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Extending a lexicalist functional grammar through speech acts, constructions and conversational software agents

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This talk proposes to advance a model of conversational agents in a computational framework that builds on the notion of speech act performatives (Searle 1969) from discourse within a functional model of grammar. In order to progress this model, we describe the language specific elements of the intelligent conversational agents paradigm and how it can be usefully employed in modelling of human language in software through use of agent-embedded speech acts.

The linguistic model employed is Role and Reference Grammar (RRG) (Van Valin 2005). This work builds on earlier research (Nolan and Salem 2011) on an RRG Interlingua-based machine translation engine. It also builds on recent work (Nolan 2011abcd, 2012ab, 2013; Diedrichsen 2010, 2012; Nolan and Diedrichsen 'to appear', Murtagh 2011, Butler and Arista 2009) on understanding constructions as grammatical objects within RRG and the role of computational approaches to functional grammars (Nolan and Periñán, 'to appear').

We propose a view in which a conversational agent has 'internal' and 'external' models to support the speech acts. The internal model of the agent is concerned with the internal state of the agent, based upon the intersection at any given time on the agent's internal **b**eliefs, **d**esires, and **i**ntentions, known as BDI states. The external model of the agent is composed of an interaction model with its world (human and other agent). Importantly, the conversational agent also has a language model in software that is related to its interaction model to support bi-directional communication in human language through speech acts. For this, we employ the RRG model to motivate the design of the language model and use the RRG bi-directional linking system.

We present a framework that connects the software agent model (Labrou and Finin 1994) and the intelligent conversational agents paradigm to the RRG model of language. This has significance in that it has potential for use with linguistically oriented ontological semantics modelling, such as the research in FunGramKB (Nolan**,** Mairal-Uson and Periñán 2009; Periñán-Pascual and Mairal Usón 2009; Periñán-Pascual and Arcas Túnez 2007, 2010; Mairal Usón and Ruiz de Mendoza 2009), and as a framework for testing of hypotheses on languages to support claims of adequacy (Butler 2009) within a functional approach. It also extends the breadth of computational work within RRG.

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Textual processing: interfacing the linguistic and the cognitive levels

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Recent research into FunGramKB has focused on the development of a proof-of-concept prototype, ARTEMIS (Automatically Representing TExt Meaning via an Interlingua-based System), which is able to automatically provide a semantic representation of a text under the format of a conceptual logical structure (Periñán, (in press), Periñán and Arcas, (in press)). Within this context, the aim of this talk is to further discuss the explanatory scope of ARTEMIS by looking at the four constructional levels as posited in the Lexical Constructional Model: level-1 or argumental constructions, level-2 or implicative constructions, level-3 or illocutionary constructions and level-4 or discourse constructions (Ruiz de Mendoza, (in press); Ruiz de Mendoza and Mairal, 2008; Mairal and Ruiz de Mendoza, 2009). Hence, this presentation is divided into two major theoretical blocks: the first deals with the representation of these four-level constructional schemata and the second is concerned with how the computer actually processes the input text. In our discussion of the representational part, we show the internal structure of the 'grammaticon' and opt for an Atribute-Value Matrix as the type of formalism used to capture the linguistic properties of each constructional level. For the second part, that dealing with processing, we propose a sort of a processing protocol, which is claimed to have a solid psychological adequacy. Finally, we briefly discuss the theoretical implications of such an approach in the architecture of ARTEMIS, i.e. more specifically in the generation of the syntactic rules (and the format of the computational grammars), together with the automatic generation of constructional and lexical rules.

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Revisiting Aktionsart types in the LCM and FunGramKB

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It is a widespread assumption that some of the semantic features of predicates determine their grammatical behaviour, and accordingly many approaches consider of paramount importance to develop a solid theory of lexical representation. Such approaches share the view that predicates are the linguistic expression of events, and their semantics must encode those aspects of a theory of events that determine a semantics-to-grammar linking. Thus, lexically-based models such as Role and Reference Grammar (Van Valin & LaPolla 1997; Van Valin 2005), Levin & Rappaport's predicate-centered system of lexical representation and the Lexical Constructional Model depart from a typology of aspectual event types to articulate their corresponding systems of lexical representation, which are different developments of the original typology proposed by Vendler. FunGramKB also makes use of such a typology for the characterization of verbal items.

Despite the fact that in RRG and the LCM Aktionsart features are the backbone of lexical representations, most contributions on lexical analysis within these proposals have concentrated on finding out other meaning components which complement aspectual features; i.e. this typology is assumed to be true for all cases and it is regularly left unchallenged.

There are, however, some issues that merit revision in order to avoid certain incoherencies in this classification of verbal predicates. The aim of this talk is to draw attention to some of these features and try to provide an alternative framework for their explanation. In doing so, a new proposal for the interpretation of some aspectual features within RGG -and consequently within the LCM and FunGramKB- will be offered.

The construction of illocutionary meaning

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Meaning is a mental phenomenon which is not encoded *sic et simpliciter* in linguistic units, but linguistic units are prompts language users rely upon in order to construct meaningful conceptual representations in their mind. Meaning in dialogic language use is an even harder challenge to interpret since illocutionary intentions are mostly conveyed indirectly and speakers are burdened with extra-effort in their search for the intended illocutionary force. Pragmaticians have ascribed the interpretation of illocutionary meaning to grammar (*codification hypothesis*) or to mental mechanisms (*inferential hypothesis*); however, linguists from different theoretical persuasions may identify a common ground to discuss the complex issue of illocutionary meaning construction through the identification of syntactic patterns instantiating speech acts and of pragmatic parameters such as social distance, politeness and cost-benefit.

The present talk aims to illustrate the advantages of addressing the investigation of speech acts in terms of illocutionary constructions, i.e. well-entrenched form-meaning pairings as any other type of construction, by reporting on three case studies devoted to the three categories of interpersonal speech acts – directive, commissive, and expressive –, and attempts to open the discussion on how knowledge engineers can represent illocutionary meaning in the natural language processing system Fun-GramKB.

Micro-theories of Specialized Knowledge Representation

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Frame-based Terminology (FBT) (Faber 2012) is a cognitive approach to Terminology, which directly links specialized knowledge representation to Cognitive Linguistics and Semantics. Its methodology combines premises from psychological and linguistic models and theories such as the Lexical Grammar Model (Martín Mingorance 1989; Faber and Mairal 1999), Frame Semantics (Fillmore 1985), and the Generative Lexicon (Pustejovsky 1995). More specifically, the FBT approach to Terminology applies the notion of *frame*, as a way of emphasizing non-hierarchical as well as hierarchical conceptual relations. In specialized communication, specialized knowledge units activate domain-specific semantic frames that are in consonance with the user's background knowledge. These frames are based on the following micro-theories: (1) a semantic micro-theory; (2) a syntactic micro-theory; (3) a pragmatic micro-theory. These micro-theories were developed to model the concepts in specialized knowledge fields, to specify the information in term entries, and to evaluate cases of cross-linguistic differences in conceptualizations. These micro-theories have been applied in EcoLexicon (http://ecolexicon.ugr.es), a multilingual environmental knowledge base and future satellite ontology for FunGramKB.

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ABSTRACTS

Remodelling entities in the FunGramKB Core Ontology

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The conceptual processing of an input text in FunGramKB largely depends on its ontological module, which has a pivotal role in the architecture of the knowledge base (Periñán-Pascual and Mairal, 2011a). It is composed of a core ontology, which represents general common sense knowledge; and satellite ontologies, which focus on the representation of domain-specific knowledge structures. The core ontology is thus the main semantic component upon which other modules and resources rely.

There are three different conceptual levels in the core ontology: metaconcepts, which are distributed in three main upper-level classes (entity, event, quality); basic concepts, which were extracted from the Longman Dictionary of Contemporary English
(Procter, 1978) and are used as the defining units of other concepts; and terminal concepts, which are rarely hierarchically structured and are thus defined according to basic concepts (Periñán and Mairal, 2011b).

The definitional semantic features of basic and terminal concepts are codified in the form of meaning postulates (MPs), which are expressed in the conceptual representation language COREL (Periñán-Pascual and Mairal, 2010). MPs are based on deep-semantics, thus linking concepts with others through the different predications that compose their definitional statement. The first predication always relates the concept to its hypernym through the predicate +BE_00, whereas the rest may vary according to concept types. For instance, concepts showing parts add meronymic predications (+COMPRISE_00), whereas artifacts are related to all kinds of predicates, depending on their function.

Once retrieved from the Longman Dictionary, basic concepts were manually structured following the COHERENT methodology, which is divided into the phases of conceptualization, hiearchization, remodelling, refinement (Periñán-Pascual and Mairal, 2011b). The completion of these four phases will ensure the coherence of the resource for reasoning purposes. However, these procedures are not a trivial task.

In the remodelling of the entities taxonomy, we have encountered several problems. First of all, the ontology allows for non-monotonic inheritance (Periñán-Pascual and Arcas-Túnez, 2010). This means that multiple inheritance may be allowed when a concept has different hypernyms but its hyponyms do not necessarily inherit all of the features of the superclasses. This is a challenge for knowledge engineers, since they have to specify the conceptual routes where a particular concept stops belonging to more than one class or inheriting certain features. Another challenge was to find among entities certain generalization patterns in order to group them together under a certain hypernym. This led to the creation of many umbrella concepts, which in turn had to be recategorized according to non-monotonic inheritance. Another drawback comes from the fact that conceptual and linguistic knowledge do not always show clear-cut boundaries, as shown in circular definitions. Circular definitions caused two main problems: (1) there were certain concepts that had to be supressed, since they were only synonyms of already existing concepts; and (2) umbrella concepts had to be very carefully selected, so that an excessive degree of multiple inheritance

would not impair the system. Inheritance is another problem, since according to prototype theory (Rosch, 1978), not all concepts belonging to the same category share all of its prototypical features. In these cases, predications can be defeated in the MPs of non-prototypical category members, but this must be kept to a minimum. This raises the question of whether certain predications should be included in the MP of a hypernym or only in all of the hyponyms that actually have a particular feature.

Finally, the construction of MPs can be a very tedious task subject to inconsistency problems. Currently, there is a protocol to assist knowledge engineers in the construction of MPs (Periñán-Pascual and Mairal), which consists of pointing to particular defining features constrained by metaconcept types. For instance, attibutes such as taste or shape are only related to SELF-CONNECTED OBJECTS, whereas size and colour are also related to FEATURES and REGIONS.

However, we believe that this protocol could be enhanced by: (1) constraining definitional features according to basic concept categories rather than metaconcepts; (2) and offering a more detailed step-based protocol of the process. In this way, MPs could be automatically delivered by answering a set of guided questions which would include definitional features but also different operators, satelllites, linked predications and most of the specifications required in COREL. The automatization of MPs would undoubtedly accelerate the construction of MPs by knowledge engineers and would assure the coherence of the process.

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The interaction of deep and shallow semantics in FunGramKB: The ontological motivation of unexpected Aktionsart variations of cleaning verbs

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Verbs which lexicalize "cleaning" events show certain peculiarities in terms of RRG *Aktionsar*t (Van Valin & LaPolla 1997) classification that could lead to classify them either as activities or as causative accomplishments. This aspectual alternation, unexpected in RRG terms, could, in our opinion, be explained if we resorted to FunGramKB. The multipurpose lexico-conceptual knowledge base seems to provide a deep semantics ontological motivation for the unusual aspectual diathesis which lies in the connection of the semantic prime +DO_00 to the metaconceptual primitives +CHANGE_00 and +TRANSFER_00 (Periñán Pascual 2013).

The analysis of "cleaning" verbs, at the same time, allows us to further refine the knowledge base by the addition of new basic concepts and the units which lexicalize them in different languages. We propose the subdivision of these verbs into either "change events" (i.e. +CHANGE_00) or "removing" events (+TRANSFER-00). The latter would imply the addition of the basic concept +REMOVE-00 in the Ontology. We will argue for the inclusion of this concept and aim at showing how these events could be lexicalized as manner or as instrument verbs in the lexicon.

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Implementing pronominal constructions in FunGramKB to refine the Spanish-English translation process

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Pronominal constructions are widespread in Spanish with a wide variety of semantic interpretations. For instance, we can see a pronominal construction with a reflexive meaning in (1), another with an aspectual meaning in (2), and another one with ablative (source) meaning in (3).

(1) Juan se lava todos los domingos por la mañana.
Juan CL washes every the Sundays by the morning.
"Juan washes himself every Sunday morning."

(2) Juan se leyó el libro.
Juan CL read the book.
"Juan read up the book."

(3) Juan se fué de Madrid a Barcelona.
Juan CL went of Madrid to Barcelona.
"Juan left Madrid and headed for Barcelona."

At this moment, FunGramKB (Mairal Usón, in press; Periñán-Pascual & Arcas-Túnez, 2010) does not include such constructions as part of its grammaticon. The aim of this paper is to provide a descriptive catalogue of such constructions in Spanish that specifies their lexical, syntactic and semantic properties. In doing so, we should be able to provide answers to the following issues:

a) The difference between a pronominal reflexive construction like (1) from a transitive generic construction like (4);

b) The telic contribution of the pronominal construction in (2), in which the verb is translated by "read up", in comparison to (5), in which the verb is translated by "read";

c) Finally, the ablative meaning of (3), which can be rephrased by two predicates ("Juan left Madrid" and "Juan headed for Barcelona"), in comparison to (6), which cannot be rephrased by two predicates but conveys just one predicate that represents a movement along a path defined by the points Madrid and Barcelona.

(4) Juan lava todos los domingos por la mañana.
Juan washes every the Sundays by the morning.
"Juan washes every Sunday morning."

(5) Juan leyó el libro
Juan read the book
"Juan read the book."

(6) Juan fue de Madrid a Barcelona.
Juan went of Madrid to Barcelona.
"Juan went from Madrid to Barcelona."

The resulting analysis will serve to populate the grammaticon and provide a machine readable representation of this particular constructional schema.

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(Re)locating concepts in FunGramKB: The case of `split´ and `separate´ events.

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In Fumero Pérez (2012a, 2012b) we analized the behaviour of three of the verbs which Levin 1993 (164-167) classifies as Verbs of Separating and Disassembling: *separate*, *detach* and *split.* A comparison of these three verbs in relation to three constructions (the *from* source construction, the apart reciprocal construction and the simple reciprocal construction) showed that the behaviour of *separate* and *detach* is different to that of *split*. The fact that split does not allow a *from* complement, whereas the other two verbs do, is an indication of its different semantic nature. That is, it does not involve a negative subevent structure and the result state that forms part of its content does not need to be locational. A revision of the syntactic features of split, therefore, revealed that there is no actual reason for its classification beyond the original class it belongs to ('break' verbs). It is its essential semantic nature as a 'break' verb that explains why it can be projected into inchoative, middle and resultative ('apart' included) structures.

Within the theoretical framework adopted for the analysis, the so-called Lexical Constructional Model (henceforth LCM) Mairal and Ruiz de Mendoza (2008, 2009) and Ruiz de Mendoza and Mairal (2007), such differences are to be captured in the Lexical Templates corresponding to the semantic representation of these verbs, since they are not merely lexical semantic distinctions, but a matter of deep conceptual semantics.

In this line, the aim of the present study is to look at the treatment of these verbs in FUNGRAM KB's knowledge base, in which we find that the verbs *split* and *separate* are defined by the same concept, SPLIT_00, and that *detach* doesn't appear at all. Taking into account the different semantic nature of these verbs, we conclude that, whereas +SPLIT_00 encodes the basic meaning of `break´ verbs, it is necessary to propose a different basic concept (motion) to define separating and disassembling verbs.

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Employing constructionist views to enhance Role and Reference Grammar's constructional schemas

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Even though constructions play a fundamental role in the general organization of a projectionist theory such as Role and Reference Grammar (RRG; Van Valin & LaPolla, 1997; Van Valin, 2005, 2012), the format employed for them is not highly elaborated, as it is not intended to be a formalism, but a collection of the key syntactic, morphological, semantic and pragmatic properties of particular forms of a language. Thus, the goal of this paper is to enrich the semantic specifications of RRG constructional templates in order to accommodate all the nuances that constructions display, specifically, in the case of the English resultative, which is the target construction in this work. This is achieved by employing the overall formalism proposed in Diedrichsen (2010, 2011) and Nolan (2011ab), as well as the work carried out by construction grammarians (cf. Goldberg, 1995; Gonzálvez-García, 2009, 2011), and by practitioners of the Lexical Constructional Model (Ruiz de Mendoza & Mairal 2007, 2011; Mairal & Ruiz de Mendoza 2009, among others).

Research Question

The study of constructions has always been a constant issue even for a projectionist functional theory of language such as Role and Reference Grammar (RRG; Van Valin & LaPolla, 1997; Van Valin, 2005, 2012). In particular, RRG advocates that "grammatical structures are stored as *constructional templates*, each with a specific set of morphosyntactic, semantic and pragmatic

properties" (Van Valin & LaPolla 1997: 73). Such templates or schemas are presented in the form of a table that specifies the syntactic, morphological, semantic and pragmatic aspects unique to the construction under scrutiny (Van Valin & LaPolla 1997: 430-436). However, even though in Van Valin (2005: 134) constructions are incorporated into the general organization of the theory as crucial elements in the semantics-to-syntax (and syntax-to-semantics) linking, the format employed for these schemas is not highly elaborated, as it is not intended to be a formalism, but a collection of the key properties of particular forms of a language (Van Valin & LaPolla, 1997: 432). Therefore, the objective of this paper is to enrich the semantic specifications of RRG constructional templates. To do so, we not only employ the overall formalism for the representation of constructions proposed in Diedrichsen (2010, 2011) and Nolan (2011ab), but we also follow the work carried out by construction grammarians like Goldberg (1995), Godlberg & Jackendoff (2004), Gonzálvez-García (2009, 2011), and Luzondo (2011), as well as that of the Lexical Constructional Model (LCM; Ruiz de Mendoza & Mairal 2007, 2011; Mairal & Ruiz de Mendoza 2009, among others). It is our claim that the morphosyntactic and semantic information that canonical RRG constructional schemas incorporate certainly needs to be enhanced so as to accommodate all the nuances that constructions display. In proving this point, this paper focuses on the English resultative construction. Thus, drawing on Diedrichsen (2010, 2011) and Nolan (2011ab), not only do we endow the schema for the English property resultative (e.g. *The blacksmith hammered the metal flat*) with a specific signature, a number of constraints on the signature, input and output strings, a workspace, and a construction body, but we also venture the inclusion of two new features, namely, information about the motivation of the construction and the family resemblance connection (cf. Table 1). The addition of the latter information is called upon by the key role played by metaphor and metonymy in order to explain some of the data under scrutiny (e.g. *We laughed ourselves silly*). Precisely, it was the theoretical apparatus of the LCM, a model which already integrates RRG in its lexical descriptions, the one that helped us shed light on this issue, showing the necessary compatibility between the projectionist and the constructionist spheres (Van Valin, 2012).

1. English property resultative construction

Signature:

a. RP_1^{Actor} V $RP_2^{Undergoer}$ (AP) or
b. $RP^{Actor/Undergoer}$ V (AP) or
c. RP_1^{Actor} V RP_2[fake reflexive] ^{Undergoer} AP or
d. RP_1^{Actor} V RP_2[non-prototypical] ^{Undergoer} AP

as tokens [1 2 3 4]

CONSTRAINTS:

C1: AP is [-gradable, +stative] and functions as predicate.
C2: AP is optional as token 4 and 3 in signatures a and b.
C3: Tokens 3 and 4 are obligatory in signatures c and d.

Input:

1. RP_1^{Actor} or $RP_1^{Undergoer}$
2. V = pred1 and 3. $RP_2^{Undergoer}$ or [_]
4. AP = pred2 [-gradable]

Or

1. RP_1^{Actor}
2. V = pred1
3. $RP_2^{Undergoer}$ = fake reflexive or RP[non-prototypical]
4. AP = pred2 [-gradable, +stative]

WORKSPACE: input [1], [2], [3], [4] and output [1] or [2]

Construction body:

Syntax:

Juncture: nuclear
Nexus: cosubordination
Unit template: 5.2
PSA: none
Linking:
syntax → semantics:
Parse the input into tokens [1], [2], [3], [4]; [1], [2], [4]

Then follow the default steps of (7.74) (Van Valin, 2005: 280) Generate output [1] If retrieving a one argument or optionally transitive activity LS in Step 2, make room for token 3 (fake reflexive or RP[non-prototypical]). Generate output [2] semantics → syntax: Retrieve the LS for the V If LS is one argument or optionally transitive activity, the construction must add token 3 (fake reflexive or RP[non-prototypical]) Then follow the default steps of (7.73) (Van Valin, 2005: 279) Generate output [2] ELSE Default linking Generate output [1] **Semantics:** [LS_1] CAUSE [BECOME LS_2], where LS_1 is the means to obtain LS_2 **Morphology**: None **Prosody**: None **Pragmatics**: Illocutionary force: unspecified Focus structure: unspecified
Output: 1. [LS_1] CAUSE BECOME**pred'$_2$** (x/y) 2. [**do'**(x, [**pred$_1$'**(x, fake reflexive/RP[non-prototypical])])] CAUSE BECOME**pred'$_2$** (fake reflexive/RP)
Motivation: Signatures (c) and (d) require a figurative interpretation
Family resemblance: resultative 2, 3, etc.

Table 1. The English property resultative construction (Jiménez-Briones & Luzondo Oyón, fc.)

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Developing an inventory of discourse constructions in the Lexical Constructional Model: The family of the *much less, let alone* and *not even* constructions.

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The work carried out to date by researchers working within the Lexical Constructional Model (LCM) has been a breakthrough in the treatment of constructional phenomena at the levels of argument structure (Gonzálvez, 2008, 2009; Peña, 2009; Ruiz de Mendoza and Luzondo, 2010), implicational structure (Galera Masegosa, 2011; Galera Masegosa and Ruiz de Mendoza, 2011) and illocution (Perez Hernandez and Peña, 2009; Pérez Hernández, 2009; Pérez Hernández and Ruiz de Mendoza, 2011; Del Campo, 2011a, 2011b, 2011c). It is now necessary to extend the analytical model into the domain of discourse constructions, on which there is only preliminary work in Mairal and Ruiz de Mendoza (2009), Galera Masegosa (2011) and Ruiz de Mendoza and Gómez González (unpublished draft). An important element of recent versions of the LCM is the high prominence given to the exhaustive analysis of *cognitive operations* other than metaphor and metonymy (cf. Ruiz de Mendoza, 2011), among them *contrast*, *echoing*, *strengthening* and

mitigation. These operations are pervasive across levels of linguistic enquiry (see Ruiz de Mendoza, 2013).

The study of discourse constructions is essential for understanding the way humans conceptualize language and for comprehending the choices we make when producing and processing language. So far, the impact cognitive operations can have on discourse constructions has not been explored. With the aim to further develop the discourse level of the LCM, the present study attempts to determine what kinds of cognitive operation are exploited in the organization of the semantic structure of the variable components of the constructional family *X Let Alone* Y, *X Much Less Y,* and X *Not Even Y* in English.

In the process of analysing this constructional family, we (i) determine its formal configuration, (ii) specify the distinctive properties (morphological, lexical, grammatical and discursive) that make it different from other construction families of the kind, and (iii) identify the factors that constrain the use of its various members.

Some may argue that the peculiarities of the *much less* construction are very similar to those of other construction types that have already been discussed in the literature (as is the case of *X Let Alone Y*, studied by Fillmore et al. 1988). Nevertheless, in the light of the LCM and on the basis of extensive corpus evidence, our study refines and motivates some of the well-known findings provided by Fillmore et al. (1988) on the construction *X Let Alone Y*. Some of these refinements include:

> (1) The correction of Fillmore's notion of the *let alone* construction as an example of a paired focus construction: we contend that instead of having two foci, constructions containing *much less* or *let alone* markers have a focal complex with internal differences in conceptual prominence. For example, in *I won't eat that garbage, let alone/much less pay for it*, there is a single focal constituent, which is determined by the contrast between eating and buying; both elements have the same status from the point of view of their quality as new (i.e. focal) information, but the second has greater conceptual prominence.
>
> (2) The description of the use of *much less* and *let alone* in "if" conditionals: we argue that "if" can work with a real conditional meaning, setting the stage (the X part of the construction) for the consequence part of the conditional sequence (the Y part) to be coordinated by *much less* or *let alone*. Or in other cases, it can adopt the meaning of "since", presupposing that the content (the X part of the construction) is known or shared by the addressee or any third party.
>
> (3) In contrast to what Fillmore defended, *let alone* is not always a "negative polarity item" (1988:512). Sometimes, the meaning of "let alone" changes from being a negative contrasting element to be an adding element, as in *People have to work harder if they want to maintain, let alone improve, their standard of living*. This use is not possible in the case of much less. The broader use of *let alone* stems from the fact that *let alone* works by singling out the Y element as adding one or more features to X, which is thus contained in Y. The added features may either contrast with part of Y, as is the case with *much less*, or they may simply make the meaning of Y include the meaning of X thereby making Y cognitively more prominent.
>
> (4) Fillmore also claimed that VP ellipsis was not possible in *let alone* constructions, but he did not explain why. In our analysis, we motivate this phenomenon both for the *much less* and the *let alone* constructions, on the grounds that the information in the X slot of the construction is different from the Y slot, and so, the information in X cannot be recovered in the Y part when VP ellipsis happens:

*Max won't eat shrimp let alone Minnie will
*I am not the man I was much less the one I will

To conclude, we postulate that the following cognitive operations are at work in the organization of the semantic structure of the much less construction: contrasting (e.g. *To my knowledge, there is limited effort to change the decisions made by any subcommittee, much less to do battle with a powerful subcommittee leader*), adding (e.g. You will have to behave better if you want to go out, let alone if I'm paying for it), *domain reduction* as a case of highlighting (e.g. *Any future, much less a secure one, seems hardly possible*), and *echoing* (e.g. *I don't think we should assume Pandora was a virgin, much less a virgin goddess*).

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Pragmatics and emotional inferences

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It has for long been taken for granted that, along the course of reading a text, world knowledge is often required in order to establish coherent links between sentences (McKoon & Ratcliff 1992, Iza & Ezquerro 2000). The content grasped from a text turns out to be strongly dependent upon the reader’s additional knowledge that allows a coherent interpretation of the text as a whole.

The world knowledge directing the inference may be of distinctive nature. Gygax & al. (2007) showed that mental models related to human action may be of a perceptual nature and may include behavioral as well as emotional elements. Gygax, (2010) however, showed the unspecific nature of emotional inferences and the prevalence of behavioral elements in readers' mental models of emotions. Inferences are made in both directions; emotional inferences based on behavior and vice versa.

Harris & de Rosnay, 2002; Pons et al., 2003 proved that different linguistic skills – in particular lexicon, syntax and semantics are closely related to emotion understanding. Iza & Konstenius (2010) showed that additional knowledge about social norms affects the participants prediction about would be inferred as the behavioral or emotional outcome of a given social situation.

Syntactic and lexical abilities are the best predictors of emotion understanding, but making inferences is the only significant predictor of the most complex components (reflective dimension) of emotion comprehension in normal children. Recently, Farina & al (2011) showed in a study that the relation between pragmatics and emotional inferences may not be so straight forward. Children with High Functioning Autism (HFA) and Asperger Syndrome (AS) present similar diagnostic profiles, characterized by satisfactory cognitive development, good phonological, syntactic and semantic competences, but poor pragmatic skills and socio-emotional competencies. After training in pragmatics a descriptive analyses showed the whole group to display a deficit in emotion comprehension, but high levels of pragmatic competences. This indicates a further need to study the relationship between emotion and inference in normal subjects too.

Vanhatalo (2005) showed that a group of synonyms of speech act verbs actually had semantically distincitive emotional elements as well as different social norms associated to these lexemes. This

semantic knowledge related to inferences was not present either in dictionaries or in current literature, placing increasing demands on empirical studies directed on native speaker intuitions.

We also suggest that while behavioral elements may indeed be of perceptual nature and the inference between emotion and behavior less culturally dependent especially when concerned with basic emotions - the inference concerned with social norms may be more complex and require elaborative inference. We suggest that in further studies a distinction between basic emotions and non basic emotions, social settings and non-social settings should be made. The cognitive models concerned with social action may be of more complex nature, but with recognizable features on lexical and syntactic levels.

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The way in which the meaning of some groups of predicates is adapted through coercion to the meaning requirements of the adjectival resultative construction

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This proposal makes use of some theoretical tools of the Lexical Constructional Model (LCM) in order to analyze some predicates which combine with the adjective *dry* in its resultative sense. Our main objectives are the following ones: (i) by resorting to Levin's (1993) work, we will classify all these predicates which are compatible with the resultative sense of the adjective *dry* into different slots. These verbs belong to different classes, mainly to the ones known as verbs of removing (both those included in the 'means subclass' and in the 'instrument subclass'), touch verbs, verbs of substance emission, verbs of change of state, verbs of ingesting, and verbs of nonverbal expression, (ii) we will study the external constraints which regulate the process of lexical-constructional subsumption (for instance, the high-level metaphors AN ACTIVITY IS AN EFFECTUAL ACTION and A CAUSATIVE ACCOMPLISMENT IS AN EFFECTUAL ACTION or the high-level metonymies INSTRUMENT FOR ACTION and MEANS FOR ACTION), and (iii), finally,

we will examine the nature of the prepositional complement, especially in the group of verbs of removing.

A two-page double-space description of my research question

In this proposal we make use of some theoretical tools of the Lexical Constructional Model (LCM) (Mairal and Ruiz de Mendoza 2008, 2009; Ruiz de Mendoza and Mairal 2008, 2010) in order to carry out an analysis of some predicates which combine with the adjective *dry* in its resultative sense. This approach elaborates on assumptions from functional projectionist theories like Role and Reference Grammar (Van Valin and LaPolla 1997; Van Valin 2005) and other insights from constructional approaches to linguistic description and explanation (Goldberg 1995, 2006; Michaelis 2003). Two pivotal notions of this model are lexical and constructional templates. While lexical templates provide the syntactic, semantic, and pragmatic information of different predicates, constructional templates specify the same kind of information at a higher level of abstraction, that of constructions. The constructicon consists of all form-meaning pairings at all levels of linguistic description. The lexical specifications in the constructicon run on a series of principles. For instance, the Override Principle states that the meaning of lexical items is adapted through coercion to the meaning requirements of the higher-level constructions in which they partake (Michaelis 2003). The way in which lexical templates fuse with constructional templates is coerced by both internal and external constraints. This proposal explores the external constraints (spelled out in the form of high-level metaphors and metonymies) which regulate the combination of a series of predicates with the resultative sense of the adjective *dry*. Boas (2003) lists the verbs which are compatible with this resultative adjective and illustrates all of them. However, he does not delve deeper into the cognitive mechanisms which allow this combination to take place. First, we will resort to Levin's (1993) work with a view to classifying all these predicates into different slots. These verbs belong to different classes, mainly to the ones known as verbs of removing (among them a difference is established between *wipe* verbs included in the 'means subclass' like *wipe, dab, rub, scrub, squeeze* or *suck* – as in *John wiped his hands dry on a handkerchief* – and those pertaining to the 'instrument subclass' such as *brush* or *towel* – as in *She towelled her hair dry*), touch verbs (like *caress, nudge* and *pat*, as in *Pat your skin dry*), verbs of substance emission (like *drip* and *bleed*, as in *The rich capitalist bled the workers dry*), verbs of change of state (more precisely 'cooking verbs' like *boil*, as in *The saucepan boiled dry on the stove*), verbs of ingesting (like *drink* and *eat*, as in *He could drink a distillery dry*), and verbs of nonverbal expression (such as *cry* or *weep*, as in *By dawn she had cried herself dry*). Second, we will study the external constraints which regulate the process of lexical-constructional subsumption. Among them, the high-level metaphor which allows an activity or a causative accomplishment to take part in the resultative construction (AN ACTIVITY IS AN EFFECTUAL ACTION and A CAUSATIVE ACCOMPLISMENT IS AN EFFECTUAL ACTION) or the high-level metonymies INSTRUMENT FOR ACTION and MEANS FOR ACTION will stand out. Finally, we will also examine the nature of the prepositional complement, especially in the group of verbs of removing. In the means subclass, the semantic configuration of the verb implies that the instrument used to carry out the action of wiping is something, of dabbing is a cloth, of scrubbing a stiff brush or of squeezing our fingers or hand. In these cases, the instrument (1) is generic and more specification is needed (e.g. *He wiped one dry with his shirt-cuff*) or (2) is different from the one specified by the verb (e.g. *She began to scrub herself dry with a towel*). In the instrument subclass, the instrument is conflated into the meaning of the verb. As a result, there is no prepositional phrase expressing instrumentality (e.g. I don't use a spray on Paris at all, *I brush her dry*). However, some occurrences lexicalize the instrument by means of a prepositional phrase either because we want to provide details of the instrument (e.g. *Towel herself dry with the fuzziest, plushest towel in the house*) or because the instrument is different from the one encoded within the meaning of the verb (e.g. *Merle sniffs and begins to towel herself with the blanket*).

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The importance of cultural knowledge in natural language understanding.

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While integrating linguistic knowledge of any kind is becoming an almost implicit practice in natural language understanding systems, the inclusion of cultural or world knowledge in these tools might have been neglected sometimes. However, a NLP system or knowledge base enriched with cultural information is a more robust, better cohesioned instrument for natural language understanding processes. The integration of this type of knowledge in NLP systems may be proven to contribute to solving some phenomena that occur in natural language, such as anaphor, metaphor and metonymy, ambiguity or co-reference, from diverse perspectives, namely linguistic, cognitive and computational. The objective of this paper is to describe the way FunGramKB integrates cultural knowledge in its conceptual modules and, in particular, how the information contained in the Onomasticon module of FunGramKB can contribute to maximising the informativeness and completeness of the whole system.

DESCRIPTION OF THE RESEARCH QUESTION

FunGramKB is a multilingual, multi-purpose lexico-conceptual knowledge base, including lexicalization of concepts in seven natural languages, and designed to be implemented in different types of natural language processing systems, but preferably those requiring an understanding of language. In order to accomplish this, the knowledge base is composed by lexical modules and conceptual modules. The conceptual modules of FunGramKB are the Ontology, the Cognicon and the Onomasticon. The latter is the module dealing with encyclopaedic knowledge, also referred to as cultural knowledge.

Including this cultural information in the repository of knowledge of FunGramKB is a step towards the enrichment of the natural language understanding that the knowledge base aims to offer. The importance of including cultural, also referred to as world knowledge in FunGramKB, lies in the fact that it is very difficult to draw a well-defined line between what constitutes pure linguistic (lexical or dictionary) knowledge and world (cultural or encyclopaedic) knowledge. Since FunGramKB's conceptual modules endeavour to complement their lexical counterpart, in order to offer a more robust natural language understanding, the fact of deliberately excluding encyclopaedic knowledge, or just failing to account for it in a solid manner in FunGramKB, may have jeopardised the knowledge base's solidity and consistency, which is not the case. The way that this cultural knowledge is integrated in FunGramKB is twofold. On the one hand, it is intertwined with the lexical or 'dictionary' knowledge codified in the Ontology. For instance, when an Entity from the Ontology in FunGramKB is defined using COREL (Conceptual Representation Language) and its meaning postulate is created, not only the information found in dictionaries or other resources is included. Very frequently, this information has to be complemented by what we call 'introspection of the editor', i.e. the editor may deem it appropriate to complement the information obtained from the resources consulted with additional knowledge obtained from his/her own vital experience of the world (common sense) that, otherwise, the machine would not be able to infer from just the compendium of definitions from dictionaries, thesauri, corpora and other resources that the editor codifies in COREL. An example of this phenomenon is the assignment of the reasoning operator to identify monotonic (+) or non-monotonic (*) inheritance that precedes each predication of a meaning postulate, where the world knowledge and common sense of the editor acquire a particular relevance in order to indicate whether each predication in the meaning postulate is strict (+) or defeasible (*).

On the other hand, world knowledge is the base for the Cognicon (which contains procedural knowledge information) and the Onomasticon conceptual modules. Focusing on the Onomasticon, this module is integrated by units referred to as 'named entities', i.e., entities which designate real-life instantiations of beings, such as people, organizations, places or objects (buildings, works of art, etc.), inter alia. Due to this nature, these entities are referred to as bio-structures in the terminology of FunGramKB. The constituents of the Onomasticon conform, thus, the formal and thorough inclusion of cultural knowledge entities into FunGramKB.

The decision to include cultural knowledge not only as a part of the Ontology, but also populating a module of their own, does not just respond to the need of completing the cognitive view of the world that FunGramKB endeavours to offer, regardless of the fact that this also constitutes a sound purpose. The inclusion of cultural knowledge is also motivated by the fact that certain NLP tasks, such as solving anaphor, metaphor and metonymy, co-reference or ambiguity benefit significantly from the maximized informativeness that the knowledge base can offer when it is enriched with information about real world bio-structures.

Thus, overall the main questions addressed in this paper are connected to the contribution that integrating world knowledge can bring to NLP systems in general and to FunGramKB in particular, as well as to show how this integration can serve as a valuable tool in solving natural language

phenomena with which NLP systems may strive, from a linguistic, cognitive and computational perspective.

Ontology modeling in FunGramKB with *change-of-state* verbs.

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The major goal of this research concerns the validity of linguistic hypotheses which are tested against a multipurpose Natural Language Processing (NLP) system known as FunGramKB (Periñán & Arcas 2004, 2005, 2006; Periñán & Mairal 2009, 2010, to name a few). FunGramKB solves some of the problems encountered in relational databases, such as SIMPLE or EuroWordNet in that it provides morphosyntactic and pragmatic information about lexical units, it avoids language dependency by working with concepts and not words, and it minimizes redundancy by cognitive clustering. This study offers an outline of the ontological modeling of concepts by focusing on the change-of-state verb *burn* and its conceptual correlates within the Ontology. Entity-specific change-of-state verbs are instantiations of the cognitive dimension #TRANSFORMATION, which comprises two obligatory participants or thematic roles: (i) a Theme, defined as an entity that transforms another entity, and (ii) a Referent, which is an entity that is transformed by another entity.

This study aims to demonstrate the usefulness of combining linguistic knowledge with the field of Artificial Intelligence. To this end, we provide a computational implementation of semantic knowledge by showing how linguistic information is modeled in a multipurpose Natural Language Processing system known as FunGramKB (Periñán & Arcas 2004, 2005, 2006; Periñán & Mairal 2009, 2010, to name a few). The present research focuses on the change-of-state verb *burn* and its conceptual correlates within the Ontology of this knowledge base. FunGramKB makes a neat distinction between the linguistic and the conceptual levels:

> (i) The linguistic level comprises a lexical and a grammatical module. The lexical component can be further divided into: (a) a Morphicon, and (b) a Lexicon. The grammatical level also known as the Grammaticon has four Constructicon modules: (a) L1-Constructicon or the argument structure layer; (b) L2-Constructicon or the implicational layer; (c) L3-Constructicon or the illocutionary level; and (d) L4-Constructicon or the discourse-structure level.
>
> (ii) The conceptual level is an accurate representation of Tulving's (1985) long-term memory model in the sense that it is composed of three language-independent knowledge schemata. The Cognicon stores procedural knowledge, the Onomasticon deals with episodic knowledge, whereas the Ontology is organized as a hierarchical catalogue of universal concepts.

The Ontology is made of three types of conceptual units: *metaconcepts,* marked by the symbol #, *basic concepts,* preceded by +, and *terminal concepts,* headed by the symbol $. In line with the hierarchical organization of the Ontology, we show that the basic concept +BURN_00 depends conceptually on the following superordinate concepts and respectively, metaconcepts: +BURN_00 << +DAMAGE_00 << +CHANGE_00 << #TRANSFORMATION << #MATERIAL << #EVENT. To preserve the minimization of redundancy commitment, we have agglutinated verbs like *combust, conflagrate, ignite, inflame, kindle* [Eng] and *arder, encender* [Spa] as lexical units linked to the basic concept +BURN_00. Basic and terminal concepts are characterized by

conceptual properties realized in the form of *thematic frames* (TFs) and *meaning postulates* (MPs). Also, new terminal concepts have been created whenever some concept exhibited a distinctive feature (or *differentiae*), which was not present in the meaning postulate of its superordinate concept. This distinctive feature is codified in the form of a satellite predication (f). For instance, we have inserted the terminal concept $CAUTERIZE_00 which displays the following meaning postulate:

> MP: +(e1: +BURN_00 (x1)Theme (x2)Referent (f1: +HEAT_00 ^ +CHEMICAL_00)Instrument) (f2: (e2: +CURE_00 (x1)Theme (x2)Referent)Purpose)

This conceptual representation can be interpreted as follows: A human being (x1) burns an entity (x2) using heat or a chemical as instruments (f1) in order (f2) to cure that entity (x2). The first predication of $CAUTERIZE_00 (i.e. e1: +BURN_00 (x1)Theme (x2)Referent) is inherited from its superordinate basic concept. Also, we can notice that satellites can be immediately followed by a basic concept (f1) or by another predication and its thematic roles (f2). These satellites add new information related to the cauterization process: the instruments used are heat or a chemical (f1) and the burning event has curative purposes (f2).

FunGramKB: where are we and where are we going?

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Almost ten years after the first publication on FunGramKB (i.e. *Meaning postulates in a lexico-conceptual knowledge base*), it is time now to reconsider the role that linguists should play in this project, beyond the manual task of data population. In fact, the goal of this lecture is not to describe the state of the art of this knowledge base but rather to present a series of questions, together with some methodological strategies, which can indeed serve to open new lines of research in the different levels of FunGramKB (i.e. conceptual, grammatical and lexical).

The linguistic-conceptual interface in FunGramKB.

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As shown in Figure 1, the linguistic level in the architecture of FunGramKB is conceptually oriented in the sense that both the grammaticon and the lexicon are interfacing with the cognitive level. In this regard, the primary aim of this presentation is to discuss this linguistic/conceptual interface, an issue which, although present in most linguistic models, has not been addressed as such. In dealing with this interface, the following issues will be discussed,

a) The notion of Conceptual Structure (CLS) (cf. Mairal, Periñán and Pérez, 2012). A CLS is shown to have more explanatory and expressive power than standard decompositional

representations like RRG's logical structures. From a CLS we have access to world knowledge as encoded in the ontology and therefore these representations go beyond those aspects that are syntactically relevant and provide a nice format to combine both linguistic and non-linguistic knowledge.

b) Continuing in the lexicon, an ontological approach also offers solutions to the pervasive nature of selection restrictions in the sense that a twofold division is followed between selectional preferences and collocations. The former are part of the ontology and encode world knowledge, while the latter are language-specific and part of the lexicon (cf. Jiménez and Pérez, 2011)

c) The conceptual shift has also marked the internal structure of the grammaticon where different construction schemas are stored from where they can be retrieved if a constructional meaning needs to be processed (Mairal, 2013). In connection with this, the format of a constructional schema will be presented.

d) Finally, I will explore the impact such an ontological approach has in the format of the syntax-to-semantics linking algorithm, an aspect which is closely related to the ARTEMIS proof-of-concept prototype (Periñán, in press; Van Valin and Mairal, in press).

In sum, this presentation provides enough empirical evidence that shows the strengths of a conceptual over a lexicalist approach.

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Irony in the Lexical Constructional Model.

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Long debates and different approaches to irony have developed over the years in linguistics and other related disciplines (e.g. psycholinguistics, neurolinguistics, etc.). This piece of research is concerned with the explanation of irony from a cognitive-linguistic perspective. It explores the cognitive operations that underlie such phenomenon. For this purpose, we make use of the analytical tools provided by the Lexical Constructional Model, which is a cognitively-oriented constructionist approach to meaning. The LCM accounts for all facets of meaning construction, namely argument structure representations, implicational structure, illocution, and discourse relations. We contend that irony needs to be handled at the implicational level, since the interpretation of ironic statements invariably requires implicature derivation. We propose that irony involves the cooperation of echoing, contrast, and metonymic expansion/reduction cognitive operations. Of course, other operations may add up to these central ones in the creation of different meaning effects.

Description of our research question

Traditionally, verbal irony has been regarded as a rhetorical device or trope and described as arising from the incongruity between what is said and what is actually the case. Making the incongruity evident gives rise to very specific, often humorous, overtones. An easy example is the sentence *It is a nice day today, indeed!*, uttered in a context in which the hearer had previously expressed his or her certainty that the weather would be good enough for an outing, but the real situation is quite the opposite (e.g. it is cold and rainy).

Wilson and Sperber (2012) argue that, unlike in traditional accounts of irony, ironical effects are not the result of saying the opposite of what one means, but rather the result of echoing a thought that the speaker attributes to others, while expressing a mocking, critical or sceptical attitude to this thought. We agree with Sperber and Wilson and acknowledge the role of echoing in the creation of ironical expressions. However, we propose that it is the combination of echoing and contrast operations, in cooperation with pretence, which gives rise to irony. In our view, the expression of the speaker's attitude is not definitional of irony, but rather an implication naturally arising from the combination of echoing and contrasting operations. We also claim that irony is to be handled at the implicational level, thereby involving the cooperation of metonymic chains, understood as the combination of two (or more) metonymic processes (cf. Ruiz de Mendoza 2000). The exploration of the activity of cognitive mechanisms at different levels of meaning construction is one of the tenets of the LCM, as required by the Equipollence Hypothesis. The *Equipollence Hypothesis* (Mairal and Ruiz de Mendoza 2009) is a working assumption according to which linguistic processes that have been attested in one domain of linguistic enquiry may also be at least partially active in other domains.

An example of ironic remark is *It is great to be back home* in a context in which a teenager goes back home after a holiday and finds her mother angry and yelling at her. As is evident from the context, the girl is being ironical, intending to mean quite the opposite of what the sentence literally says. In this case the girl echoes the kind of thought that she would have voiced in the more desirable situation of being received by her parents in a peaceful and relaxing home environment.

Here, an operation of expansion is at work: the remark *It is great to be back home* is expanded onto the situation in which this sentence would be uttered, that is, a peaceful and relaxing home environment. This situation (which we may call the *expected* situation) sharply contrasts with the *real* situation that the girl encounters when she gets home. In the real situation, the idea that going back home is not great is expanded onto a situation in which the environment is not nice (i.e. your mother is yelling at you, your room is a mess, the central heating is broken, etc.). Then, a subsequent operation of reduction affords access to the speaker's personal reaction towards the contrast between the expected and the real situations. In this case, the speaker is probably expressing annoyance and resignation.

Our study develops in some more detail the analysis of this and other examples taken from the web. We also address more complex cases in which other cognitive operations (i.e. resemblance, strengthening, mitigation) are involved in the creation of ironic remarks.

Procedural representation of financial terminology in *FunGramKB* [1]

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FunGramKB conceptual level comprises three main modules: (1) the Ontology, which represents a hierarchical catalogue of concepts that describe semantic knowledge; (2) the Cognicon, which stores procedural knowledge by means of scripts, i.e. conceptual schemes of stereotypical events based on Allen's temporal model (1983); (3) the Onomasticon, which stores encyclopedic information about named entities and events.

The terms analysed here have been extracted from the *Global Crime Term Corpus (GCTC)*, which refers to the subdomain of organized crime and terrorism[1] (Ureña, Alameda and Felices, 2011). This research is being carried out within the boundaries of the *FunGramKB* project (Periñán and Arcas, 2011). Among the processes involved in the compilation of the specialized corpus (that is, automatic filtering, manual filtering, conceptualization and hierarchization), it was during the conceptualization when procedural knowledge was detected.

In this contribution we intend to show the methodological proposal to build up the scripts of two financial concepts included in the Cognicon ("carousel fraud" and "cuckoo smurfing"). For this purpose, we use the COnceptual REpresentation Language *(COREL)*, which serves as the metalanguage that connects the whole conceptual level of the knowledge base. Thus, the aim of

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this paper is to present a script model as a carrier of both the common-sense knowledge and the specialized knowledge included in the aforementioned concepts.

To illustrate this process, we describe the script @CUCKOO_SMURFING_00 in (1) and its natural language equivalent in (2).

(1) +(e1: +PUT_00 (x1: +CUSTOMER_00) Agent (x2: +MONEY_00)Theme (x5: +BANK_ACCOUNT_00)Location (x3: +COUNTRY_00)Origin (x4)Goal (f1: x6: +ALTERNATIVE_REMITTER_00)Means) (f2: (e2: +MOVE_00 (x1)Agent (x2)Theme (x5)Location (x3)Origin (x7: +BANK_ACCOUNT_00)Goal)Purpose)
+((e3: + BE_00 (x6)Theme (x8: +CRIMINAL_00)Referent)(e4: +CHANGE_00 (x6)Theme (x9: +DIRTY_MONEY_00)Referent)) (f3: (e5: +BECOME_00 (x9)Theme (x10: +LEGAL_00)Attribute)Purpose)
+(e6: +PUT_00 (x8)Agent (x9)Theme (x13: +BANK_ACCOUNT_00)Location (x11: +COUNTRY_00)Origin (x12: +CUSTOMER_00)Goal)
+(e7: +USE_00 (x12)Theme (x9)Referent (f4: +LEGAL_00)Manner)
+(e8: +KNOW_00 (x12)Theme (x9)Referent (f5: (e9: +BE_01 (x9)Theme (x13: +LEGAL_00)Attribute)Purpose)
+(e9: +HAVE_00 (x8)Theme (x9)Referent (f6: +ECONOMIC_SYSTEM_00)Location)
+(e10: +TRAVEL_01 (x8)Agent (x16)Theme (x14)Location (x15)Origin (x11: +COUNTRY_00)Goal (f7: (e11: +TAKE_00 (x8)Theme (x2: +MONEY_00)Referent)Purpose)
+(e12: +BE_01 (x2)Theme (x17: +LEGAL_00)Attribute)

(2) A legitimate customer deposits funds with an alternative remitter in a foreign country for transfer into another customer's bank account. The customer does not know that the alternative remitter is part of a criminal syndicate involved in laundering of illicit funds. The third party uses the illicit funds because they believe they are legitimate. Illicit funds get into the legitimate economy. The criminal deposits illicit cash profits from the crime syndicate into the bank account of the customer awaiting the overseas transfer. The criminal travels overseas and accesses the legitimate money that was initially deposited with the alternative remitter.

Then, the temporal relations are stated as follows in (3).

(3) e1 ->e3 [Before]
e3 ->e4 [During]
e3_>e6 [Before]
e6 ->e7 [Before]
e7->e8 [During]
e8->e9 [During ^ Meets]
e9->e10 [Before ^ Meets]
e10->e12 [During]

Thus, we can infer that the concept instantiated by "cuckoo smurfing" requires several layers of actions and operations that are in fact an instance of a low-level situational construction (Ruiz de Mendoza and Mairal, 2008; Garrido and Ruiz de Mendoza, 2011) that requires the formalization of a complex script at the Cognicon.

Moreover, the scrutinity of the concept +CUCKOO_SMURFING_00 in the specialized dictionaries has shown that there is a lexical instantiation in English of "cuckoo smurfing", but not in Spanish. Consequently, we can conclude that *FunGramKB* Cognicon provides a suitable framework to represent the procedural knowledge implicit in the financial concepts included here, even the most complex ones.

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Semantic and cognitive basis of colour in marine biology terms: Vantage Theory and figurative thought.

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Research following Vantage Theory (VT) (e.g. MacLaury 1992, 2002) has traditionally focused on general language for modelling colour categorisation, but not on specialised terminology. Drawing on principles from this Theory and (socio-)cognitive linguistics and psychology (e.g. Langacker, 2000; Kristiansen, 2008), this research analyses colour categories in the terminology of marine biology in English and Spanish. Based on a corpus of academic articles, the study explores the semantic and cognitive basis of colour, and explains how vantage points and categorisation have a bearing on colour dimensions (hue, hue distribution, brightness, etc.) when conceptualising and designating sea organisms. The analysis of the terms revealed that figurative thought plays a pivotal role in the formation of specialised concepts through colour attribution both in English and

Spanish. The influence of figurative thought is also shown to give rise to inter- and intralingual terminological variation.

A good example is the interlinguistic pair *gamba blanca-rose shrimp*, which have a literal and figurative meaning, respectively. *Rose shrimp* has both a metonymic and metaphorical basis. The metonymy is explained as follows. Rose is a non-basic colour term, concretely, what Steinvall (2011: 222) calls *elaborate colour term*, that is, a simplex lexeme that originally designates an object, and secondly, refers to a colour shade by derivation. Specifically, the whole (rose flower) stands for the part (pink colour). The metaphor arises because two different domains of experience, ROSE and SHRIMP, are compared due to colour analogy. As Figure (1) shows, the hue of the shrimp's exoskeleton looks very much like the hue of a rose. Based on VT premises, rose hue is said to emerge from a *complementation* relation between two colours (MacLaury 1992: 142). In this relation, white and red have separate foci, although their ranges overlap at their edges, which leads to the construal of a new category (pink/rose) that intervenes between the two colours.

Figure 1. Shrimp *Parapenaeus longirostris*

From a socio-cognitive perspective, the *rose shrimp-gamba blanca* phenomenon is an example of *social categorisation* (Kristiansen 2008: 417), which is a cognitive process involving the accentuation of intragroup similarities and accentuation of intergroup differences on relevant continuous dimension. Pink and white are two colour categories sharing a transitional zone where it is not possible to distinguish between both categories. On closer examination, some areas of this shrimp's exoskeleton stay on such undefined zone of the continuous dimension, which can be defined as whitish pink or pinkish white. While English-language scientists opt for whitish pink, their Spanish-language peers stay on the other side of the continuum, strengthening attention to similarity between white and pinkish white, as indicated by the term *gamba blanca*. This is an instance of coarse hue discrimination, which should not be adequate in scientific language. As Langacker (2000: 76-77) notes, zooming in on colour nuances is performed in contexts where subtle colour distinction becomes important. A context of this type is marine biology research, where hues, shades, and brightness are often crucial in distinguishing between two organisms from different taxonomies.

If we analyse English-language scientists' conceptualisation of the shrimp in terms of VT, whitish pink can be regarded as a case of coextensivity, which is observed when one category is construed from two different points of view or vantages. The ranges of the two hues involved encompass each other's foci, although they exhibit a dominant-recessive pattern (MacLaury 1992: 141). Accordingly, pink is the dominant hue, an aspect that is also syntactically indicated since *pink* is the head of the phrase. In contrast, *whitish*, premodifier of *pink*, is recessive.

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Conceptualisation of human entities in legal satellite ontology under the postulates of FunGramKB: The case of the individual wrongdoer [2]

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This paper describes some of the phases in the process of constructing a term-based "satellite ontology" or domain ontology within the ontological architecture integrated in FunGramKB –a lexico-conceptual knowledge base for the computational processing of natural language (Periñán-Pascual & Arcas-Túnez 2004, 2007, 2010a; Periñán-Pascual & Mairal-Usón 2009, 2010). The main hypothesis is that the multilevel model of FunGramKB Core Ontology can be connected to terminological subontologies or "satellite ontologies" in order to minimize redundancy and maximize information (Periñán-Pascual & Arcas-Túnez 2010b). If, in general terms, the purpose of subontological creation is to expand the conceptual model of the knowledge base so that it can be applied to natural language processing tasks related to domain-specific translation, computer assisted consultancy or expert artificial reasoning, then this paper proposes the first steps to attain that goal following the COHERENT methodology (Periñán-Pascual & Mairal-Usón 2011): a stepwise method for forming specialised concepts and their subsumption under the Core Ontology. Although the proposed methodology is partly based on the model for building ontological meaning

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described by Periñán-Pascual & Arcas-Túnez (2010b) and applied by Jiménez-Briones & Luzondo-Oyón (2011), it, in turn, incorporates the use of specialised dictionaries and the lexico-conceptual decomposition of complex specialised terminology. In doing so, the paper furnishes substantial evidence on the modelling, subsumption and hierarchisation of a set of concepts borrowed from the domains of criminal law (cf. Breuker, Valente & Winkels 2005; Valente 2005; Breuker, Casanovas & Klein 2008), particularly those included in the *Globalcrimeterm* corpus and subontology under construction (Ureña Gómez-Moreno, Alameda-Hernández & Felices-Lago (2011); Felices-Lago and Ureña Gómez-Moreno (2012). To illustrate this process, we have selected the superordinate basic concept +WRONGDOER_00 –which represents a person who breaks the law- and its basic and terminal subordinate concepts in the diverse subdomains of the *Globalcrimeterm* subontology (all of them under the metaconcept #ENTITY), particularly those referring to individual agents. Consequently, we intend to present a sample of the modelling, subsumption and hierarchisation of concepts such as $ASSASSIN_00, $BOMBER_00, $LONE-WOLF_00 or +TERRORIST_00 in the area of terrorism and $EXTORTIONIST_00, $GANGSTER_00, $RACKETEER_00, +TRAFFICKER or $STRAWMAN_00, generally linked to the area of organized crime.

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FunGramKB: Observations on the Italian Lexicon compilation.

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FunGramKB (Functional Grammar Knowledge Base) is a multipurpose lexico-conceptual knowledge base for natural language processing (NLP) systems (Periñán Pascual and Arcas Túnes 2010b). It can be defined as multipurpose since it is both multifunctional and multilingual, thus it can be reused in many NLP tasks and with many natural languages. For each language FunGramKB provides a lexical and a grammatical level, each containing linguistic information different for every single language (language-dependent modules); furthermore it provides a conceptual level, instead containing a single ontology (Periñán Pascual and Arcas Túnes 2010a), the same for every language stored, which becomes the pivotal module for the whole architecture (language-independent module).

In this talk, I will focus on the population of FunGramKB in order to take stock of the situation about lexical representation (morphosyntax, LCM core grammar, miscellaneous, in the FunGramKB Editor) in the knowledge base: as far as the Italian language is concerned, I will firstly describe the procedure I followed while filling in the lexicon section through the FunGramKB Suite, and then the distribution of concepts in the ontology; how they have been translated into
Italian and distributed throughout the lexical domains (Faber and Mairal 1999) here implemented.

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A practical approach to criminal offences in FunGramKB

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In the past four decades, the application of ontologies to artificial legal reasoning has been particularly productive in Knowledge Engineering (Casellas 2011; Ashley 2011). However, many issues are yet to be resolved in this research area. One current line of investigation within FunGramKB focuses on specialised knowledge, especially on the assembly of Satellite Ontologies (Felices-Lago et al. 2012). This paper deals with BRIBERY, a concept included in FunGramKB's Satellite Ontology of crime. The semantics of this concept is analysed in relation to knowledge spreading, as envisaged by Periñán-Pascual et al. (2005, 2009). The paper is organised as follows. Firstly, an overview of main applications of legal ontologies for professional purposes is made. Secondly, the semantics of BRIBERY is discussed, with a focus on procedural knowledge. Finally, a theoretical simulation of legal reasoning is proposed based on this concept.

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An LCM Account of Lexical-Constructional Subsumption Processes: The Case of *cover* and *spread*.

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This research, which has been conducted from the perspective of the Lexical Constructional Model (LCM) (Ruiz de Mendoza and Mairal, 2007, 2008), aims to explore the semantic representation of the verbs *cover* and *spread* and examine the constraints which underline their different syntagmatic behaviors in terms of the structural patterns and diathesis alternations in which these lexical units might participate (Levin 1993). Using the analytical tools provided by the LCM, we will account for the internal constraints which might condition the lexical-constructional subsumption processes of the predicates under study and which would explain why the verb *spread* can participate in the "Spray/Load alternation" (*She spread butter on her toast / She spread her toast with butter*) whereas *cover* cannot, and, similarly, why *cover* can participate in the "Locatum Subject Alternation" (*Pat covered the table with flowers / Flowers covered the table*) whereas *spread* cannot.

In this talk I aim to present the results of the study of the verbal subdomain "to put something on (the surface of) something else (cover/spread)", included within the domain of verbs of position, as presented in the paradigmatic organization of the lexicon in Faber and Mairal (1999). For the purposes of this research, I have followed the theoretical framework of the Lexical Constructional Model (henceforth LCM) as outlined in Ruiz de Mendoza and Mairal (2007, 2008) and Mairal and Ruiz de Mendoza (2006, 2009a/b). The LCM adopts an inferential approach (Mairal and Ruiz de Mendoza 2009b) which aims to explore the relationship between lexical and syntactic meaning and provides a basis for the characterization of the logical structure of verbs, their semantic content (lexical templates) and the cognitive and pragmatic constraints which might restrict, block or, on the contrary, license the subsumption of lexical templates and other higher-level constructions.

This paper examines the restrictions that control the syntactic behavior of the lexical units *cover* and *spread* with the aim of providing a complete description of their semantic representation along with the structural patterns and diathesis alternations (Levin 1993) in which these predicates might participate. In order to provide a detailed semantic description of these lexical units, we will recur to Levin's verb classes (1993), to the FrameNet database and to the Ontology presented in the lexico-conceptual knowledge base for natural language processing systems, FunGramKB, which stores a hierarchical catalogue of the basic concepts to which these predicates can be ascribed. We will then present the lexical templates and logical structure of the predicates under study, and will move on to introduce their constructional templates at the core grammar level of description. Finally, by analyzing the interaction between their lexical and constructional templates, we intend to explore the constraints which underline the syntagmatic behavior of these verbs and which would explain why the verb *spread* can participate in the "Spray/Load alternation" (*She spread butter on her toast / She spread her toast with butter*) whereas *cover* cannot, and, similarly, why *cover* can participate in the "Locatum Subject Alternation" (*Pat covered the table with flowers / Flowers covered the table*) whereas *spread* cannot. With this study I also hope to contribute to confirm the explanatory potential of the LCM for the study of the semantic and syntactic description of predicates.

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Deadjectival verbs: event-change path and (not always) result.

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We will depart from the idea that the adjectival roots in change-of-state deadjectival verbs are 'paths of change'. Following the general assumption that PPs are the simplest representations of paths (in the spatial domain, canonically); and that they also deliver extended metaphorical (non-spatial) uses involved by our human perception of the notion of change according to which 'change-of-state' events can be seen as analogues of motion events (e.g., Levin&Hovav 2005); we will entertain the hypothesis that Adjectival Rhemes would represent (abstract) spatial paths which are mapped on to the dynamic (change-of-state) event (Zwarts 2003), providing a gradable (property) scale which functions as the mapping to the PATH transversed by the undergoer of the event of change. Further, the PATH structure of the adjective would be mapped onto the temporal PATH structure of the time line of the event.

Since PATH can be either bounded or unbounded, we will see that the difference between closed-scale or open-scale adjectives correlates with resultativity in certain verbs and to gradable change (though by this not implying the attainment of a resulting state) in others, thus allowing the discrimination of two natural classes, which are particularly salient in Spanish.

Deadjectival verbs would arise from rhematic material being incorporated/conflated from the adjective [A^0] in complement position into the verbal head (Hale & Keyser 1993, Ramchand 2007, i.a.). Considering that one of the essential properties for being selected complement of a BECOME

predicate (a process projection) is for the root to certain scalar structure that can be mapped to the verbal change in a systematic way (following Ramchand 2007); under the system proposed here, in their composition, the complement position of the verbal head would be filled by RHEMES (either RHEMES of process or RHEMES of result) embedded by the A^0; the main difference being that RHEMES (having PATHS as subcase), do not describe participants (arguments) in the eventive structure, but actually denote a scalar property that can be measured. Measure would reflect the extent to which entities have the property in question.

Consequently, only closed-scale adjectives give rise to a telic/resultative event: by homomorphism, the endpoint of event is identified with the final stage of the PATH: the attainment of the property (the rhematic material) embedded by the adjectival root (which is interpreted as rheme of result).

On the other hand, while there is still a similar relation between the process and the undergoer of the change, a crucial difference will lie in whether the root is construed either a resulting/final state or as definitional of the process itself, since in open-scale cases the property denoted by the A^0 is not necessarily attained by the undergoer, rather it describes the kind of change underwent.

As a result, the main contrasts could be accounted for based on the kind of PATH the A^0 will be able to build; and the process (change) denoted by the verb would be established via the scalar structure of that property. Further internal differences among these verbs would be part of the lexical encyclopedic properties of the root, and would not be directly encoded in the syntax.

Meaning construction and syntactic representation in copulas: Eventive type shift from a constructionist view.

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According to mainstream assumptions, stative verbs involve no dynamicity/process/change in the predication. However, *estar* is known for delivering also telic (resultative/inchoative) constructions implying a change through time and allowing adjuncts associated to telicity. However, as we already pointed out in previous
works (Múgica & Mangialavori 2012, Mangialavori 2013), describing the copula solely on this basis would imply an overgeneralization, since there is an equally fair number of constructions simply denoting an [atelic] state of affairs. Hence, a unanimous, undivided approach to the aspectual/eventive properties of copular clauses would be misleading; and, at best, a shift in eventive type has to be considered[3]. Here, we will claim this is due to a composition.

[3] Moreover, evidence has shown that these variations in eventive type —relevant at different grammatical levels and extragrammatical levels—, are not dependent on the AP predicate, nor on perfectiveness (tense inflection) but induced by the semantic structure of the copula (cf. Mangialavori 2012).

In our account, the state can be integrated (i.e, augmented) with a process portion [ProcP] to form a coherent (complex) event by specifying its end/result. We will assume that resultative/telic constructions contain two subevents (ProcP and [RESULT]state) in their representation, thus rendering a complex event in which a process 'leads to' the resulting state denoted by the AP[4]. This projection would be in charge of (i) mapping the additional [sub]event onto the (first-phase/lexical) syntactic structure; and (ii)licensing the entity undergoing it ('subject'-of-ProcP=UNDERGOER), thus giving rise to the resultative interpretation.

The proposal of augmentability via conflation/composition with ProcP (since Hale & Keyser 1993, Ramchand 2007) —corresponding to the superordinate predicate BECOME identified by the Functional Lexematic Model (Faber & Mairal 1999, Jiménez Briones & Pérez Cabello 2008)— is interesting in that it matches both claims about lexical template augmentation and constructional templates (regarded as cornerstones of LCM); moreover, it suits approaches taking states as building blocks for complex eventive predications (Rothmayr 2009).

Important aspects of this proposal are the claims that (i) there is a general combinatorial semantics that interprets this syntactic structure in a regular and predictable way; (ii) the semantics of event structure and its components is read directly off the structure; and that (iii) the event structure classically taken to be associated with an atomic lexical head may actually be internally complex. At the same time, the semantics that is compositionally built up by the syntax at this level can only include those aspects of meaning that are genuinely predictable and systematic, since grammatically relevant information actually comes from the interpretation of an (event structure) composition. Encoding the structure in the syntax means that the generalisations at this level involve a kind of systematicity/recursion that is found in syntactic representations[5].

The only encoding necessary will be the category features in the lexical entry which will (i)be semantically interpreted in the event composition, and thus (ii)determine what kind of first-phase the item will be able to build/identify.

[4] The difference would be drawn from its position in a different (more complex) structure derived by composition (triggering the interpretation of the NP as the UNDERGOER of a process, and a state description which is interpreted as the RESstate).

[5] The basic templatic semantics is built up autonomously, as one tier or dimension of meaning (constructionalist view), with the association to lexical content providing the other tier or dimension of meaning.

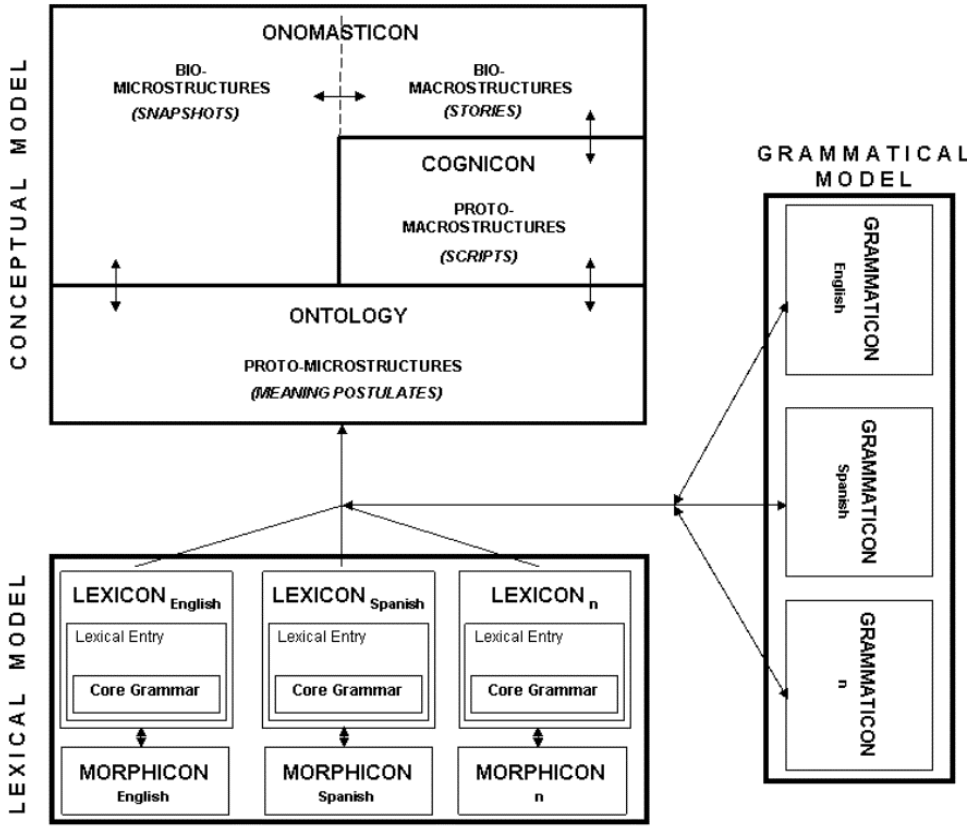

Figure 1. FunGramKB modules (at www.fungramkb.com)