articulatory Structure Level*.

The Articulatory Structure Level will be utilised to refer to the lexical representation of SLs in which the essential (computational) phonological parameters of an object as defined by the lexical item are captured.

Table 5 illustrates the four levels of lexical meaning proposed by Pustejovsky (1991) and the additional level proposed in order to cater for the linguistic phenomena consistent with SL.

Table 6 provides an overview of the computational phonological parameters for the handshape parameter described previously. Other MF and NMF parameters have also been defined similar to this.

These parameters will be catered for in terms of lexical meaning within our proposed Articulatory Structure Level, which represents the essential (computational) phonological parameters of an object as defined by the lexical item. These parameters will be used to account for various linguistic phenomena pertaining to ISL MFs and NMFs including temporal information associated with these, which are necessary to adequately represent ISL within our linguistically motivated computational framework.

Table 5. Five levels of lexical representation for sign language

Lexical Representation Level	Description
<i>Argument Structure</i>	The behavior of a word as a function, with its arity specified. This is the predicate argument structure for a word, which indicates how it maps to syntactic expressions.
<i>Event Structure</i>	Identification of the particular event type (in the sense of Vendler (1967)) for a word or phrase: e.g. as state, process, or transition.
<i>Qualia Structure</i>	The essential attributes of an object as defined by the lexical item.
<i>Inheritance Structure</i>	How the word is globally related to other concepts in the lexicon.
<i>Articulatory Structure</i>	The essential (computational) phonological parameters of an object as defined by the lexical item.

Table 6. ISL handshake computational phonological parameters

Parameter	Computational Parameter Subcategories
Handshake <HS>	f1Shape(xi,yi,zi).... f1Shape(xn,yn,zn) f2Shape(xi,yi,zi).... f2Shape(xn,yn,zn) f3Shape(xi,yi,zi).... f3Shape(xn,yn,zn) f4Shape(xi,yi,zi).... f4Shape(xn,yn,zn) tShape(xi,yi,zi).... tShape(xn,yn,zn) tOverLap(xi,yi,zi).... tOverLap(xn,yn,zn) tPalm(xi,yi,zi).... tPalm(xn,yn,zn) eventDuration(ti, tn) timeline(ti, tn) hsDef((f1Shape_i, f1Shape_n, eventDuration(ti, tn)), (f2Shape_i, f2Shape_n, eventDuration(ti, tn)), (f3Shape_i, f3Shape_n, eventDuration(ti, tn)), (f4Shape_i, f4Shape_n, eventDuration(ti, tn)), (tShape_i, tShape_n, eventDuration(ti, tn)), timeLine(ti, tn))

Summary

In this chapter we have defined the various computational phonological parameters that are necessary to represent ISL MF and NMF for SL in computational linguistic terms. On further investigation we re-defined the

signing space for ISL in terms of our humanoid avatar and the 3D space in which it is encompassed.

We further defined new body anchored phonological parameters and we also defined parameters relating to time, namely *timeline* and *eventDuration*. We looked to Pustejovsky's theory of the Generative Lexicon (GL) and proposed that with a view to representing SL, in particular ISL, the GL theory of Lexical Representation should be extended from 4 levels to 5 levels.

It was proposed that we must develop an entirely new level of representation for lexical meaning to capture the linguistic phenomena consistent with ISL in order to truly represent and accommodate ISL in linguistic terms. This new level of information structure will be referred to as *Articulatory Structure Level*. Articulatory Structure Level will be utilised to refer to the lexical representation of signed languages in which the essential (computational) phonological parameters of an object as defined by the lexical item are captured.

Conclusion

The unique contribution of this research is that it fuses a constructional perspective in important phenomena in SLs, in particular to this research of ISL, within a RRG context. Within this body of work, we have motivated a new level of lexical meaning for language termed the Articulatory Structure Level. This level of lexical meaning caters for the linguistic phenomena pertinent to SLs, which have no written or oral form and occur in a visual gestural modality. We argue for this new level of lexical meaning as an extension to GL theory (Pustejovsky, 1991). This new level of lexical meaning describes the essential (computational) phonological parameters of an object as defined by the lexical item. This new level of lexical representation has the potential to be utilised also in terms of the linguistics of signed and spoken languages.

We demonstrate innovation within this research and also contribute to knowledge within the domain by leveraging the development of an avatar within 3D space in the provision of computational phonological parameters capable of representing ISL and the lexical definition of a SL word (Zeshan, 2007) within a lexicon architecture. We argue that new parameters for timeline and eventDuration must be included in terms of computational phonological parameters for ISL. We also argue a new definition in terms of the signing space for ISL and body anchored parameters for ISL in linguistically motivated computational terms.

Future work will look to implementing this new layer of lexical meaning in the development of RRG logical structures that are universal and robust enough in nature to cater for the linguistic phenomena consistent with SLs, in particular to this research, ISL. These proposed rich logical structures will be developed as part of this Sign_A framework, which will have the potential to be leveraged as a linguistically motivated computational framework in the development of avatar technology used for real-time Text-to-Sign translation. RRG logical structures will be defined for ISL verbs, nouns and also ISL classifier constructions.

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CHAPTER FIFTEEN

FUNCTIONAL LINGUISTIC BASED MOTIVATIONS FOR A CONVERSATIONAL SOFTWARE AGENT

KULVINDER PANESAR

1. Introduction

This chapter discusses a linguistically orientated model of a conversational software agent (CSA) (Panesar 2017) framework sensitive to natural language processing (NLP) concepts and the levels of adequacy of a functional linguistic theory (LT). We discuss the relationship between NLP and knowledge representation (KR), and connect this with the goals of a linguistic theory (Van Valin and LaPolla 1997), in particular Role and Reference Grammar (RRG) (Van Valin Jr 2005). We debate the advantages of RRG and consider its fitness and computational adequacy. We present a design of a computational model of the linking algorithm that utilises a speech act construction as a grammatical object (Nolan 2014a, Nolan 2014b) and the sub-model of belief, desire and intentions (BDI) (Rao and Georgeff 1995). This model has been successfully implemented in software, using the resource description framework (RDF), and we highlight some implementation issues that arose at the interface between language and knowledge representation (Panesar 2017).

In this chapter, we motivate, explain and demonstrate how a linguistic theory can form a linguistic engine to a conversational software agent, termed LING-CSA (Linguistic CSA). Natural language (NL) is the most easily understood knowledge representation (KR) for people, but challenging for computers due to its inherent ambiguous, complex and dynamic nature. To date, there has been a great evolution in the field of CSAs enfolded three emerging trends of more sophisticated natural language processing via improved parsing techniques, humanising of agents through language and their pervasiveness (Perez-Marin and Pascual-Nieto 2011). A long-standing issue within NLP CSA systems is refining the

accuracy of the interpretation of meaning in conversation with cognitive intelligence.

A CSA is a program that engages in conversation using NL dialogue with a human user. The challenge here is for the system to encapsulate sufficient knowledge, for example, from the user's question to present a grammatically correct response. When a person hears or sees a sentence, an individual will make full use of their knowledge and intelligence to understand it; additionally, besides the grammar, knowledge about the words, the sentence context, and an understanding of the subject matter is necessary. Here the computational model must model this natural language understanding (NLU) and the interactions that combine grammar, semantics and reasoning. Two main requirements for a CSA specified by Mao, Sansonnet et al. (2012) and Lester, Branting et al. (2004) are the ability of accurate NLU and the technical integration (application). The CSA must respond appropriately to the user's utterance via three phases: (1) interpret the utterance, (2) determine the actions (logic) required in response to the utterance, (3) generate a response.

Historically, CSAs link to the concept of intelligent machines and the question 'can machines think' (Turing 1950). Turing worked on a proposal of how to test this using the imitation game (Turing Test) and used dialogue testing as a means to work out whether or not the computer program was intelligent. This question has inspired exciting competitions (such as the yearly Loebner prize) to demonstrate human-like conversations, with four times winner 'Mitsuku' Chatbot (Worswick 2018). Further investigating within cognitive science—'can machines think' and the strong AI challenge, Searle (1980) introduces the Chinese room argument (experiment). It demonstrates that the computer program may very well look like it understands Chinese, but it only simulates that knowledge, which is not a form of intelligence. Subsequently, there is a need to address the differences between a human brain and computer program in terms of having a mind, and being able to think and understand. This "understanding" implies both the possession of mental (intentional) states and the truth (validity and success) of these states (Searle 1980).

The dialogue system (DS) component is a more refined "intelligent" version of a Chatbot, where the NL input must be constrained and unexpected, requiring a robust complex framework, with an integrated knowledge base (KB) which may take the form of ontologies deploying computational linguistic technologies. This is one of the investigative areas of this research. Further, a CSA has a deep strategic role to hold a conversation and enable the mechanisms to focus on the conversation on achieving a goal, via NL dialogue (O'Shea, Bandar et al. 2010). There is a

need to plan, and to decide what to do next, and manage the conversation, requiring dialogue management (DM) (Treumuth 2011).

The CSA's role is that of a linguistically aware and knowledge aware process simulating an empowered human to take part in the conversation. So how is this goal achieved? This is 'intentionality', in that the agent displays beliefs, desires and intentions (BDI) concerning objects, events and states of affairs in the real world (Searle 1983). To achieve this communication and interaction the plan-based method of DM using the BDI model architecture, is very flexible and supports a greater complexity of conversation (Kluwer 2011).

This chapter discusses the motivations and experimental outcomes of LING-CSA. The objectives include: (1) to clarify the requirements and address how the goals of linguistic theory align with LING-CSA; (2) to introduce Role and Reference Grammar as the grammatical system; (3) to review an innovative approach of speech act constructions (SAC) and the re-organisation of RRG for effective parsing; (4) to establish our cognitive agent manipulations and knowledge base.

2. Motivating Works

2.1 Requirements of a conversational software agent

To enable cognitive manipulations a CSA comprises the following architectural components: the interpreter, the dialogue management (DM) and the response generator (RG) with three models - internal state, external interaction and language feature (Nolan 2014b). The internal model and state is reflected by the agent's BDI.

The external model of the agent is reflected by the interacting participants (human and other agents) in its world. The language model is related to the interaction model to support dialogue via speech acts—the linguistic act of uttering a sentence (Searle 1969).

Further the CSA must have robust functional capabilities for parsing and generating utterances, as well as dealing with challenging grammatical rules and structures, and handle conversational behaviour. To summarise, the CSA must have a representation of the key facets, as noted by Nolan (2014b) in (1):

- (1)
 - a) The set of beliefs that the agent has at a given time;
 - b) The goals that agent will try to achieve;
 - c) The actions that the agent performs and

- d) The knowledge of the effects of these actions;
- e) The environment information the agent has (not necessarily complete or correct);
- f) The ongoing discourse interaction that the agent participates in the environment over time;
- g) Human language understanding and conversation tracking over a discourse.

2.2 The goals of linguistic theory

NL is ambiguous, contextual and implicit, and grounded in human cognition, and subsequently provides an infinite number of ways to express the same meaning and thus there is a need for an effective NLP and NLU model. Language 'is an immensely complex behaviour' where there is a requirement for a mental lexicon consisting of knowledge of words in that language, together with knowledge of the grammatical use of those words in the sentence (Jones and Mewhort 2007:1). This signifies that the mental lexicon has psychological links. This is deeply rooted within the work of Van Valin and LaPolla (1997) who state that there are a set of general goals that most linguists have agreed upon, which include: (1) description of the linguistic phenomena (LP); (2) explanation of LP; (3) understanding of the cognitive basis of language.

Describing the LP demands: (1a) describing an individual language (1b) describing the commonality between languages (language universals); (1c) describing the differences between languages (language typology). The demands are crucial for the evolution of the language itself, and presupposes the other goals, in that, one cannot explain a language if you cannot describe it first, alternatively one cannot understand the cognitive basis of a language without its description.

Explaining the LP involves the use of criteria and standards to explain (2a) how speakers use language in different social situations; (2b) why human languages have the structure they do? (2c) what is common to all human languages; (2d) use of inductive or deductive theories; (2e) theory-internal explanatory criteria related to phonology, semantics, pragmatics and processing; (2f) theory-external criteria related to reasoning, categorisation and perception. Understanding the cognitive basis of language outlined by Van Valin and LaPolla (1997:4) presents three facets of the psychology of language in (2):

- (2)
- a) Processing: What cognitive processes are involved when human beings produce and understand language on line in real time, assist our understanding of the cognitive basis of language? How specialised to languages are these processes?
 - b) Knowledge: What constitutes knowledge of language? How is it organised? How is it represented? How is it employed in language processing? How does knowledge of language relate to knowledge in other cognitive domains?
 - c) Acquisition: How do human beings come to have knowledge of language?

Our focus in this chapter is the processing and knowledge of language. Chomsky (1965) in his book - *Aspects of the theory of syntax*, proposed levels of adequacy that grammar must meet.

These include: (1) observational adequacy—determines and predicts which sentences (grammatically) are well-formed, and those which are not; (2) descriptive adequacy—presupposing it is observationally adequate in native speaking, and assigns structural description for sentences—both in terms of the structure and meaning; (3) explanatory adequacy—presupposes it is descriptively adequate and part of the theory that informs about the “how these facts arise in the mind of the hearer and speaker”—theory-internal. Both observational and descriptive adequacies are empirical accuracies.

The latter two types of adequacy are explicitly cognitive in nature, as they make reference to native speaker intuition and to language acquisition. Van Valin and LaPolla (1997) discuss the communication and cognition perspective. They describe the link between a human language’s role as a means of communication and the broader cognitive processes such as reasoning and conceptualisations, and further cognitive systems such as perception and knowledge. The knowledge and processing of language is critical under the computational adequacy of the LT.

2.3 RRG and the linking algorithm

A computational model must model NLU understanding and the interactions that combine grammar, semantics and reasoning. NL is conceived of as a functional system (Francois 2014), and RRG is a mature, functional LT that involves the interaction of syntax, semantics and pragmatics across grammatical systems (Van Valin Jr 2005). This is addressed on three points. Firstly, RRG’s functional view encapsulates the

syntax-semantic generalisations which are prominent to explain the semantic motivation of grammatical phenomena. Secondly, RRG has a system and algorithm which will allow for comprehension and production of linguistic expressions. Thirdly, RRG looks at language as a means of communication, and aims to be “typologically adequate” to address fairly the analysis of all languages, as languages have varying arbitrariness such as the position of the verb, and hence RRG provides added value. Figure 1 demonstrates the organisation of RRG. The double-headed arrow shows that the RRG bi-directional linking system maps the semantic representation with the syntactic representation (Van Valin Jr 2005).

The bi-directional linking system facilitates the working of the syntactic-semantic pragmatic interface for simple and complex sentences. The logistics of the comprehension process is that the parser would take the input and produces a structured syntactic representation of the clause. Van Valin Jr (2005) asserts that all grammatically relevant elements of the layered structure of the clause (LSC), cases, adpositions and other elements will be identified in this representation. Next it is the task of the grammar to map the LSC and operator projection into the semantic representation of the clause. The interpretation of this mapping is achieved by the syntax-to-semantic linking algorithm. In the semantic-to-syntax linking, Gottschalk (2011) notes that an inheritance process within the lexicon maps the lexical elements into the logical structure (LS), thus producing an output. Having produced the LSs, it is the task of the grammar to project the LSC and all other grammatical elements from the LS in question.

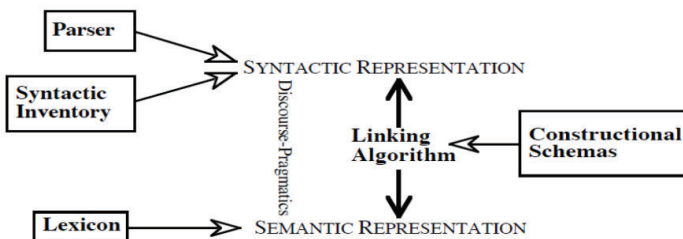


Figure 1. Organisation of RRG

In Figure 2, Van Valin represents a view of the RRG linking system with some universal and language specific traits. The semantic macroroles, logical structures (LS), and hierarchy linking them are universal and represent the domain of lexical processes. This encompasses limited cross-linguistic variations; alternatively, it is in the linking to the syntactic functions of the macrorole and arguments that languages differ substantially.

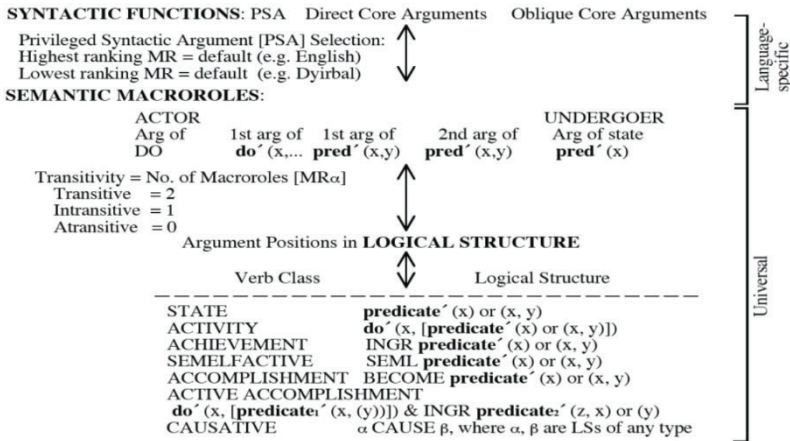


Figure 2. RRG - Linking system

Constructional schemas (CSs) play a crucial role in the linking system. For the semantics-to-syntax linking algorithm they supply the language-specific and construction specific details necessary for the correct encoding of the meaning in the morphosyntax (Van Valin Jr 2005). Similarly, CSs are important for the syntax-to-semantic linking for languages which have different privileged syntactic arguments (PSA) and for different constructions in languages such as Jakaltek and Sama.

CSs invoke the syntactic inventory for the appropriate syntactic template (combination of lexical entries), as illustrated in Table 1.

Table 1. Constructional schema for English WH-questions

Construction: English WH-question

SYNTAX:

Template(s): PrCs
 PSA: None
 Linking: WH-XP to PrCs

Morphology: Default

SEMANTICS:

Contains an open proposition with a variable α ,
 WH-XP = α

Pragmatics:

Illocutionary force: Interrogative

Focus structure: Narrow focus on PrCs

2.3.1 Semantic to syntax linking algorithm

The semantic-to-syntax procedure manipulating the semantic LS to syntax LSC, identifies a range of general linking principles, which may be superseded by specific requirements of a construction as stipulated in its CS. The steps outlined are all subject to cross-linguistic variation, and thus must be contextualised for each individual language.

An example sentence, “Chris was presented with the flowers by Sandy at the party” (Van Valin Jr 2005:140-142), and its analysis, is illustrated in Table 2 (Panesar 2017).

The linking from syntax-to-semantics is more difficult than the linking from semantics-to-syntax. This is because it involves the interpretation of the overt morphosyntactic form of a sentence and deducing the semantic functions of the elements in the sentence from it. Table 3 outlines a set of steps—“What did Sandy present to Chris”—a WH-question in English (Van Valin Jr 2005) and further illustrated in Figure 3.

Table 2. Steps identifying the application of the semantic-to-syntax algorithm

Step 1 – Semantic representation	
Task	Comments
<ul style="list-style-type: none"> • Selection of the verb or the predicting verb. May contain more than one verb. 	The verb here is ‘present’.
<ul style="list-style-type: none"> • Role of the sentence—a specific communicative intention either an active, passive, declarative or interrogative. 	This is a declarative statement.
<ul style="list-style-type: none"> • Depending on the role—this will influence the semantic representation and the selection of the appropriate syntactic template 	Select the syntactic template
<ul style="list-style-type: none"> • Any items in discourse such as NPs are represented here. 	In this case we have no discourse referents
<p>OUTPUT - No operators shown. Takes place in the lexicon <_{IF}DEC<_{TNS}PAST<be-at’(party_{ACS}, [[do’ (Sandy_{ACV}, Ø) CAUSE [BECOME have’ (CHRIS_{ACS}, flowers_{ACV})]])>>></p>	

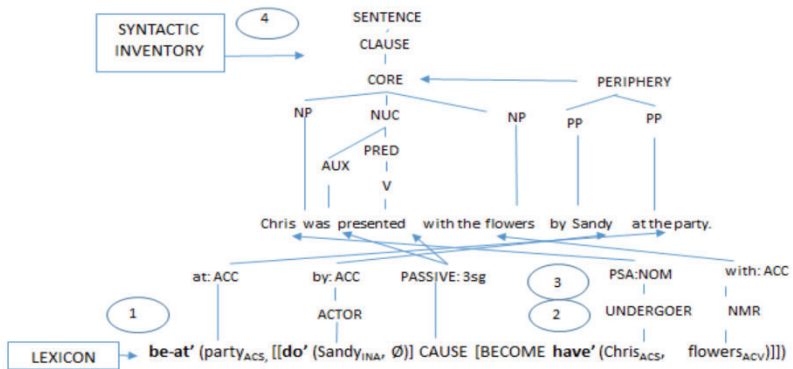


Figure 3. Semantics-to-syntax linking algorithm
Steps 1 to 4—passive construction

2.3.2 Syntax to semantic linking rules

RRG's linking algorithms provide a set of linking rules to support the explanatory, descriptive, cognitive and computational application of human languages. Another interesting principle of the linking algorithm relates to the 'completeness constraint'. As stated by Van Valin Jr (2005) 'all the specified arguments in the semantic representation must be realised in the syntax in some way, and conversely, that all the expressions in the syntax must be linked to something in the semantic representations of a sentence, in order to be interpreted'. This principle is an important computational test in implementation.

Table 3. Semantic to syntax - interrogative steps (Panesar 2017)

Step	Purpose	Contextualised to the example
1	Verb selection and voice	‘What’ refers to a PrCs operator? Verb is ‘present’. Active voice. Main issue–there are 3 argument positions to be filled–‘What’, ‘Sandy’ and ‘Chris’. ‘Smashed’ is transitive and active voice–thus the PSA is the actor. The second NP is direct as is the undergoer.
2	Retrieve the LS and verb from the lexicon. Assignment of the macroroles	Retrieval of ‘present’–[do’ (x, Ø)] CAUSE [BECOME have’ (y,z)]. ‘to Chris’ matches a preposition assignment rule, to make this an undergoer. Yielding ‘x=actor’ and ‘y=undergoer’ and z is replaced by the starting NP–‘What’
3	Assignment of arguments to the LS arguments	Yielding the result ‘x=Sandy’ and ‘y=Chris’ and z is replaced by the non-macrorole argument.

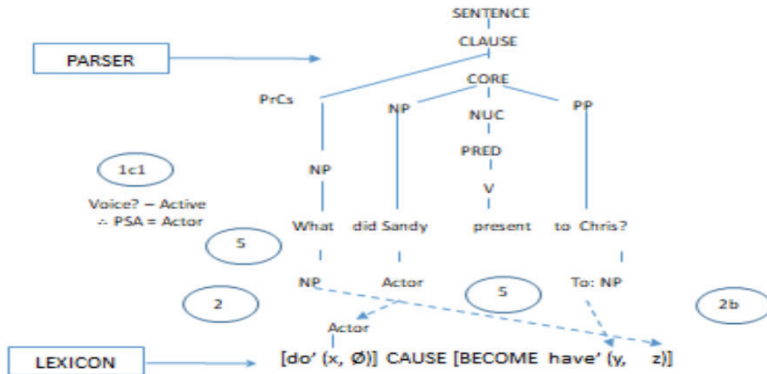


Figure 4. Linking from syntax to semantics (WH-question)

2.4 The use of speech act constructions and re-organisation of RRG

RRG recognises the importance of grammatical constructions, in their representation as constructional schemas (CS). Here the cross-constructional and cross-linguistic generalisations are captured in terms of the general principles and constraints that constitute the linking algorithms, e.g. the actor-undergoer hierarchy (AUH), the layered structure of the clause, the

privileged syntactic argument selection hierarchy (Van Valin Jr 2005). But CSs only represent the idiosyncratic, language-specific features of constructions, and are an under-utilised resource. Nolan (2014) proposes that constructions could specify lexical, semantics and pragmatic information, as well as syntactic information. He further utilised the notion of the construction in RRG, developed it further, theoretically, and further applied it to real world problems which are RRG compatible. This leads to questions (3) regarding constructions in RRG.

In the expanded role of constructions within RRG and the contextualised bi-directional linking algorithm, it helps that constructions will become more central to RRG whilst preserving the lexicon in a role as information provider to the construction. A benefit of this enhanced construction is that it provides a richer and better-motivated understanding of constructions in a lexically orientated functional model of grammar, as noted by Nolan (2014), comparative to the less articulated expressions of construction found in the various strands of construction grammar. As a driver, constructions are considered as *structural grammatical objects*, reformed into a speech act construction (SAC) in (4):

(3) Questions regarding constructions in RRG

- a) How does the RRG theory understand a construction and what information does it contain?
- b) How do the constructions relate to other parts of the grammar, and each other?
- c) Where do the constructions exist in the model?
- d) Is (part of) our grammatical knowledge organised in constructions
- e) Do constructions include information about form, function and meaning?
- f) Are constructions organised in a structured network and with other constructions?

(4) Speech act constructions

- a) With a constructional SIGNATURE to identify the schema
- b) That a construction schema has an input and output, and
- c) Contains a local workspace over the processing of the variables and various lexical and grammatical rule apply, according to
- d) Construction constraints
- e) The construction has a principled relationship to the lexicon via the LINKING SYSTEM.

Here the constructions will reside in a construction repository, with an internal architecture that facilitates the retrieval and activation of

constructional schemas based on the identification of a constructional signature for real-time linguistic processing. For the LING-CSA the notion of CSs and constructions are extended in the form of speech act constructions in conjunction with the underlying speech act theory discussed in the next section. The SAC is much richer than the syntactic templates or the CSs—whereby the constructions have all the pragmatic, semantic, and lexical information, identification of a PSA and signature, and syntactic morphological elements, along with all the key interfaces necessary for the next stage of processing. There is no need for any syntactic templates or an inventory, as found in the original RRG linking rules. The SAC is an updatable data source, in that the selected SAC is based upon the predicating verb, and parsed and checked against the possible signature (for example [PN V DET N]) for validity and well formedness (Panesar 2017). Any specific features learnt from the lexicon related to the syntax, semantic, pragmatics, can be added during the SAC lifecycle. This innovative approach means that RRG is re-organised and the parser works differently with the SAC and lexicon as illustrated in Figure 5.

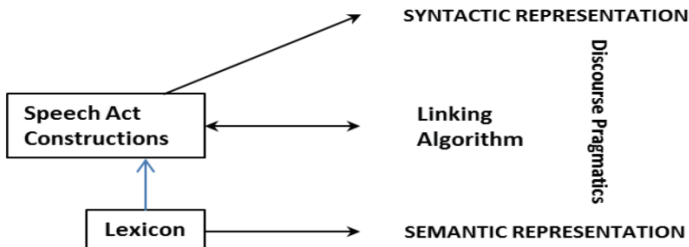


Figure 5. Parser for the CSA framework

2.5 RRG and Speech Acts (SAs)

The CSA (single-agent) must respond appropriately to the user’s utterance via three phases: (1) interpretation; (2) determine the actions (logic) that should be taken in response to the utterance; (3) generate a grammatically correct dialogue response. To achieve these phases, speech act theory (SAT) comes into play based on work from Austin (1962) to Searle’s work to address the issues of meaning and expression of NL. Searle (1969:22) states “speaking a language is engaging in a rule governed form of behaviour” and that “illocutions are intentional acts”. Further, the SAT provides the basis for interpretation of the utterance in terms of a speaker’s intention and the effect it has on a listener. These intentions are composed of SAs involving

a range of functions (actions) denoted as illocutionary acts, for example, John says to Mary *'pass me the glasses please'* involves the illocutionary act (the point of the SA) of requesting or ordering *'Mary to hand the glasses over to him'*.

2.6 SAs and beliefs, desire and intentions model (BDI)

The BDI model was based on a model of human behaviour from the theory of human practical reasoning (Bratman 1987). Put simply, the BDI model reflects a change of 'mental' states. Beliefs refer to the facts representing what an agent believes about the world. Desires are all the possible state of affairs (goals) that the agent potentially may accomplish. Intentions are the agent's commitment to its desires (goals) and its commitment to the plans selected to achieve these goals. As part of SA analysis, it is important to understand the differences between the different types of illocutionary acts (IA), and the impact of these. Furthermore, does every IA have an illocutionary verb, and how does the illocutionary point (IP) influence the illocutionary force (IF) (Panesar 2017:167)? Searle (1985:4) identifies that SAs differ due to differences in psychological states. For instance, as in the BDI model, an SA reflects beliefs, desires, wants and intentions. For example, a speaker states, explains, asserts or claims 'p' is a representation that the speaker expresses the belief of 'P'. A speaker who promises, vows, threatens or pledges to do 'A' is a representation that the speaker expresses an intention to do 'A'. A speaker who orders, commands, requests the hearers to do A is a representation of the desire (want, wish) that H do A.

2.7 Agent belief base (ABB)

2.7.1 Knowledge representation and reasoning (KRR)

Our next question is how to derive a knowledge representation (KR) model to communicate knowledge in LING-CSA. Ramirez and Valdes (2012) note that knowledge has several facets, with some static components called concepts or facts, and some dynamic components such as skills, abilities, procedures, and actions which collectively enable general cognition.

Our interest is in the three primary cognitive processes: learning, understanding and reasoning, termed as KRR (knowledge, representation, and reasoning) and a central issue in AI. Our task here is to establish a common ground for KRR and one which further maps objects and relationships of the real world to computational objects and relationships. Chein and Mugnier (2008) affirm that a knowledge base (KB) collates

symbolic KR about an application domain, containing different kinds of knowledge such as ontology (symbolic representation of objects and relations), facts, rules and constraints, and a reasoning engine.

To evaluate KRR, two important performance indicators noted by Tecuci (1998:34) are: 1) representational adequacy and 2) inferential adequacy—the ability to represent the appropriate inference procedures for application domain. These inference procedures have the role of manipulating the structures in order to derive new structures reflecting new knowledge inferred from old knowledge. For example, a reasoning capability based on an algorithm (modus ponens—stating that if A holds and if B can be deduced from A, then B holds) (Chein and Mugnier 2008).

2.7.2 KRR for the LING-CSA

Two graphing theories are investigated for the KR of the LING-CSA's belief base.

Firstly, for knowledge organisation, it will employ conceptual graphs (CGs) selected due to their effective representation of NL text (Sowa 2009). CGs are used to represent knowledge in a logically precise, humanly readable, and computationally tractable form, represented in different notations including human language (Omerovic, Milutinovic et al. 2001). CoGui is a graph-based visual tool for building CG KB - structure and content (Kamsu-Foguem and Abanda 2015). Encoding to the COGXML (Conceptual Graphs Extensible Markup Language) standard facilitates the exchange of graphs. In this case, CGs are translated to RDFS (Resource Description Framework Schema) (Yao and Eitzkorn 2006), and applied to the Semantic Web (SW) space. The LING-CSA's KB contains ontological knowledge based on the food and cooking domain with facts and rules as shown in Figure 6.

Secondly, CGs are translated to SW technologies, specifically RDF graphs (triples), as there is no loss of semantic meaning (Chein and Mugnier 2008). SW is a solid web-technology platform, representing an era of connecting knowledge using a range of tools, techniques, technologies and architecture denoted by W3C Semantic layer technology stack (Spivack 2007).

RDF, RDF Schema (RDFS) and OWL (Web Ontology Language) have, at their heart, the RDF graph. RDF provides the core mode semantics for an open and extensible graph model of interconnected data items linked by a Uniform Resource Identifier (URI), a compact sequence of characters that identifies an abstract or physical resource. RDFS and OWL are vocabulary based, particularly for building schema and ontologies with different

degrees of expressivity whereby classes and properties can be established. Carroll, Dickinson et al. (2004) note they facilitate a simple triple-based representation of knowledge, with formal semantics allowing for automated inference and querying of graph patterns, suitable for LING-CSA. These RDF triples with SPO (subject-predicate-objects), are modelled using the Jena API, and further queried via SPARQL.

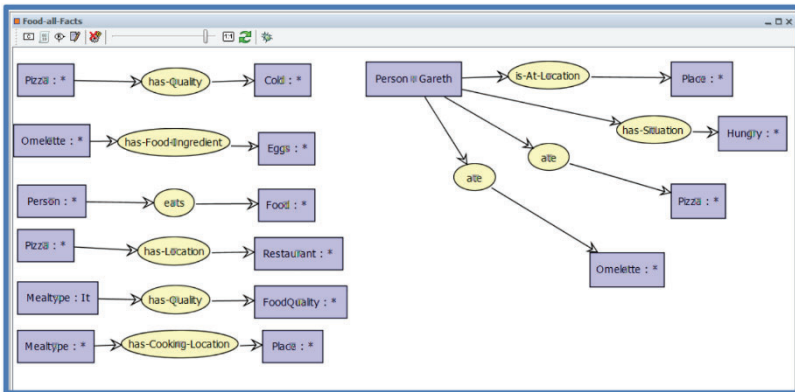


Figure 6. COGUI - a set of facts, food and cooking domain (snapshot)

From a computational perspective, how will the model of language and grammar in the form of a conversation work in a knowledge-aware agent environment? Here the concept of presupposing something, taking it for granted as background information is considered common ground among the participants in the conversation (Stalnaker 2002).

2.8 Summary of motivations

RRG is used as the linguistic engine to process the NL components of the CSA, and cognitive thinking is addressed using the BDI model and SAs. The main RRG projects addressing SAs, the challenge of deep NLU, and goals of linguistic theory are based on the work of Murtagh (2011), Gottschalk (2012), Nolan (2014a), Nolan (2014b), Nolan and Perrián-Pascual (2014). The RRG linking system and its internal rules provide a powerful facility for the production and comprehension of an utterance, and will interface with the agent’s environment and program to support an agent response. For a proof-of-concept, simple sentences are considered as the most effective starting point. The computational adequacy of RRG for this CSA will be assessed and discussed in the conclusions.

3. Methodology and experiments to explore these motivations

We integrate our discussed motivations into a conceptual architecture framework LING-CSA. Central to this is RRG as the linguistic engine, and our goal is to understand what has been uttered, and work towards a well-formed grammatically correct response, as illustrated in Figure 7.

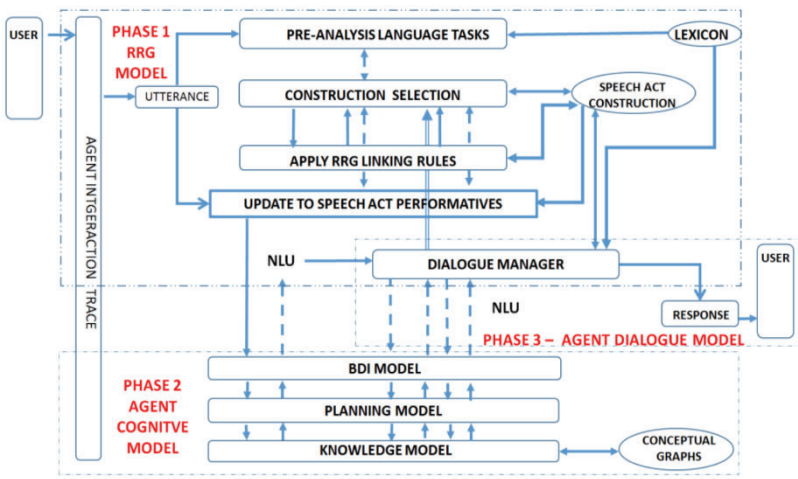


Figure 7. Conceptual architecture of the CSA (Panesar, 2017)

3.1 Conceptual architecture of LING-CSA

Figure 7 presents three phase models: (1) RRG language model, (2) Agent Cognitive model (ACM) with two inner models of: (a) knowledge model; (b) planning model; (3) Phase 3–Agent Dialogue Model (ADM) where the DM is a common component of Phase 1 and Phase 3, due to the discourse referents of an utterance, and the need to create a grammatically correct response.

The CSA will constitute a closed domain - food and cooking, for its richness and universality. A range of NLP manipulations include tokenisation, sentence splitting, part-of-speech-tagging, morphological analysis, syntactic and semantic parsing. The DM will assist with the SA dialogue, working with the syntactic parser in order to work effectively with the data sources. RRG manipulations exist for both simple and complex

sentences, but the LING-CSA is limited to the simple linking system using transitive, intransitive and ditransitive verbs/auxiliary verbs with variable word order flexibility. RRG’s bi-directional linking algorithm and discourse-pragmatics interface will be mapped into speech acts constructions, invoking the lexicon to support all three phases, and internal BDI manipulations as illustrated in Table 4, with the LSs partially expanded for readability in this chapter.

Table 4. Snapshot - lexicon – lexical entries and lexemes (data source 1)

Lexical entry 1: ate								
POS TYPE	VERB TENSE - ASPECT	DEF	P TYPE	NO	GR	CASE	ANIM	HUM
Verb	PST	DEF+/-	3	SG	M/F	DNA	ANIM	HUM
LOGICAL STRUCTURE (LS) : <tns:pst <do'(x, [eat'(x, y)]) & BECOME consumed'(y) >>								

Lexical entry 2: eat								
POS TYPE	VERB TENSE - ASPECT	DEF	P TYPE	NO	GR	CASE	ANIM	HUM
VERB	PRS/ FUT	DEF+/-	3	SG	M/F	DNA	ANIM	HUM
LOGICAL STRUCTURE (LS) : <tns:prs <do'(x, [eat'(x,y)]) & BECOME consumed'(y) >> <tns:fut <do'(x, [eat'(x,y)]) & BECOME consumed'(y) >>								

Lexical entry 3: eating								
POS TYPE	VERB TENSE - ASPECT	DEF	P TYPE	NO	GR	CASE	ANIM	HUM
VN	PROG	DEF+/-	3	SG	M/F	DNA	ANIM	HUM
LOGICAL STRUCTURE (LS) : <tns:prs <asp:prog <do'(x, [eat'(x, y)]) & BECOME consumed'(y) >>								

Lexical entry 4: is								
POS TYPE	VERB TENSE - ASPECT	DEF	P TYPE	NO	GR	CASE	ANIM	HUM
VBE	DNA	DEF+	DNA	DNA	DNA	DNA	DNA	DNA
LOGICAL STRUCTURE (LS): be'(x,[pred'])								

Lexical entry 5: hungry								
POS TYPE	VERB TENSE - ASPECT	DEF	P TYPE	NO	GR	CASE	ANIM	HUM
ADJ	DNA	DNA	DNA	DNA	M/F	DNA	ANIM	HUM
LOGICAL STRUCTURE (LS): DNA								

Lexical entry 6: restaurant								
POS TYPE	VERB TENSE - ASPECT	DEF	P TYPE	NO	GR	CASE	ANIM	HUM
N	DNA	DEF+/-	DNA	SG/P L	DNA	DNA	DNA	DNA
LOGICAL STRUCTURE (LS): DNA								

The analysis of utterance/responses will be constrained to assertive and interrogative (WH-word) SAs. The SAC snapshot examples illustrated in Table 5 include: - ‘assertive: ATE’ and ‘interrogative: IS’.

Table 5. Empty Speech Act Construction (data source 2)

<p>ASSERTIVE: ATE RRG [NP VERB NP], [PN VERB], [ADV PN VERB DET N], [PN VERB ADJ], [PRP DET N PN VERB DET N], [PN VBE VERB N], [PN PRP DET N PRP DET N], [PRO VERB DET N], [PN VERB NP], [PN VERB DET N], [NP VERB QNT N], [DET N VERB N], [DET N VERB QNT N], [NP VERB (DET) (ADJ) N (ADJ)], [PN VERB DET N ADJ], [PN VERB (DET) ADV N ADJ], [PN VERB DET N PRP DET N], [PN VERB N PRP DET N], [PN VERB N PRP DET N], RRG NONE RREG UTT INPUT RRG WKSPACE RRG DEFAULT ASSUMPTION (1ST NP=‘ACTOR’) RRG NO PARTICULAR SPEC RRG NONE RRG CONTAINS A NOUN PHRASE BEFORE AND AFTER THE VERB RRG DEFAULT RRG TRUE/FALSE RRG ASSERTIVE RRG NARROW FOCUS ON THE ELEMENT LOG STRUCTURE TO ADD</p>
<p>INTERROGATIVE: IS RRG [WH1 N VBE POSS], [WH3 VBE POSS N], [WH7 VBE DET N ADJ], [WH7 VBE DET N ADJ ADV], [VB3 N VBE ADJ], [WH3 N VBE PRP N], [WH3 N VBE POSS ADJN], [WH4 VBE DEM], [WH1 VBE PRP N], [WH7 VBE N ADJ], [WH8 VBE DET N], [RRG NONE RRG UTT INPUT RRG WKSPACE RRG DEFAULT ASSUMPTION (1ST NP=‘ACTOR’) RRG NO PARTICULAR SPEC RRG NONE RRG CONTAINS A NOUN PHRASE BEFORE AND AFTER THE VERB RRG DEFAULT RRG TRUE/FALSE RRG INTERROGATIVE RRG NARROW FOCUS ON THE ELEMENT RRG LOG STRUCTURE TO ADD</p>

The selected SAC is updated with all the necessary information to generalise the lexicon from surface syntax to the underlying semantic forms. Information includes: (1) voice opposition; (2) macrorole; (3) pragmatic; (4) semantic; (5) lexical; (6) the identification of the PSA (privileged syntactic argument)–akin to the subject of subject-verb-object; (7) the signature; (8) syntactic morphology (rules); (9) the focus; (10) information such as tense that cannot be inferred otherwise. Discourse referents are also checked.

The updated SAC will store each text and the associated complete logical structure based on the working semantic predicating element. The linking system will facilitate the syntactic parse to enable fixed word order for English (SVO), and to unpack the agreement features between elements of the sentence into a semantic representation (the logical structure) and a representation of the layered structure of the clause. The linking system will facilitate procedures for semantic-to-syntax and syntax-to-semantics parsing and generation.

3.2 Design framework - Agent Cognitive model (Phase 2)

Cohen and Levesque (1988) take the viewpoint of language as action, and view utterances as events (updated to speech act performatives (SAP) messages) that change the state of the world, and hence the speakers and hearer’s mental state change as a result of these utterances. To support the mechanics of this LING-CSA, the key dimensions are presented in Table 6.

Pavey (2010) asserts that illocutionary force is a universal operator as every language has social interactions and thus will have different SAs (core to conversation meaning) and different ways of using the language, as illustrated in Figure 8 for speech act classes (Searle 1985).

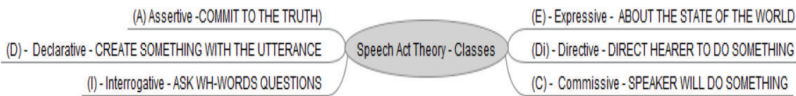


Figure 8. Speech Act classes

The three actions associated with an utterance include: (1) Locution: the physical act of uttering the sentence; (2) Illocution: the action of conveying the speaker’s intent to the hearer; (3) Perlocution: any actions caused as a result of uttering the sentence. This may include actions taken by the hearer upon the occurrence of the utterance. Our focus is the illocutionary act (IA). It is necessary for a computer program to recognise the illocutionary act (or linguistic act) of an SA, for both the speaker (USER) utterance and hearer (AGENT) and a response. For this chapter, assertive and interrogative SAs are considered.

The single LING-CSA will constitute a language model, a mental model (to work the BDI states), a planning model (to reason with states based on current knowledge), a knowledge model (world knowledge—made up of shared and individual beliefs) and a dialogue model (to provide a response back to the user).

Table 6. Agent framework dimensions (Panesar 2017)

Dimension	Linguistically Centred Conversational Software Agent (LING-CSA)
1. Implementation information	<p>No existing implementation.</p> <p>Proposed use of regular Java syntax, and POJO (plain old Java objects).</p> <p>Proposed interfaces with RRG Language Model, and dialogue manager in the form of a BDI interpreter. Both user and agent have a BDI triple, however, two viewpoints are adhered to.</p>
2. Formal semantics	<p>No formal explicit semantics defined but indirectly based on First Order Logic (FOL) axiomatization.</p>
3. Basic components (architecture)	<p>The state of the cognitive agent includes:</p> <ol style="list-style-type: none"> a) its current belief base b) a set of current intentions (in the form of plan instances, i.e. responses to be executed) c) An option selector to decide upon the range of options formulated into a plan of possible responses d) A generator to select the correct response e). An event queue
4. Agent operation cycle	<ol style="list-style-type: none"> a) Percept: an input from the environment. The user will investigate a range of utterances. Observe the world and the agent's internal state, and update the <i>event queue</i>. Once an event occurs (for example user's utterance) we must be able to recognise the event, and respond to it. Here it will be necessary to have a "listener" to the event. b) Options selector - generate possible new plan instances whose trigger event matches an event in the event queue (relevant plan instances) and whose precondition is satisfied (applicable plan instances). c) Generator: Select for execution an instance from the set of applicable plan instances—based on a set of rules. Here the agent selects the plans of highest relevance to its beliefs and intentions, and is deliberative and dynamic. d) Push the selected instance onto an existing or new intention stack, according to whether or not the event is a (sub)goal; e) Select an intention stack, take the topmost plan instance and execute the next step of this current instance: if the step is an action, perform it, otherwise, if it is a sub-goal, insert it on the event queue. f) Generate an action in the form of a grammatically correct response. g) An event Listener, will listen for all events.

5. Applicability	Agent dialogue with linguistic manipulation and understanding
6. Ontology integration	Knowledge model invoked at run time by the BDI interpreter, queried for the agent’s existing beliefs and intentions.
7. Update BDI states of agent	The agent’s knowledge will be updated with new beliefs as per agent’s planning and results

The next question is how will this integrate and function. This is achieved in the Phase 2–Agent Cognitive Model (ACM) with an input from the Phase 1 RRG Language Model. The behaviour of the agent is identified by the following basic loop where the agent iterates the following two steps at regular intervals: (1) Read the current message, and update the mental state including the beliefs and commitments; (2) Execute the commitments for the current time, possibly resulting in a further belief change.

The ACM Phase 2 model has a series of pre-agent and main agent steps illustrated in Figure 9 (Panesar 2017). The preliminary steps include: (1) Pre-Agent–Create Belief Base–the agent’s knowledge reflects the belief Base; (2) Pre-Agent–Map to Message Format–the appropriate Speech Act Performative (from the Phase 1–RRG Language Model) is re-mapped into a data structure to reduce redundancy and enable efficiency in the reasoning process. The main steps 1 to 6 are illustrated in Figure 9.

Bratman (1987) identifies the workings of how people make decisions and takes action in the form of the mental attitudes of beliefs, desires and intentions (BDI) and in relation to rational interaction. The user instigates the utterance into the CSA framework, and it is the agent which decides on the appropriate dialogue and grammatical response. These sub-dialogue internal representations will be manipulated based on discourse representation theory (DRT) (Kamp, Van Genabith et al. 2011).

To facilitate conversation, the dialogue management is invoked, and discourse referents in the previous utterance of the sub-dialogue are resolved. This will serve two purposes: 1) to establish the NLU of the utterance; (2) to forward to the dialogue model to ascertain a response. This response generator here will further make use of the RRG and SACs model, to formulate a grammatically correct response.

- (ii) ACM criteria:
 - a) Could the system demonstrate the agent BDI and KR?
 - b) Could the system represent the user's BDI states?
 - c) Could the system query the KB for a fact (from the speech act performative)?
 - d) Could the system devise an appropriate plan based on the BDI states?
- (iii) ADM criteria:
 - a) Could the system generate a grammatically correct response in RRG based on the agent's knowledge?

5. Results and technical discussions

LING-CSA was evaluated by grouped criteria per phase model. In Phase 1–RRG model, the analysis of a SAC for each specific construal (either an utterance or response)—has two steps as in (6) (Panesar 2017).

- (6)
 - a) Find the matching SAC of that specific predicating element.
 - b) Select the matching signature pattern of the utterance from the SACs.

An example is in (7):

- (7)
 - a) Utterance: “Gareth is in the restaurant”
 - b) Predicating element: ‘is’
 - c) Selected SAC: assertive: IS
 - d) Matching signature: [PN, VBE, PRP, DET, N]

This information contributes to the updateable SAC. This SAC is further mapped into a message format as an input to the agent environment (with four additional attributes: performative, user, sender and agent information) which collectively form the speech act performative (SAP). This is illustrated in Figure 10, and demonstrates the RRG Model at work. The SAC, RRG Lexicon and grammatical rules work together to demonstrate a richness of information that can be applied to simple sentences. The completeness constraint has been indirectly achieved by the allocation of logical arguments to the LS, and further demonstrates this behaviour in the LSC. If there is any periphery information in the sentence, pragmatically the

meaning has not changed; this is identified in both the LS and LSC. To summarise, RRG is fit for purpose as a linguistic engine and the speech act performative (message) is perceived in the agent environment, meeting the criteria in 5i (a-d).

```

*****
Syntactic representation of this utterance >>>>>
SENTENCE ( CLAUSE ( <CORE> <NP> gareth ( <NUC> ( <PRED> <AUX> is ) ) ) ( <PP>
in ( <NP> ( the restaurant ) ) ) ) )
*****
Speech Act Performative
*****

:::Performative =SAP ASSERTIVE IN :::Sender =<USER>:::Receiver<AGENT:::ontology =
:::Signature =[PN VBE PRP DET N]:::Constraint =DEFAULT:::Input =gareth is in the
restaurant:::Workspace =[[gareth, PN], [is, VBE], [in, PRP], [the, DET],
[restaurant, N]]:::Syntax =SENTENCE ( CLAUSE ( <CORE> <NP> gareth ( <NUC> (
<PRED> <AUX> is ) ) ) ( <PP> in ( <NP> ( the restaurant ) ) ) ) )::: PSA
=gareth:::SemanticsRRG =NONE:::Linking =CONTAINS A NOUN PHRASE BEFORE AND AFTER THE
VERB:::Morphology =DEFAULT:::Pragmatics =TRUE/FALSE:::IllForce
=ASSERTIVE:::FocusStructure=NARROW FOCUS ON THE ELEMENT:::OutputLS
=<IF>ASS<TNS><PRT> be-in'(gareth,restaurant)

```

Figure 10. Syntactic & semantic representation, and speech act performative message to the agent environment

5.1 Agent's knowledge model and a technical issue

As noted earlier, the agent's knowledge model (AKM) is based on RDF triples to support the cognitive model of the CSA. During implementation a technical challenge arose, involving the querying of the RDF triples against the perceived message of a NL utterance encapsulated in the SAP. This challenge presented a conflict of compatibility (and dependency) against the SVO of an RDF statement, illustrated in Figure 11. Here the NL syntax is conflated to a simple SVO triple with three ontology words.

This original NL sentence has lost its internal constituent phrase structure (phrase-splitting), whereby the prepositions and predicative nominative) are completed into the relation name, and the object of the proposition is conflated to a class name. These syntactic limitations give rise to serious impacts such as: (1) SVO triples are void of morphology; (2) a complex NL syntax will be reduced to a set of simple SVO triples; (3) the SVO construct will have one and only one named element; (4) The lack of function words makes it difficult to connect different SVO triples to form compound sentences or form a discourse context. Linguistically, this demonstrates a restriction of noun-verb-noun structure with morphology, lexical and syntax limitations adding to the cascading conflation (Bimson and Hull 2016) as identified in Figure 11.

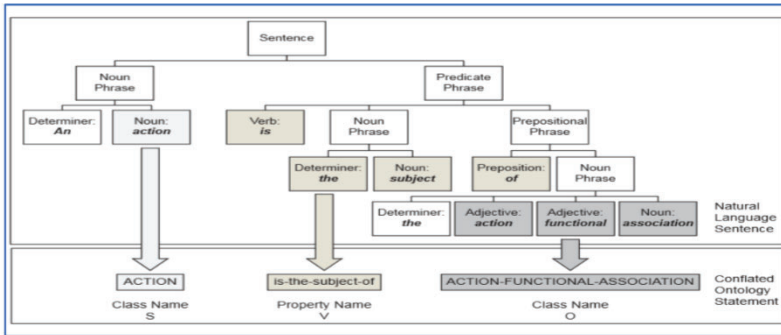


Figure 11. Complex NL sentence to a conflated ontology statement

Languages are semantically more expressive than ontologies which demonstrate a major challenge in translating the NL semantics to the ontology semantics (OS), leading to a significant meaning loss and semantic gaps characterised in terms of morphology, lexicon and syntax.

5.2 Considerations of a lexical bridge for querying in the Agent Cognitive Model

A resolution is to reduce this semantic gap by building a lexical bridge (LB) (Bimson, Hull et al. 2016) between the NL semantics and the ontology semantics, with an aim of capturing more of the meaning through attempting to lexicalize the ontology. This will entail parsing the ontology literals (class and property string names) to more lexicalised items, thus forming an ontology lexicon (OL).

A further step can be taken to check the semantic equivalence of the ontology lexical meaning with a range of NL semantics. This OL can be used to identify and eliminate any redundant knowledge, such as RDF assertions, to find any hidden lexical meaning.

This LB will form a component of the ACM of the LING-CSA specifically as an extension to the knowledge model to support the representation and reasoning activities. Figure 12 outlines the LB demonstrating the semantic crosswalk form of the NL semantics to the RDF semantics based on parsing the RDF triples into NL words. The LB comprises (8):

- (8)
 - a) An RDF parser to parse the RDF Triples into NL words, against the common RRG Lexicon (to generate an ontology lexicon).

- b) Reuse of the existing NL parser (RRG Parser) to algorithmically parse NL text into words, parts of speech from Phase 1-RRG model, using the RRG lexicon.
- c) An ontology-to-NL mapping-algorithm comparing the RDF triples with the NL words.

Previously, the situation in Figure 11 presented no opportunity to compute the agent's BDI states as they are dependent on the KR of the agent's belief-base. This is resolved by extending the LB and using the mapping algorithm computations to create a BDI parser, which in turn will support the deduction of the agent's BDI states as illustrated in Figure 12.

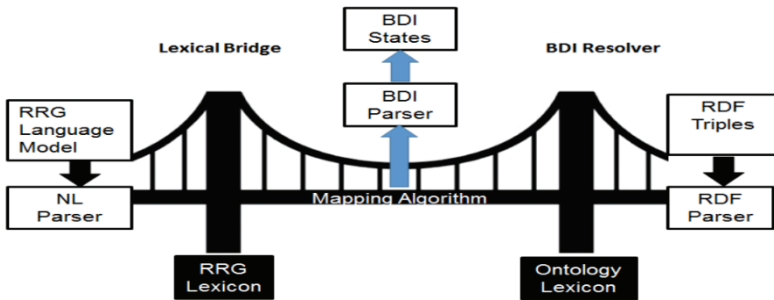


Figure 12. Lexical Bridge for the CSA's belief base + BDI Parser to resolve the agent's BDI states

6. Conclusions

Our motivations are: (1) to explore the accuracy of the interpretation of meaning to provide a realistic dialogue, and (2) to explore the cognitive facet of intelligence in conversation based on a knowledge agent. LING-CSA is implemented as a Java based prototype with the innovative intersection, interfacing and integration of models with RRG. The Speech Act Constructions and the RRG Lexicon working together demonstrate a richness of manipulations whilst analysing a simple sentence based on grammatical rules, and the speech act performative message is successfully perceived by the agent environment. Testing simple utterances with a single clause, with a specific tense and aspect, a range of verb types, is computed as a logical structure based on the layered structure on the clause, and resulting in the interpretation of the meaning of the simple sentence in English.

The current empirical results present strong correlations with the goals of linguistic theory. Further, these results demonstrate that a linguistically motivated approach adds value and is able to facilitate: (1) describing phenomena; (2) explaining phenomena; (3) language processing; and (4) knowledge of language within an agent environment. It identifies the linguistic speech act, characterised as a speech act construction, as an extension to the theoretical model via the computational RRG (Panesar 2017). Further, the agent behaviour is derived from a BDI model, interfacing with the speech act and their commonality of planning and intentionality. These results concur with Matney's (2016) discussion of how the Samsung Viv's 'dynamic program generation' allows the AI-powered assistant to understand intent and generate a program itself to best answer the query, features—'describing what you want it to do'. This approach ties in with the act of intentionality and further the descriptive nature as a goal of a linguistic theory (Panesar 2017). Subsequently, this chapter addressed the knowledge representation at the language/knowledge interface. We identify the complexity of lower level computational mappings of NL-agent to ontology mappings. One approach tackled was to create a lexical bridge between the NL semantics lexicon (RRG lexicon) and RDF triples via a mapping algorithm and an RDF parser. We have identified how the RRG linguistic theory can describe and explain an utterance; additionally, the SW technologies present an expansive KR framework for communicating information with the potential of facilitating conversation on the Internet.

We present a rich multi-disciplinary solution encompassing cognitive science, linguistics, knowledge representation, software agency, and computer science. To conclude, we provide an insight into the bridge between knowledge and language.

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SECTION D.

**DIGITAL ONTOLOGIES,
AND THEIR ROLE IN MEANING**

CHAPTER SIXTEEN

AN EXPERIMENTAL REVIEW OF A SUPERVISED METHOD FOR WORD SENSE DISAMBIGUATION USING DAMIEN (DATA MINING ENCOUNTERED)

FREDY NÚÑEZ TORRES

Introduction

The following chapter presents an experimental analysis of a supervised machine learning method, the Naïve Bayes algorithm, for automatic Word Sense Disambiguation (WSD). This approach considers the description of the linguistic phenomenon of lexical ambiguity and the development of an experiment applied to a Chilean Spanish corpus, that was designed based on the semantic representations available on the lexico-conceptual knowledge base FunGramKB (Periñán-Pascual & Arcas Tunez, 2004; Periñán-Pascual & Mairal-Usón, 2009). The assembly and execution of the experiment has been carried out using Data Mining Encountered, DAMIEN (Periñán-Pascual, 2017), a computer environment to support linguistic research efficiently.

The phenomenon of lexical ambiguity

According to the traditional perspective of formal semantics, Ide & Véronis (1998) characterize the phenomenon of lexical ambiguity as the association between a lexical item in a text or discourse, and a meaning that may be distinguishable from other meanings potentially attributable to that lexical item. Also, some of the classical authors in the field of semantics and theoretical linguistics, such as Lyons (1977) and Cruse (1986), distinguish two general types of lexical ambiguity: *homonymy* and *polysemy*. These distinctions have been updated mainly by Pustejovsky (1995) and Pustejovsky & Boguraev (1996), as a result of the computational

implications that are established from this specific type of relations between some lexemes and their potential senses.

First, homonymy corresponds to a phenomenon in which a lexical item contains, by accident or by etymological motivations, two or more meanings. It has also been referred to as *contrastive lexical ambiguity*. An example of this case is the lexical unit «bat» in the following propositions:

- (1a) The *bat* was flying around the house.
- (2b) The player hit the ball with his *bat*.

Therefore, «bat» in (1a) refers to the ‘nocturnal winged mammal, similar to a mouse’, or, as in (1b), to the ‘artifact made of wood that is used in some sports to hit a ball’. Then, these two words have the same orthographic form, but unrelated meanings.

Second, polysemy (or complementary ambiguity)¹, refers to cases in which the same lexical item can have multiple and related meanings. An example of this is the relation between different uses for the verb «open», as in the following propositions:

- (2a) The journalist *opened* a debate about the investigation
- (2b) The passenger *opened* a can of soda

In example (1a), the opening reference is related to the initial phase of communicative action, while in (2b) it refers to the opening of a physical object, with the purpose of accessing its content. In both cases, the meanings of «open» seem to be related with ‘unveil something that is closed or hidden’, either literally or metaphorically. Additionally, in the two propositions, there is an animated entity that causes the action that is referred to by the verb, called *agent*. However, the compositional meanings of each example differ. This relation can be formalized as follows:

¹ Also called (and predominantly in some cases), *complementary polysemy* in the works of Weinreich (1964) and the first approximations of the Generative Lexicon (Pustejovsky, 1991, 1995).

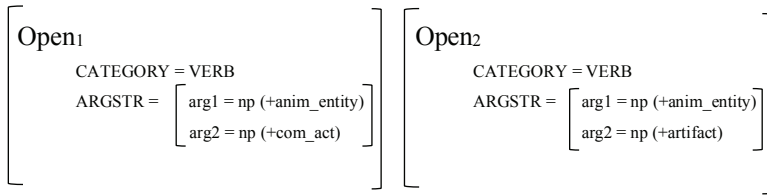


Figure 1. Formalization of argument structure for complementary polysemy presented in the verb «open».

These models approach the phenomenon of lexical ambiguity considering that the different situations in which a linguistic expression is used can guide its meaning in different directions. Thus, a proposition will be regarded as ambiguous if it has potentially two meanings to refer to different states of affairs, which correspond to two different choices by the speaker as if the result were the production of two completely different expressions. Indeed, ambiguity, according to Escandell (2004), occurs due to the existence of two denotative meanings for the same entity.

On the other hand, some authors propose perspectives that integrate the semantic and syntactic levels, such as Chiernia & McConnell-Ginet (2000). They describe ambiguity as the association between a word or string of words with more than one meaning in the language system; or Pustejovsky (1995), who proposes to characterize ambiguity as a bivalent projection of sense that could be expressed at different levels: a lexeme, a syntactic construction, or the projection of any of these structures in the representation of a particular state of affairs. An example of the above is the case of the lexical item «lamb» in the following propositions:

(3a) The *lamb* runs through the farm.

(3b) Pedro ate *lamb* at dinner.

In (3a), «lamb» refers to the ‘mammalian animal that is a young sheep’, while in (3b) it refers to the ‘lamb meat, which is a cooked portion of the animal’, in a conceptual meronymic relation (HAS-PART) in which the «lamb», as a meat, is a part of the «lamb» as the animal.

Thus, in this example both senses would be logically related and, therefore, be part of the potential of the lexical item to extend in other derived senses. However, ambiguity is also associated with compositionality, as it is possible to distinguish each sense depending on the representations it refers to. So:

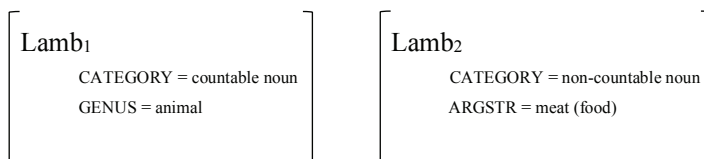


Figure 2. Formalization of the senses presented in the noun «open».

In both cases, these are lexical units capable of projecting different meanings while interacting with specific syntactic contexts. This problem is addressed by the hypothesis of selective restrictions². In the cognitive process of disambiguation, the semantic components of a lexeme are capable of projecting meanings into a specific phrase. These particular meanings will be specified by the compatibility of the lexical entry to be modified. In this case, the process of disambiguation will depend on the compatibility of the lexical meaning that is necessary for the choice of a particular syntactic structure instead of another.

Finally, and in general terms, any process of lexical disambiguation should comprise three phases: (a) decoding the input and pairing it with words that are lexically ambiguous, (b) accessing the lexical and semantic information of the ambiguous word, and (c) integrating the information with the syntactic context. According to Hong (2015), this is a phenomenon that has been discussed predominantly in the fields of semantics, psycholinguistics and computational linguistics. In this sense, it is essential to consider that the study of ambiguity involves the interaction of different levels of linguistic analysis: lexical, syntactic, semantic and phonological.

In summary, it is possible to observe different proposals from theoretical linguistics for the interaction of these levels in the phases of the disambiguation process: first, a modular treatment in which the integration of information will depend on the output produced by previous levels. Second, an interactive perspective, in which the processing of one level will affect the processing of other adjacent levels.

Lexical ambiguity as a natural language processing problem

Human language integrates two complementary types of information: conceptual, which is semantic knowledge; and computational, which is

² Also called *selective constraints*, defined as preferences of the predicate concerning the grammatical class of its arguments.

metadiscursive knowledge. This dichotomy allows the conceptual content to be organized in order to convert it into accessible knowledge (Geeraerts, 2010). Thus, computational linguistics aims to reproduce the patterns with which the human mind and language work, and to transfer them to the relationship between humans and machines. According to Periñán-Pascual & Mairal-Usón (2009), this problem is addressed explicitly in the framework of natural language processing (NLP): a branch of artificial intelligence that focuses on the study and design of computer systems to facilitate communication between humans and machines. Besides, it tries to deliver solutions to the specific problems that are proposed by computational linguistics.

Some tasks addressed by this perspective are the development of dialogue systems, extraction and retrieval of information, machine translation (either automatic or semi-automatic), speech recognition, etc.

A relevant application in NLP systems is the treatment of lexical ambiguity. The goal is to apply the computational (and therefore automatic) ability of a machine to activate a possible interpretation of a lexical unit in a given syntactic context. This problem, called word sense disambiguation (WSD), not only implies an adequate description of the phenomenon of lexical ambiguity, but also requires the development of an algorithm that can assign meanings to lexical units placed in authentic linguistic contexts. The procedure involves labelling a corpus and providing a consistent number of rules for the selection of the senses of a lexical unit in a given context.

Since the 1950s, there has been interest in WSD as a necessary and intermediate task in NLP development, in the context of the computational treatment of language. Machines, or computers, do not possess the inherent ability to process natural languages and, therefore, are unable to recognize cases of ambiguity unless they are provided with specific mechanisms to accomplish this task.

It is essential to understand the problem of WSD as an aspect of the development of artificial intelligence that can only be solved as two other issues are addressed: (a) the representation of encyclopedic knowledge, and (b) the representation of commonsense knowledge. Thus, the WSD process is defined, according to Nevzorova, Galieva and Nevzorov (2015), as the ability of the machine to identify the meaning of a lexical item in a given syntactic context, based on computational procedures.

In general terms, it is assumed that lexical disambiguation has become a procedure of assigning meaning to a lexical unit, supported in the context in which that unit occurs. This conclusion is consistent with the idea that a proper meaning for a specific word will be selected from an inventory of

senses that define the range of possibilities for that lexical unit in a particular syntactic context.

In the field of NLP, the development of systems that can solve the problem of WSD is recognized as an intermediate task to achieve highly complex procedures. For example:

- a) Machine translation: translation appropriate to the syntactic context in the case of predominantly lexical ambiguity.
- b) Extraction (or recovery) of information and hypertext navigation: precision of occurrences for search results by keywords in documents, databases or search engines.
- c) Grammatical analysis: morphosyntactic labelling in part-of-speech tagging systems or other systems of analysis, labelling or automatic morphosyntactic recognition.
- d) Speech processing: speech synthesis systems in which segmentation and discrimination of homophony in speech recognition is necessary.
- e) Text processing: correction of literal and accentual spelling in word processors, both for words and for syntactic contexts.

According to the above, any WSD system involves the process of matching the context of the word's occurrence, either with the information of an external source of knowledge or with the information about the syntactic contexts of previously disambiguated cases of the word that derived from a corpus. In short, this variety of methods of association is used to determine the best match between the given context and one of these sources of information, with the aim of assigning a meaning to each occurrence.

The FunGramKB knowledge base

Functional Grammar Knowledge Base³ is a multipurpose and multilingual lexical-conceptual knowledge base. It is composed of a cognitive level that is language independent, and a specific linguistic level for each language (Periñán-Pacual & Arcas-Tunez, 2004; Periñán-Pascual & Mairal-Usón, 2009; Periñán-Pacual & Arcas-Tunez, 2010). Although it is a system with a predominantly linguistic motivation, it is based on a lexical-conceptual approach.

³ Further information about FunGramKB project and natural language processing tools are available at <http://www.fungramkb.com/>

The architecture of FunGramKB distinguishes three levels for the storage of concepts. Each of these levels contains different conceptual modules. First, the lexical level is composed of the *lexicon*, the *morphicon* and the *grammaticon*. These modules correspond to the lexical units in their syntactic and pragmatic relations, as well as all their grammatical inflections. The second is the conceptual level. While, in general, each module is specific to each language, the conceptual level is an abstract linguistic representation understood as a framework of knowledge applicable to all languages. At this level, the three types of Tulving's long-term memory model⁴ have their correlate in each of the three conceptual modules: *ontology*, *cognicon* and *onomasticon*.

The ontology is a hierarchical catalog that integrates the knowledge that comes from experience at a high level of prototypicality. It contains events, entities and qualities. Then, the cognicon contains procedural knowledge as instances of events or entities. Finally, the onomasticon includes episodic knowledge, which is the specification of particular events and characters.

The third is the grammatical level. This level contains the grammaticon module, which systematizes and grammatically classifies each lexical item based on the RRG postulates. Therefore, FunGramKB proposes that understanding a language requires a developed knowledge base derived from common sense, together with the interaction between linguistic and conceptual levels. The above is summarized in the following scheme:

⁴ The conceptual schemes of FunGramKB are based on the long-term memory model by Tulving (1985), which classifies memory into three types: (i) semantic memory (ontology), which stores all the constituent features of the lexeme, (ii) episodic memory (cognicon), which stores biographical knowledge, and (iii) procedural memory (onomasticon), which stores how specific daily processes are carried out, and how we perceive them.

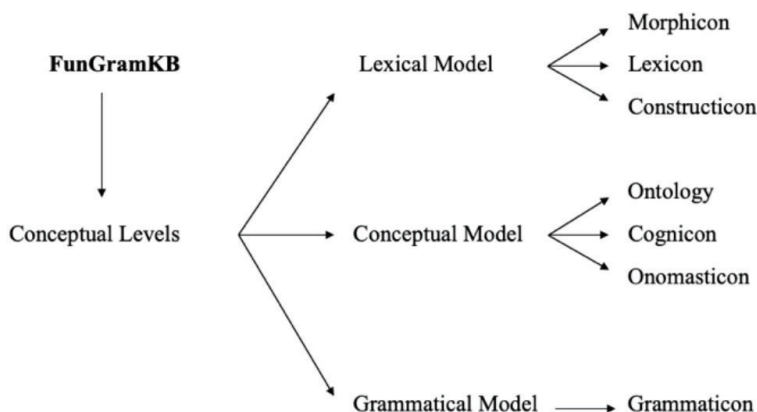


Figure 3. Conceptual levels in FunGramKB, adapted from Perrián-Pascual & Mairal-Usón (2009)

FunGramKB contains three types of conceptual units. The metaconcepts show the great conceptual dimensions for each unit, which in most of the cases match with many of the ontological units of the higher level. Each metaconcept has a thematic frame that will inherit its child or basic concepts. They are preceded by the symbol #, as in the metaconcepts #ENTITY, #EVENT and #QUALITY.

The basic concepts are specific concepts that are used to define other concepts. Each basic concept has a thematic frame and a meaning postulate. They have been identified from the Longman Dictionary of Contemporary English (Procter, 1978), as a result of several phases of conceptualization, hierarchization, remodelling and refinement (Perrián-Pascual & Mairal-Usón, 2010). The basic concepts are preceded by the symbol +, as in +FEEL_00 for events, +ATTRIBUTE_00 for entities, and +FAST_00 for qualities.

Finally, the terminal concepts are those concepts that differ or specify aspects of the basic concepts. The thematic frame gives the characteristics of the unit, integrating those inherited by the upper levels in the taxonomy. Then, the meaning postulate will detail those characteristics by assigning a predetermined series of roles. The terminal concepts are represented by the symbol \$, as in \$EXCHANGE_00 for events, \$SCARECROW_00 for entities, and \$FRIENDLY_00 for qualities.

DAMIEN (Data Mining Encountered)

DAMIEN⁵ is a computer workbench that can integrate techniques from multiple disciplines within text analysis (corpus linguistics, statistics, and textual mining) to support linguistic research more effectively (Periñán-Pascual, 2017). DAMIEN contains four interfaces:

- a) Corpus: tasks related to the exploration, preprocessing and processing of a corpus or data collection (i.e., TXT or HTML).
- b) Statistics: tasks related to the description and interpretation of data from the application of statistical procedures.
- c) Mining: tasks related to data mining and prediction methods (such as classifiers or clustering for machine learning).
- d) Evaluation: tasks related to the application of evaluation metrics.

Regarding the contribution of this workbench in the field of NLP, DAMIEN manages to integrate into the same work environment the different tools and techniques that can be applied in the analysis of linguistic corpora. These techniques come from different disciplines, such as corpus linguistics (e.g. frequency lists; XML-XSL processing; database administration and SQL; regular expressions; etc.), Statistics (e.g. descriptive and inferential statistics; graphic representation of data; etc.), natural language processing (e.g. extraction of N-grams; derivation; morphological and syntactic analysis; POS tagging; etc.), and Text Mining (e.g. classification and clustering).

In summary, according to Periñán-Pascual (2017), DAMIEN allows linguists and researchers to solve three major task groups: (1) data collection and management, related to visualization, editing, sorting, search and information extraction; (2) data analysis, associated with the convergence of statistics with corpus linguistics, through descriptive statistics (measures of central tendency and dispersion), and inferential statistics (such as correlation, regression, or multivariable analysis); and (3) data presentation, related to the transfer of text to graphic representations, based on data analysis, for scientific divulgation in different formats. These tasks represent the steps necessary to plan, assemble and evaluate text data experiments.

⁵ DAMIEN (DAta Mining ENcountered) was programmed with Microsoft ASP.NET 4.0 and C# by Carlos Periñán-Pascual (Universitat Politècnica de València, Spain) for academic or research purposes. DAMIEN is an open access toolkit, available at <http://www.fungramkb.com/nlp.aspx>.

WSD experiment using DAMIEN

This approach considers the development of an experiment applied to a Chilean Spanish corpus that was designed based on the semantic representations available on the lexico-conceptual knowledge base FunGramKB. The primary goal is to present a machine learning procedure for automatic WSD (Pedersen, 2000; Zheng-tao et al., 2009). The assembly and execution of this experiment have been carried out using DAMIEN.

The Naïve Bayes classifier

The supervised methods for machine learning correspond to different types of algorithms to solve the WSD problem that uses a previously trained corpus. This corpus has been annotated based on specific characteristics that provide linguistic information. All supervised methods have, at least, three application phases in common:

1. Select a data set that shows the different classifications for each element (values, features).
2. Identify patterns associated with each element.
3. Generalize patterns into rules.
4. Apply the rules to classify new elements not present in the initial dataset.

The Naïve Bayes approach, first used for WSD by Gale et al. (1995), is a supervised probabilistic classifier that assigns the most probable sense to a word, based on a probabilistic model of dependencies between the senses of the word and a set of characteristics presented in the initial (or train) corpus. This approach is called naïve because the presence or absence of a particular characteristic is not related to the presence or absence of any other, given the original variable. That is, each of its features constitutes an independent probability.

The system calculates the prior probability based on Bayes Theorem. Finally, the disambiguation process is performed using the Bayes decision rule. The disambiguation process computes the score of each sense of an ambiguous word and decides the most appropriate sense for a specific word in the test sentence:

$$P(\text{sense}|\text{feature}) = \frac{P(\text{sense}) * P(\text{feature}|\text{sense})}{P(\text{feature})}$$

According to Fulmari & Chaldak (2014), applying the naïve assumption, the algorithm reduces to:

$$\underset{S_1 \in \text{Senses}_D(w)}{\text{argmax}} P(S_i) \prod_{j=1}^m P(f_j | S_i),$$

Where f_j represents the feature vector, and S_i represents the sense of a particular word. Thus, the correct sense for a word will be the sense with the highest probability value.

The corpus

A semi-automatic selection of potentially ambiguous lexical units (nouns) was carried out. In total, 120 instances (syntactic contexts) were selected for the lexical unit «cabeza» (head), extracted from the written mass media corpus belonging to CODIDACH: Corpus Dinámico del Español de Chile (Dynamic Corpus of Chilean Spanish), development by Sadowsky (2006). Along with this, the selected lexical units were linked with specific concepts from the #ENTITY subontology of FunGramKB, as shown in the Table 1:

Table 1. Lexical unit «cabeza» (head) and their corresponding concepts in FunGramKB

Concepts (senses) for «cabeza» in FunGramKB	Description in FunGramKB
+HEAD_00	The upper or front part of the body in animals; contains the face and brains; "he stuck his head out the window".
+INTELLIGENCE_00	Your ability to think, feel, and imagine things.
+CHIEF_00	A person who is in charge; "the head of the whole operation".
+LEADER_00	A person who rules or guides or inspires others.

Preprocessing

1. Creation of a collection of documents derived from the corpus, corresponding to 120 input sentences in *.txt* format, containing the lexical item «cabeza».

2. Creation of a template in .csv format, with the senses labeled for each of the input sentences included in the collection of documents.

Processing

3. Creation of an N-gram/document matrix for each lexeme considering the absolute frequency in each document.
4. Application of a start list to filter the essential words in the data collection.
5. Creation of a new N-gram/document matrix, considering the filter generated with the start list.
6. Cross-validation: the information was extracted randomly from the labeled matrix, so that the machine can label automatically new unknown datasets. In this case, three datasets were generated, each with a train and a test corpus.
7. Classification: application of Naïve Bayes algorithm for the datasets of each sense.

Evaluation

In the evaluation procedure, a confusion matrix was used along with the metric of precision (positive predictive value), recall (sensitivity) and F-score (harmonic mean). The results were determined as follows:

$$precision = \frac{true\ positive}{true\ positive + false\ positive}$$

$$recall = \frac{true\ positive}{true\ positive + false\ negative}$$

$$F - score = 2 * \frac{precision * recall}{precision + recall}$$

The general results are the following, considering the average of all the datasets for each sense (equivalent to a basic concept), and the macro-average for the system.

Table 2. Macro-average results for the supervised WSD system

Sense	Precision	Recall	F-score
+HEAD_00	0,587	0,706	0,636
+INTELLIGENCE_00	0,095	0,133	0,111
+CHIEF_00	0,483	0,246	0,317
+LEADER_00	0,321	0,433	0,355
Macro-average of the system	0,372	0,380	0,355

Conclusions

The task of this chapter was to address the linguistic problem of lexical ambiguity, and its computational approach in automatic word sense disambiguation. Along with this, DAMIEN has been presented as a highly efficient workbench for linguistic research, that integrates tools from statistics and corpus linguistics. Finally, a WSD experiment based on a machine learning technique applied to the knowledge stored in FunGramKB has been proposed.

Regarding the Naïve Bayes approach and its results, it is an algorithm considered as an example of simple classifiers within the whole range of possibilities for supervised machine learning. One of its advantages is that it is possible to include a high number of features in order to capture the linguistic information that is necessary for the probability selection process. So, this method is not limited to the information provided by the syntactic context.

However, one of the main problems of this algorithm is that its results depend on the characteristics of the corpus and the number of features. This difficulty supposes an initial criticism of stochastic models for WSD and installs the need to enhance the integration of statistical and symbolic methods from an interlingual and knowledge-based approach, to design a formal representation for a computational procedure to be able to solve more efficiently the WSD process in an NLP tool.

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CHAPTER SEVENTEEN

ONTOLOGY ENRICHMENT: A CASE STUDY ON THE PLANTS DOMAIN

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Introduction

Technical development of Information and Communication Technologies (ICT) has permitted that an enormous amount of data circulates the Internet faster than ever before. In fact, since the Internet has become the primary means for information, there is so much information available to the users, that it is often difficult to access it.

Indeed, according to the World Trends in Freedom of Expression and Media Development Global Report for 2017-2018 released at UNESCO's 39th General Conference, nearly half of the world's population of 7.6 billion people now has access to the Internet, and media content availability has dramatically increased largely.

Unfortunately, computer systematization for access and retrieval of this information is challenging, as there exists what was known as the "knowledge acquisition bottleneck" (Maedche & Staab, 2001), which points to the lack of reliable computational systems able to extract meaningful patterns from immense volume of data.

Ontologies are one of the preferred approaches to tackle this. They form structures from classes, which can be extensional (only characterized by members), or intensional (if some limitations apply in order to be part of a class). In Wong's et al. (2012) words, ontologies represent the intensional aspect of a domain to rule knowledge (extensional aspect). As explained by Ureña (2018), they are computer-readable diagrams able to structure abstract units of thought, which are then matched with the actual units that represent them in each natural language. In the case of taxonomies, the simplest type of ontologies, structures are of the IS-A relation sort. For

instance, an abstract unit of thought would be ANIMAL, which could include “dog”, “elephant” or “woman”, in English, or “chien”, “éléphant” or “femme” in French.

Ontology learning is the attempt of Knowledge Engineering to create ontologies of this sort, using automatic or semi-automatic methods. Thus, the final objective is that ontologies are created or increased and improved with no, or very little, human intervention.

Ontologies can be built up using structured, semi-structured or unstructured data. Additionally, depending on the way in which information is organized, they can be a) linguistics-based, b) logics-based, c) based on machine learning methods, which, in turn can be supervised, or unsupervised, or d) statistics-based. Linguistic approaches use different strategies, such as POS (part of speech) based patterns, semantic lexicons, or seed words. Some examples of taggers are Brill’s (1992), or Haase et al.’s POS tagger (2005), for sentence parsing (Poon & Domingos 2010). Syntactic structure analysers are also included in this category, trying to establish sentence level relations. The proposal made by Wong et al. in 2012 can be mentioned here. Alfonseca and Manandhar (2002) proposed yet another linguistic approach, based on co-occurrences that can be found within sets of concepts.

Logic based proposals are the least used in ontology learning. They deal with relations and axioms. This can be approached from inductive logic programming (ILP) (Lima et al., 2014), or from logical inference (Shamsfard & Barforoush, 2004).

Machine learning methods, which are the ones considered in this paper are the last group in the list, and use algorithms to automatically analyze an ontology, process it, and establish relations among its elements (Gacitua et al., 2007).

Statistics based methods use clustering, latent semantic analysis, co-occurrence analysis, term subsumption, contrastive analysis, frequency analysis, or TF-IDF in order to group and classify data. Clustering, for instance, is the grouping of similar terms (Lee et al., 2007); co-occurrence is the identification of units, which usually appear together within a set of data. The proposal we present here falls into this category.

Two main correlative subtasks are comprised in ontology learning: ontology construction and ontology enrichment. The construction of an ontology is the first step, and refers to the making of ontologies, and to the creation of a structure based on the relationships between the terms included within. Clearly, the identification of such relations is crucial for later improvement or expansion. These same ontologies can afterwards be expanded, and/or improved (enrichment). Indeed, the second step is the growth (expansion) of a given ontology. Depending on the sort of

relationships established from the moment of their creation, ontologies can be taxonomic, which, as explained above, establish *is-a* relationships (a bed is [a piece of] furniture), or non-taxonomic, which account for other types of relationships, such as *synonymy*, *cause*, etc.

From their exhaustive analysis, which looked into more than 80 approaches for ontology learning and improvement, Wong et al. (2012) concluded that there is no detailed methodology able to guide ontology learning from text. In addition, there is no proposal able to complete a fully automatic system for ontology learning. The method proposed here attempts to resolve this situation.

One of such ontologies is FunGramKB (Mairal Usón & Periñán Pascual, 2016; Mairal Usón & Ruiz de Mendoza, 2009; Periñán Pascual & Arcas Túnez, F., 2010, 2014; Periñán Pascual & Mairal Usón, 2009, 2010; Periñán Pascual, 2013). FungramKB is a lexical-grammatical-conceptual database, which is both multifunctional and multilingual. Because of this, FunGramKB is structured in three modules: the Ontology, the Cognicon and the Onomasticon. It distinguishes three conceptual levels (i.e. metaconcepts, basic concepts, and terminal concepts). The proposal presented here could be used as an ontology-learning tool to enrich it.

In previous work (Ureña, 2018; Ureña & Mestre-Mestre, 2017) we presented a method for ontology enrichment which aimed at enlarging an ontology based on the collocational information of the features which characterize a term. The underlying reasoning is that two similarly described subordinate concepts likely correspond to the same superordinate. This was used to locate the corresponding superordinate node for each of the terms proposed for inclusion (subordinates).

The present paper presents a similar experimentation, carried out using a specialized domain related to the plant kingdom. The particularity of this domain-specific corpus is that, due to the classification of plants, the basic working units were bigrams, as will be explained later on in the text.

The paper is organized as follows: after this first section, that describes the introduction and related work, the second section explains the methodology used for the experiment. Then, the results are shown. Section 4 is dedicated to the conclusions.

Methodology

This section describes an experiment carried out to retest the reliability of an ontology enrichment method (hereafter OEM) designed to complete taxonomic relations based on specialized domain texts, using bigrams as basic components.

The general procedure of the OEM starts by selecting an input term, in this case, a bigram, in order to include it into a pre-existing reference taxonomy, and allocating it in a superordinate unit already existing in the taxonomy. This operation is mechanically carried out based on the existing defining features of the terms, both the new (input) term, and that of reference, the superordinate. The hypothesis statement is that the greater the coincidence of relevant features between a superordinate and the input term, the greater the possibility for them to be in a subsumption relation. That is to say, shared features between two terms (an input term and a superordinate) might indicate a relation amid them, in this case, a hierarchical one.

The OEM uses three data sources for the completion of the enrichment process: first of all, a reference taxonomy, an encyclopedic database, and finally, a domain corpus. Each one of these plays a crucial role in the experiment devised, providing specific information necessary in the projected automatic classification.

The reference taxonomy used to extract the input terms is a Plants database, and has been obtained from an open-access website supported by the US Department of Agriculture, and, in particular, the Natural Resources Conservation Office¹. The role of the taxonomy is twofold: on the one hand, it is used to extract the terms, which will be used as input terms in the experiment. On the other, it is used to validate the results, allowing us to double-check that the classification has been correctly completed, and the subsumption relations are established as expected; placing the input term under the appropriate superordinate.

Table 1 shows the exact terms used for the experiment, including both, the species and the specific families of the plants used. The initial hypothesis is that the OEM can reveal that the input term *Abies balsamea*, which belongs to the *Pinaceae* family, shares more and/or more significant features with *Pinus palustris*, which is another species in the sample taxonomy that belongs to the *Pinaceae* family:

¹ <https://plants.sc.egov.usda.gov/classification.html>

Table 1. Input terms. Species and families.

Species	Family
<i>Abies balsamea</i>	<i>Pinaceae</i>
<i>Acer saccharinum</i>	<i>Aceraceae</i>
<i>Magnolia grandiflora</i>	<i>Magnoliaceae</i>
<i>Morus alba</i>	<i>Moraceae</i>
<i>Nyssa sylvatica</i>	<i>Cornaceae</i>
<i>Ostrya virginiana</i>	<i>Betulaceae</i>
<i>Phleum pratense</i>	<i>Poaceae</i>
<i>Pinus palustris</i>	<i>Pinaceae</i>
<i>Raphanus sativus</i>	<i>Brassicaceae</i>
<i>Rosa canina</i>	<i>Rosaceae</i>
<i>Secale cereale</i>	<i>Poaceae</i>
<i>Sorghum bicolor</i>	<i>Poaceae</i>
<i>Triadica sebifera</i>	<i>Euphorbiaceae</i>

Regarding the encyclopedic database used for the experiment², it is the framework databank for the taxonomy used in the experiment. As described in the website, it provides information about all kinds of plants existing in the U.S.: vascular plants, mosses, liverworts, etc. It presents a complete report of the plants, including their names, symbols, distributional data, species, characteristics, crop information, etc. It will be used to extract the features of the superordinates, necessary for the matching, which, as explained above, is the starting point of the entire procedure.

The domain corpus used has been collected using Anthony's 2018 AntCorGen³. This tool is able to search for documents in the PLOS ONE journal database⁴ which respond to specific criteria, as for instance subject categories. Depending on the needs, specified sections (abstract, introduction, etc.) are separately downloaded and stored for use (Anthony, 2014).

Finally, the fourth founding element in the experiment carried out is the tool used for text processing, DAMIEN (Data Mining Encountered)⁵, developed by Perrián-Pascual (Perrián-Pascual, 2017). This robust online toolkit enables the completion of numerous language-related tasks, comprising corpus processing, statistical analysis, data mining, and evaluation.

² <https://plants.sc.egov.usda.gov/java/factSheet>

³ <http://www.laurenceanthony.net/software/antcorgen/>

⁴ https://journals.plos.org/plosone/browse/database_searching

⁵ <http://www.fungramkb.com/nlp/aspx>

Results

The search of the input term *Abies balsamea* in the PLOS database yielded as many as 94 concordances from 72 documents. The concordances were then submitted to DAMIEN, which retrieved a set of 1,399 collocates of the input term. Table 2 shows the first ten collocates of *Abies balsamea*.

Table 2. First ten collocates of *Abies balsamea*.

Collocate	Collocational strength (Chi-square with Yates' correction)
â fagus	11898.577
abbreviation plant	11898.577
abies sachalinensis	11898.577
abietina var	11898.577
abscondita c	11898.577
abscondita cb	11898.577
absent road	11898.577
abundant model	11898.577
acadian forest	11898.577
accession no	11898.577

The set of collocates was next processed in order to compare the input term's collocational context against the set of linguistic features of the subordinates from the golden taxonomy. Table 3 shows the number of features shared by the input and the subordinates as well as the total weight of such features. The weight of each feature was calculated by using a pre-established range of scores according to which 0.5 and 0.1 refer to collocates with the strongest and the weakest chi-square values, respectively, with corresponding scores for intermediate chi-square values (Ureña, 2018; Ureña & Mestre-Mestre, 2017):

Table 3. Feature matching between *Abies balsamea* and other subordinate species.

Superordinate	Subordinate	Shared features with input term	Weight of shared features	Z-score
Aceraceae	<i>Acer saccharinum</i>	21	9	1.78
Magnoliaceae	<i>Magnolia grandiflora</i>	16	6.3	0.68
Moraceae	<i>Morus alba</i>	8	3.6	-0.43
Cornaceae	<i>Nyssa sylvatica</i>	7	2.9	-0.71
Betulaceae	<i>Ostrya virginiana</i>	9	3.7	-0.39
Poaceae	<i>Phleum pratense</i>	7	2.6	-0.83
Pinaceae	<i>Pinus palustris</i>	15	6.4	0.72
Brassicaceae	<i>Raphanus sativus</i>	9	4.4	-0.10
Rosaceae	<i>Rosa canina</i>	3	1.1	-1.45
Poaceae	<i>Secale cereale</i>	8	3.7	-0.39
Poaceae	<i>Sorghum bicolor</i>	8	3.3	-0.55
Euphorbiaceae	<i>Triadica sebifera</i>	20	8.7	1.66

Discussion

The results indicate that the species sharing the highest number of features with the input term *Abies balsamea* is *Acer saccharinum*, which suggest that both terms can be classified under the same superordinate family, *Pinaceae*. These results, however, are not consistent with the hierarchical order in the golden taxonomy, in which only the species *Pinus palustris*—and not *Acer saccharinum*—is a member of the *Pinaceae* family. In fact, as Table 3 shows, *Pinus palustris* ranks third on a scale of relatedness to the input term (Z-score = 0.72).

The results should be interpreted in a broader context, also including two previous tests in which the OEM was successful in allocating the input unigrams within the goal taxonomy (see Section 1). This means that further research is necessary in order to validate the usefulness of the proposed model and to assess the need for additional linguistic filters in learning tasks relying on bigrams or trigrams as seed terms.

Conclusion

This paper has presented the results from a study that measured the efficacy of an ontology enrichment method (OEM), which uses both corpus and encyclopedic data in automatic classification tasks. The experiment follows two previous experiments in which the authors tested the OEM for the automatic classification of unigrams from the specialized knowledge fields of virology and chemistry. As a follow-up of the experiments mentioned above, the main goal of the present paper was to evaluate the performance of the OEM in identifying the superordinate term of the bigram *Abies balsamea* in a golden ontology of plants. The results show that for the sample selected, the OEM failed to classify the input term under the appropriate superordinate in the taxonomy. Even though the OEM was exploited successfully in previous research, its poor performance in this study suggests that this method requires refining and further testing with more datasets. Future research should focus on evaluating this method in contexts where complex units, such as bigrams and trigrams, are used in the ontology enrichment task.

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