i-Term/i-Model versus FunGramKB: two different approaches to ontological organization

María Ángeles Gómez Castejón [a], Diana Fernández Lloret [b]

[a] Catholic University of Leuven & UNED
Leuven, Belgium
Spain
angeles.gomezcastejon@hotmail.com

[b] University of Granada
Granada, Spain
dianalloret@gmail.com

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Abstract

There is a constant need for terminological models of information, precisely, in specialized contexts. One way of describing conceptual information is through knowledge representation resources e.g. knowledge bases and ontologies. The objective of this paper is to compare how these resources organise terminological information for users. In particular, we will compare the conceptual representations in i-Term, a terminology and knowledge management application with its ontology module i-Model, and in FunGramKB, a multipurpose knowledge base for natural language understanding. With this aim in mind, we will introduce and discuss the concept modelling principles governing both i-Term/i-Model and FunGramKB in a practical and comparative way.

1 Introduction

In the multicultural professional world in which we live, there is a clear need for explicit models of semantic information (terminologies) to facilitate information exchange (Faber et al., 2011). One way of approaching this need for specialized and structured information is through different types of knowledge representation resources e.g. knowledge bases and ontologies.

In general, these resources have been criticized for not being sufficiently flexible and having little or no connection with the general knowledge represented in upper level ontologies or in other domain-specific ontologies.

Furthermore, nowadays there is no single methodology for knowledge representation resources. The determination of an adequate methodology and principles should contribute to avoid some common difficulties in conceptual modelling such as insufficient expressive power and redundancy.

When describing meaning in computational lexicography, the cognitive meaning in a lexical unit can be described by means of semantic features or primitives (i.e. conceptual meaning), or by means of associations with other lexical units in the lexicon (i.e. relational meaning). Obviously, the latter does not provide a definition as such of the lexical unit, but it describes its usage through meaning relations with other lexical units. Although it is easier to establish associations among lexical units in the form of meaning relations rather than formally describing the conceptual content of the lexical units, the inference power of conceptual meaning is stronger. In this regard, it could be said that i-Term/i-Model adopts a relational approach to represent lexical meaning while FunGramKB relies on a cognitive approach, that is to say, it formally describes the cognitive content of lexical units (Periñan & Arcas, 2007).

Within this context, the goal of this paper is to describe the concept modelling governing both i-Term/i-Model and FunGramKB in a comparative way. In other words, we compare and describe how concepts can be represented conceptually in their respective ontological modules since the ontology is the key element where conceptual meaning is modelled.

This paper is organised as follows. In Section 2, we provide the most relevant aspects of both i-Term/i-Model and FunGramKB. In section 3, we mainly describe the types of concepts used for concept modelling in both systems and other aspects related to conceptual organization. In section 4, we explain the conceptual meaning representation highlighting the most representative characteristics of both systems. And finally, we provide some concluding remarks in section 5.

2 i-Term/i-Model and FunGramKB: An overview

As noted earlier, there is a need for different semantic information models in professional and working contexts. In this respect, we present a general overview of i-Term/i-Model and FunGramKB as two different types of knowledge representation resources.

In this context, i-Term/i-Model is a terminology and knowledge management application with its graphical concept modelling module i-Model for concept clarification, whereas FunGramKB is a multipurpose and multifunctional knowledge base for Natural Language Processing (NLP) systems as explained in section 2.2.

2.1 i-Term/i-Model

The Danish Centre for Terminology (DANTERM) has developed i-Term, a state-of-the-art terminology and knowledge management application (Madsen, 2005). i-Term stores, structures and searches for knowledge about concepts, and has been mainly developed for registering and maintaining company- and institution-specific terminology (Madsen et al., 2005). i-Term has a graphical concept modelling module, i-Model, which organises the concepts in i-Term and which allows the user to create a domain-specific ontology (i.e. concept system), comprising all kinds of relations between concepts, characteristics of concepts and subdivision criteria (Madsen, 2006).

The development of i-Term is based on experience gained from co-operation with Danish companies as well as on the results of the CAOS project, which was carried out at CBS (Computer-Aided Ontology Structuring), and whose aim was to develop a computer system designed to enable semiautomatic construction of concept systems, or ontologies, cf. (Madsen et al., 2005).

The research and development project CAOS has been developed on the basis of some terminological ontology principles likewise i-Term/i-Model. i-Term/i-Model has specific characteristics to terminological ontologies as outlined in the following lines. Terminological ontologies are used herein as a synonym of *concept system* which is normally used in terminology work. A terminological ontology is a domain-specific ontology, cf. Guarino (1998). In terminological ontologies, one refers to the nodes as concepts which are described by means of characteristics that denote properties of individual referents belonging to the extension of a concept. By terminological ontology we mean an ontology which is based on the analysis and specification of concept characteristics, and the use of subdivision criteria, which is focused on differences among concepts (Madsen, 2006; Madsen et al., 2008a; Madsen & Thomsen, 2009a).

2.2 FunGramKB

FunGramKB is a user-friendly online environment for the semiautomatic construction of a multi-purpose lexico conceptual knowledge base for natural language processing (NLP) systems and for natural language understanding. On the other hand, FunGramKB is both multifunctional as well as multilingual. In other words, FunGramKB can be reused in various NLP tasks (e.g. information retrieval and extraction, machine translation, dialogue-based systems etc.) and can be reused with several natural languages, in particular, English, Spanish, German, French and Italian (Periñan & Arcas, 2007a).

FunGramKB consists of three information levels: Lexical level, Grammatical level and Conceptual level. In turn, these levels are made up of several independent but interrelated modules, as explained below. In FunGramKB, the Ontology becomes the key module for the whole system (Periñán & Arcas, 2010a) and therefore we will focus on the Ontology:

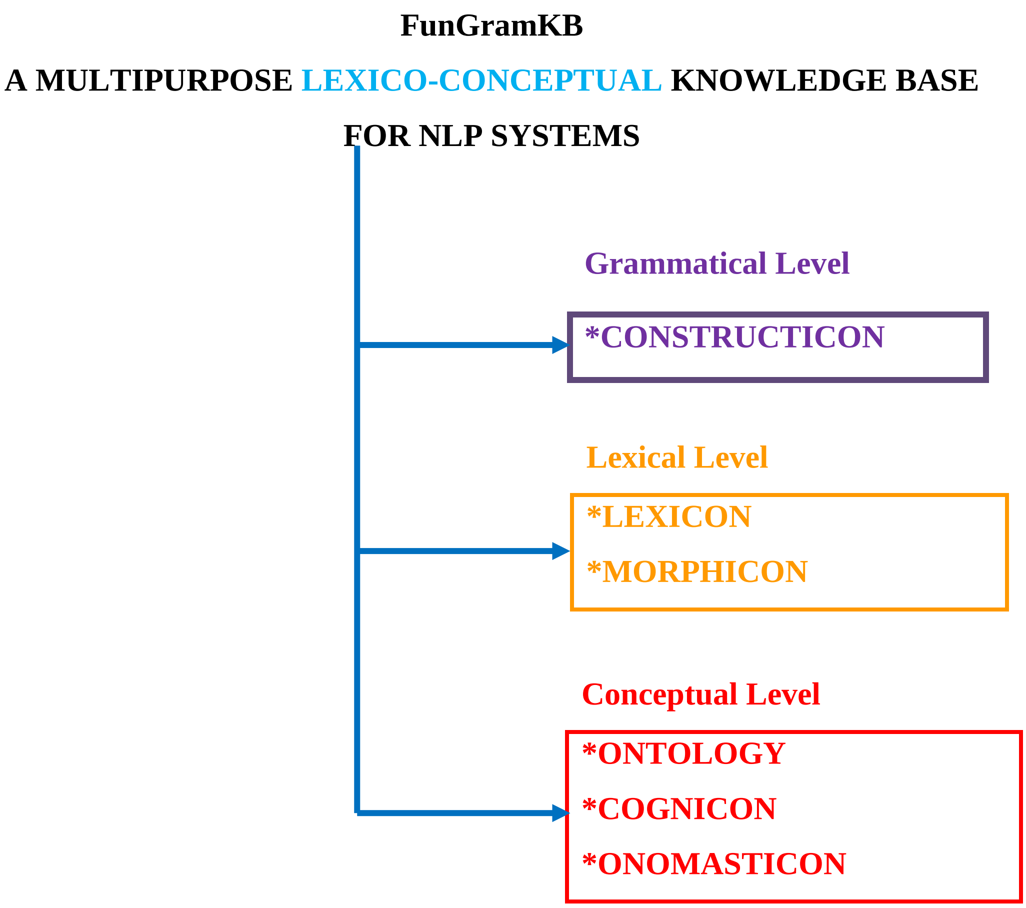


Figure 1. FungramKB Knowledge levels

The conceptual level is formed by three modules: the Ontology, the Cognicon and the Onomasticon. Firstly, the Ontology presents the hierarchical structure of all the concepts that a person has in mind when talking about everyday situations. The Ontology consists of a general-purpose module (i.e. Core Ontology) and several domain-specific terminological modules (Satellite Ontologies). Secondly, the Cognicon stores procedural knowledge by means of cognitive macrostructures, in other words, script-like schemata in which a sequence of stereo typical actions is organised on temporal continuity basis. And, finally, the Onomasticon stores information about instances of entities and events (e.g. people, cities, products etc.).

In FunGramKB, every lexical or grammatical module is language-dependent whereas every conceptual module is shared by all the language and therefore is not language-dependent (Periñán & Arcas, 2010a, 2010b):

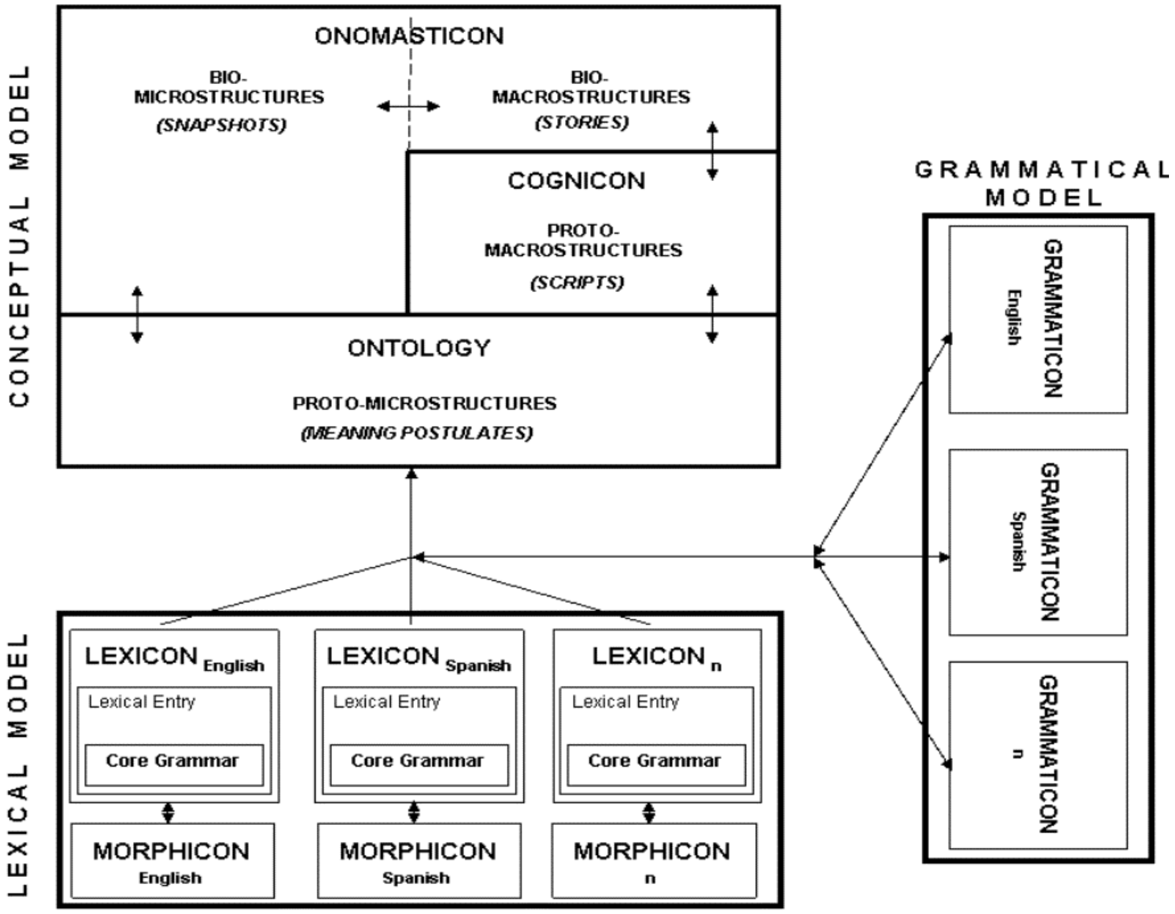


Figure 2. FungramKB architecture

All the knowledge included in the conceptual modules is represented through COREL (Conceptual Representation Language) (Periñán & Arcas, 2010), which is a key factor for successful reasoning. In this way, the information sharing could take place effectively among all the cognitive modules. This formal language is partially founded on Dik's model of semantic representation (1978, 1989, 1997) and was initially created for machine translation (Periñán & Arcas, 2007a).

3 Conceptual organization: concept types

In this section, the conceptual organization of both knowledge representation resources i-Term/i-Model and FunGramKB will be described. Basically in i-Term/i-Model concepts are structured according to a set of relations established among them, while in FunGramKB concepts show a more abstract approach as they are connected through semantic properties as explained in section 4.

3.1 i-Term/i-Model

In i-Term/i-Model information about concepts is culture (language) dependent and concepts are structured into *superordinate*, *subordinate* and *coordinate* concepts establishing a range of relations among them (i.e. generic, partitive, termporal and associative relations (Madsen, 2006). The terminologist inserts these type relations when building concept systems (Madsen et al., 2005). See the table 1 below for a graphical view of relations:

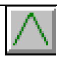
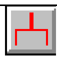
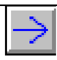
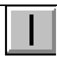
Concept relation	Equivalent symbol
type relation (generic)	symbol: 
part-whole relation (partitive)	symbol: 
temporal relation	symbol: 
associative relation	symbol: 

Table 1. Concept relations

In the following figure 3, relations organise and structure the conceptual hierarchy in the concept system. To illustrate how relations work, we provide the concept system of ”windmill”, where only generic, part-whole and associate relations operate:

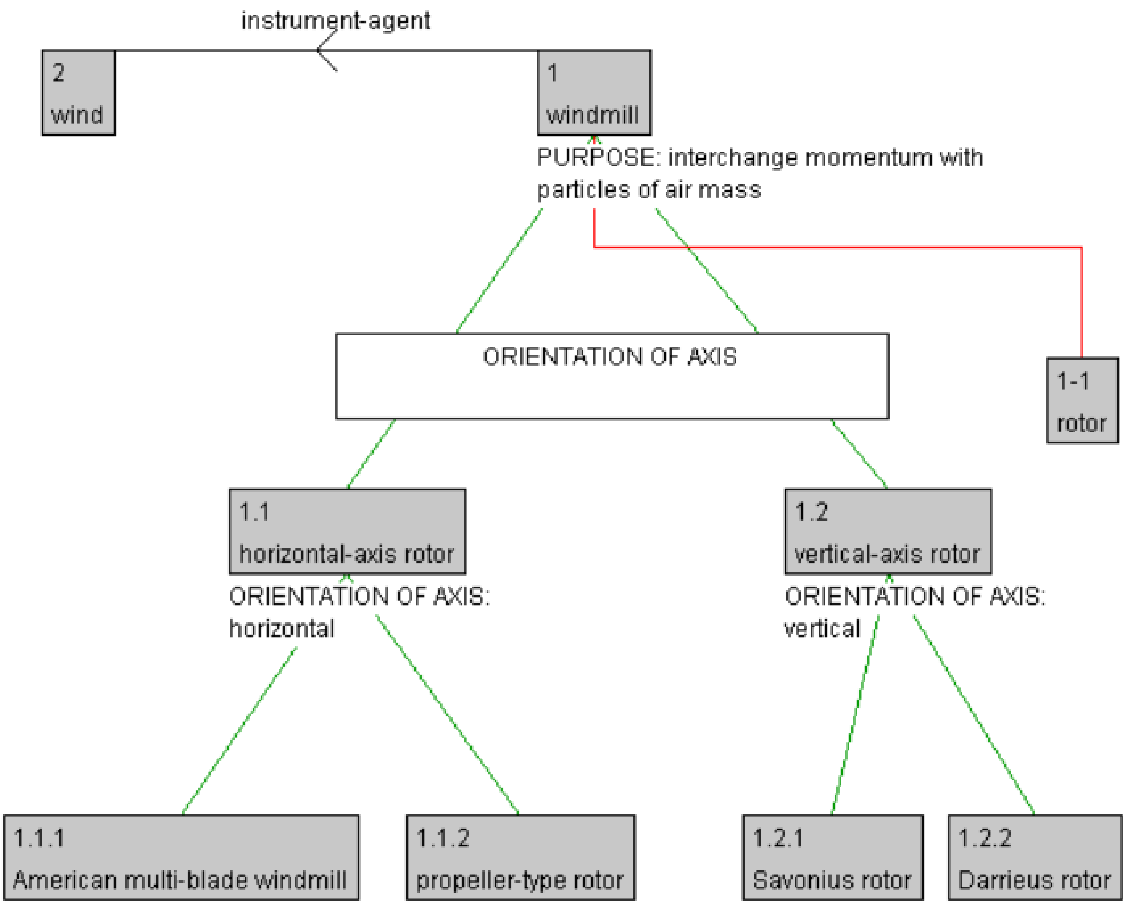


Figure 3. Type relations (Madsen et al., 2005)

In the following figure 4, we can also observe temporal relations in the concept system:

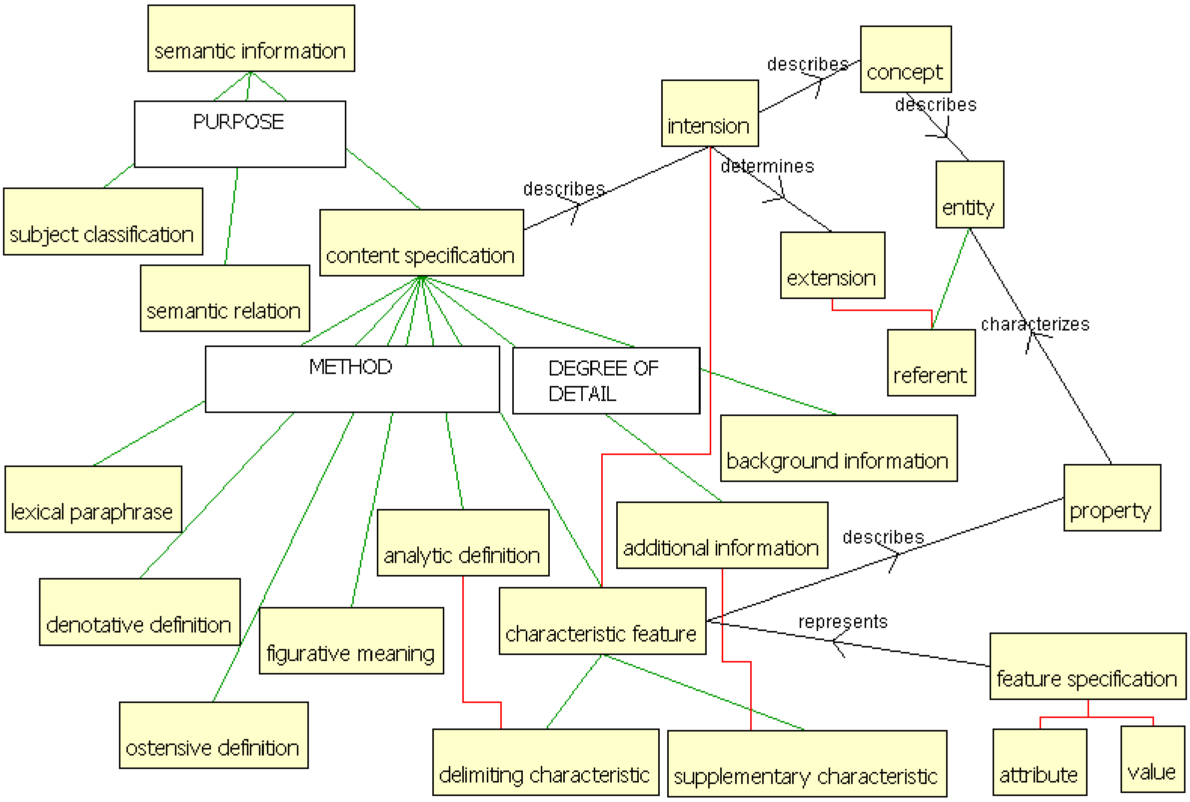


Figure 4. Concept system including temporal relations Madsen & Thomsen, 2008b)

Firstly, concepts located in one level higher up in the concept system (the one of which the current concept is a part or type) is that concept's *superordinate concept*. Secondly, *subordinate concepts* refer to a concept divided into parts or types, or a smaller part of an object, or a narrower range of objects, for example, 'wheel' has the subordinate concepts 'rim'and 'hub'. (Madsen et al., 2007). And, finally, those concepts which have the same superordinate concept and which therefore appear on the same level in the concept system are denominated *coordinate concepts*.

In the following figure (5) we can see the different types of concepts and the relations established among them which build the concept system of "molecular structure", where the different conceptual levels are also indicated through a notation system. For example, "molecular structure" is the first superordinate concept in the system indicated by number "1", followed by subordinate concepts indicated through a subdivision of the notation (e.g. the subordinates concepts of "molecular structure": "constitution" noted as 1-1 or "conformation" noted as 1-2).Coordinate concepts are placed at the same level in the conceptual system and are numbered in sequence (e.g. "N-terminal residue" (1-1-2-1.1) and "C-terminal residue" (1-1-2-1.2) and fall under the same dimension "location" created in the conceptual system:

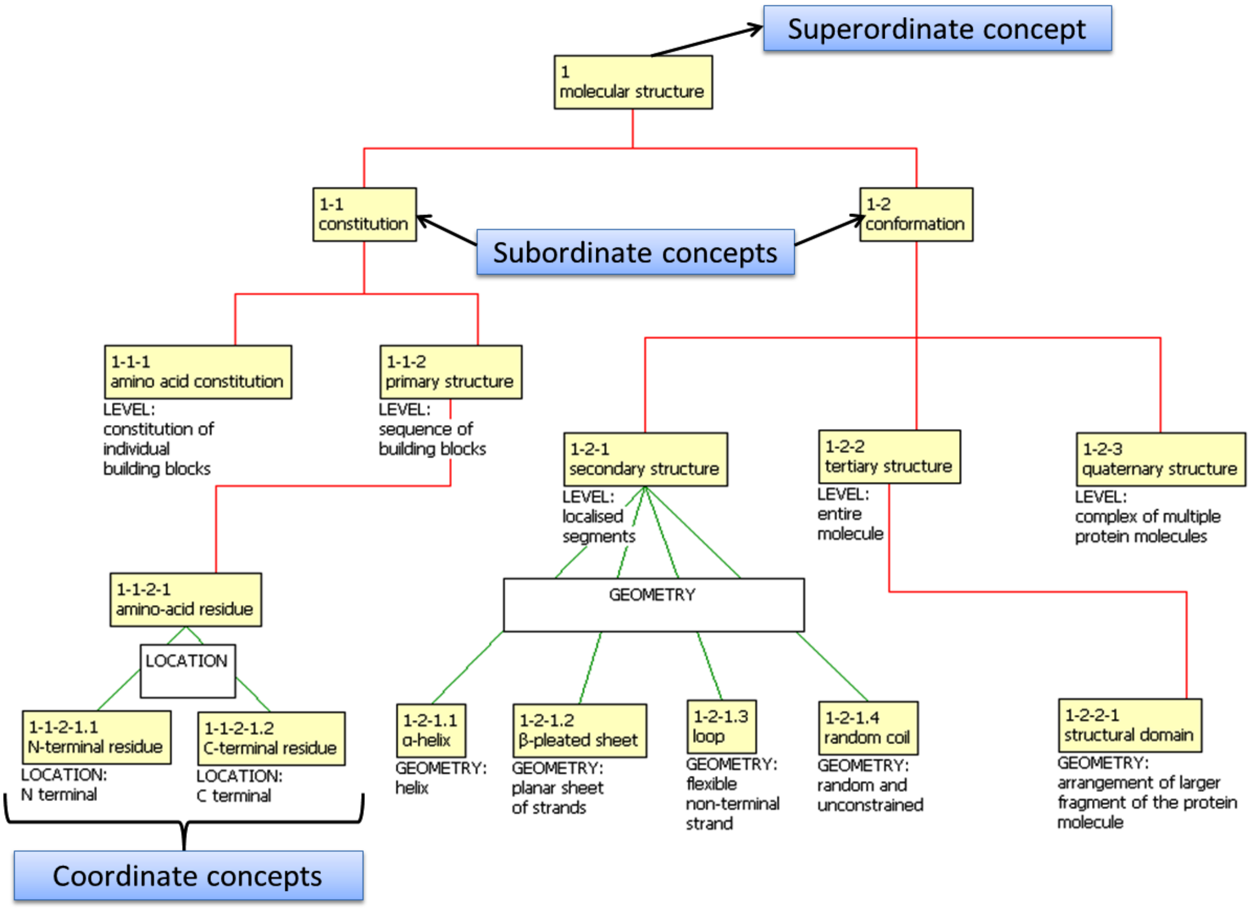


Figure 5. Concept types in i-Term/i-Model

Next, we present the types of concepts existing in the Ontology of FunGramKB and how they are arranged through a subsumption relation as explained in the following section.

3.2 FunGramKB

As noted earlier, in FunGramKB the Ontology consists of a general-purpose module (i.e. Core Ontology) and several domain-specific terminological modules (Satellite Ontologies). In this article we will focus on the Core Ontology as this is the one which includes and reflects the speaker´s knowledge of the world (i.e. human beings' cognitive system):

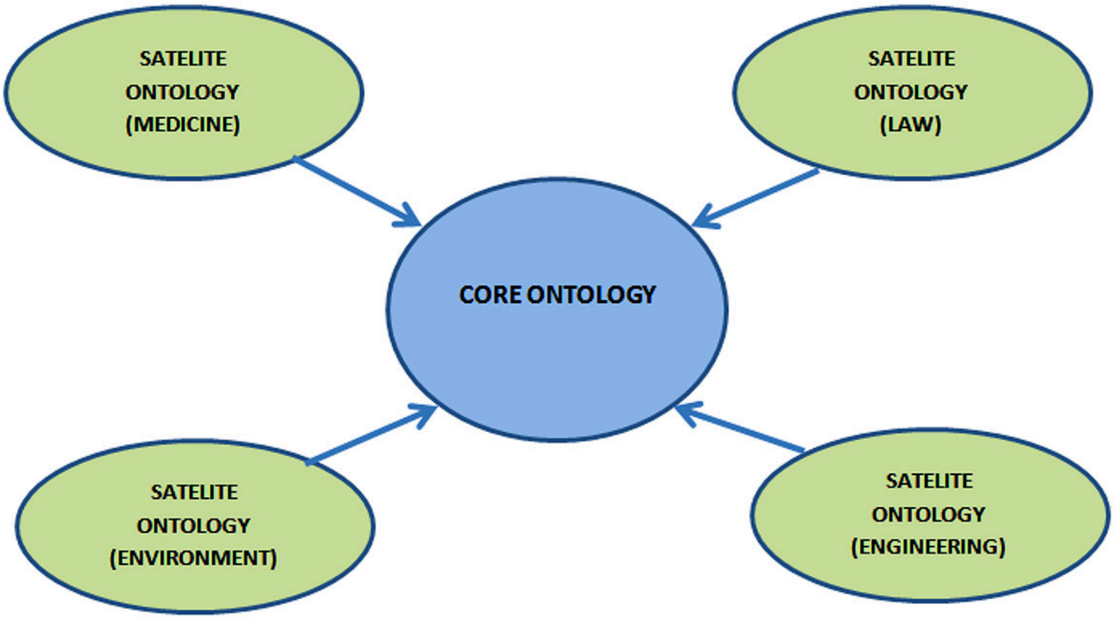


Figure 6. Core Ontology and Satellite Ontologies

FunGramKB Core Ontology distinguishes three different conceptual levels*: metaconcepts*, *basic conc*epts and *terminal concepts* (Periñán & Arcas, 2004; Periñán & Arcas, 2007a; Periñán & Arcas, 2010b). Unlike i-Term /i-Model, concepts in FunGramKB provide an abstract view of the world with different degrees of abstraction ranging from high to low:

ONTOLOGY LAYERS

METACONCEPTS
BASIC CONCEPTS
TERMINAL CONCEPTS

Figure 7. Conceptual hierarchy in FunGramKB

We go on to describe the main characteristics of the concepts presented above. In the first place, Me*taconcepts*, preceded by symbol # (e.g. #COMMUNICATION, #PHYSICAL, etc.), constitute the upper level in the taxonomy. The analysis of the main upper-level in the main linguistic ontologies - DOLCE (Gangemi et al., 2002), Generalized Upper Model (Bateman, Henschel and Rinaldi, 1995), Mikrokosmos (Mahesh and Nirenburg, 1995), SIMPLE (Lenci et al., 2000), SUMO (Niles and Pease, 2001) - led to a metaconceptual model whose design contributes to the integration and exchange of information with other ontologies. Since subsumption is the only taxonomic relation permitted, the FunGramKB Ontology is actually divided into three subontologies. Therefore, each subontology arranges lexical units of a different grammatical category: #ENTITY, #EVENT, and #QUALITY account for nouns, verbs and adjectives respectively (e.g. +HUMAM_00, +SAY_00 and +HAPPY_00) (Jiménez-Briones and Luzondo, 20011). The result amounts to forty-two metaconcepts distributed into the three subontologies (i.e. #ENTITY, #EVENT, and #QUALITY).

Secondly, *Basic concepts*, preceded by + (e.g. +BIRD_00, +HUNGRY_00 and +TRANSLATE_00), are used as defining units which allow the construction of meaning postulates (henceforth MP) for basic concepts and terminals as well as taking part as selection preferences in thematic frames (henceforth TF). MPs and TFs provide the semantic properties of the concepts and will be explained in detail in the following paragraphs. The starting point for the identification of basic concepts was the defining vocabulary in *Longman Dictionary of Contemporary English* (Procter, 1978) and as a result of a deep revision, the inventory employed in FunGramKB amounts to 1,300 basic concepts.

Finally, *Terminals*, preceded by $ (e.g. $METEORITE_00, $SKYSCRAPER_00, $VARNISH_00), are those concepts that lack definitory potential in the construction of meaning postulates. The borderline between basic concepts and terminals is just based on their definitory potential to take part in meaning postulates. In this sense, FunGramKB uses an “integrated top-down and bottom-up”, where conceptual promotion and demotion can occur between the basic and terminal levels.

Therefore, some terminal concepts can be promoted to basic concepts when the inclusion of a new language demands a different approach to the world model. On the contrary, basic concepts can be depromoted to terminal concepts whenever they cannot be used to define other concepts. In any case, the metaconceptual level always remains stable. In other words, the FunGramKB Ontology is grounded on a spiral model, where conceptual promotion and depromotion can occur between basic and terminal concepts as illustrated in Figure 8:

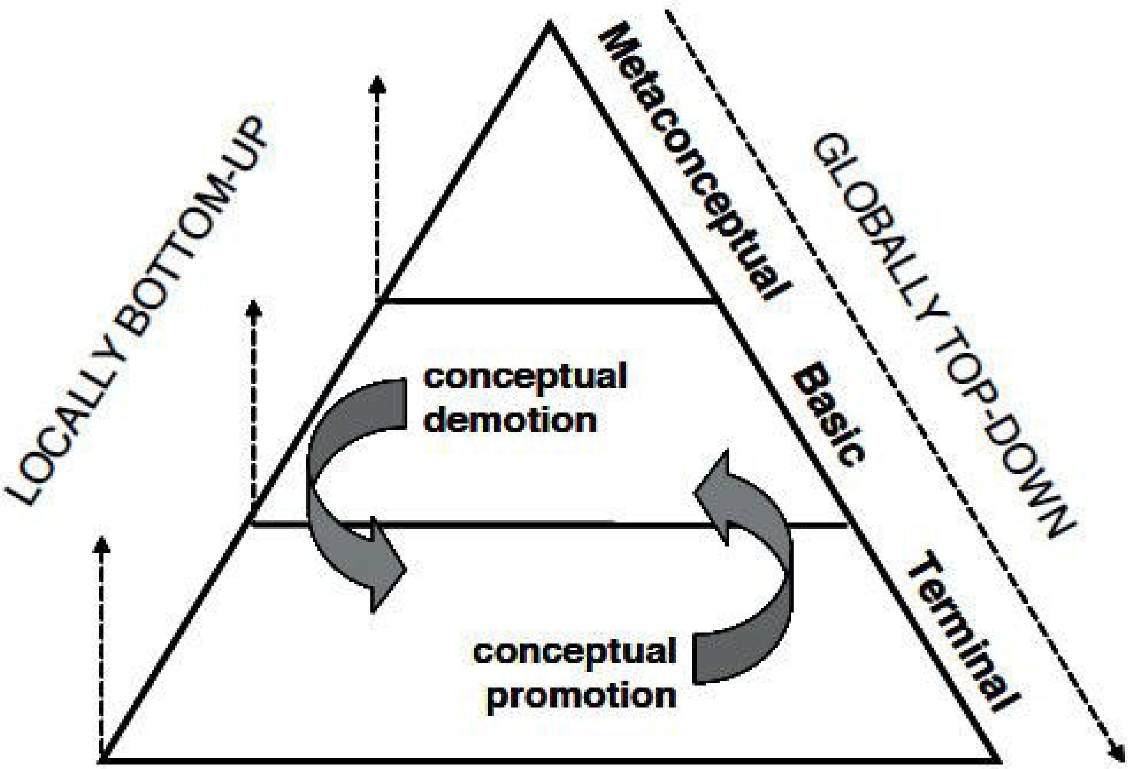


Figure 8. FunGramKB Ontology design

The design of the FunGramKB Ontology responds to the need of a core level of knowledge (i.e. basic concepts) which plays a pivotal role between those universal categories that can favour ontology interoperability (i.e. metaconcepts) and those particular concepts which can provide immediate applicability (i.e. terminals).

4 Conceptual Meaning Representation

In i-Term/i-Model concept representation is built on concept relations and their characteristics, while FunGramKB provides a cognitive representation of the meanings of a lexical unit by means of meaning postuales (MPs) and thematic frames (TFs) understood as conceptual properties.

In this study we will focus on the comparison of concepts integrated within the Ontology of FunGramKB and i-Term/i-Model respectively. In particular, we will compare the concepts “printer” and“$TOASTER_00” from i-Term/i-Model and FunGramKB, on account of their definitions and their representativeness. On the one hand, both concepts can be defined in terms of belonging or being in the category of “machines” and, on the other hand, both concepts enable us to illustrate the most relevant characteristics in meaning representation (i.e. relational and conceptual meaning representations in i-Term/i-Model and FunGramKB respectively).

4.1 i-Term/i-Model Conceptual Meaning Representation: *Characteristics*

Although conceptual representation and definitions are closely related processes in i-Term/i-Model, we firstly show how conceptual representation is carried out and then we explain how definitions are elaborated and fit into i-Term/i-Model conceptual representation.

In i-Term/i-Model we understand the term ontology as a "concept model", i.e. a model that describes knowledge about concepts (information about concepts) as opposed to ontologies understood as "conceptual data model" that represents an abstract view of the real world (Madsen & Thomsen, 2008a: 12). In this sense, ontology understood as a "concept model" provides information about concepts in the form of *feature specifications* and concept relations as we will see in subsequent paragraphs. *Feature specifications* are the formal modelling of the terminologist's *characteristics* (Madsen et al., 2005).

In i-Term/i-Model the concept *characteristics* is the starting point for concept representation, since the analysis of the characteristics of concepts is the basis of the elaboration of concept systems and definitions, the evaluation of equivalence between concepts in different languages as well as the selection of the most appropriate terms (Madsen, 1998a).

In i-Term/i-Model *characteristics* correspond to a *feature-value pair*, this means that a characteristic of a concept consists of *a relation from this concept and another concept, the associated concept*. Then, the links and relations to concepts are encoded as features in the concept system, this indicates that relations among concepts should play a role in the definition of *characteristics*, or in other words, *characteristics* must be understood as a relation from the concept being defined plus the concept thus related to the one being defined. These *feature specifications* are appropriate according to Thomsen (1998b) because the relation between the concept being defined and the associated one is important for definitions. Therefore, identification of the differentiating characteristics is very important when defining concepts in concept systems (Madsen et al., 2007).

In i-Term/i-Model the first step to define terms is to formalize the relations between the concepts and to introduce characteristics delimiting related concepts (feature specifications, consisting of attribute-value pairs). On the basis of these *feature specifications*, subdivision criteria are introduced, which group concepts and thereby give a good overview.

As previously mentioned, we provide the example of printer in which the *genus proximum* is "printer", the subdivision criterion or attribute is "character transfer", one of the features are "character transfer, noise and copy" and, finally, their corresponding attribute values are "non-impact, quiet, simple". The superordinate concept and the attribute of the feature specification must be the same in the definitions of subordinate concepts falling under one subdivision criterion, e.g. noise and copy (Damhus et al., 2009):

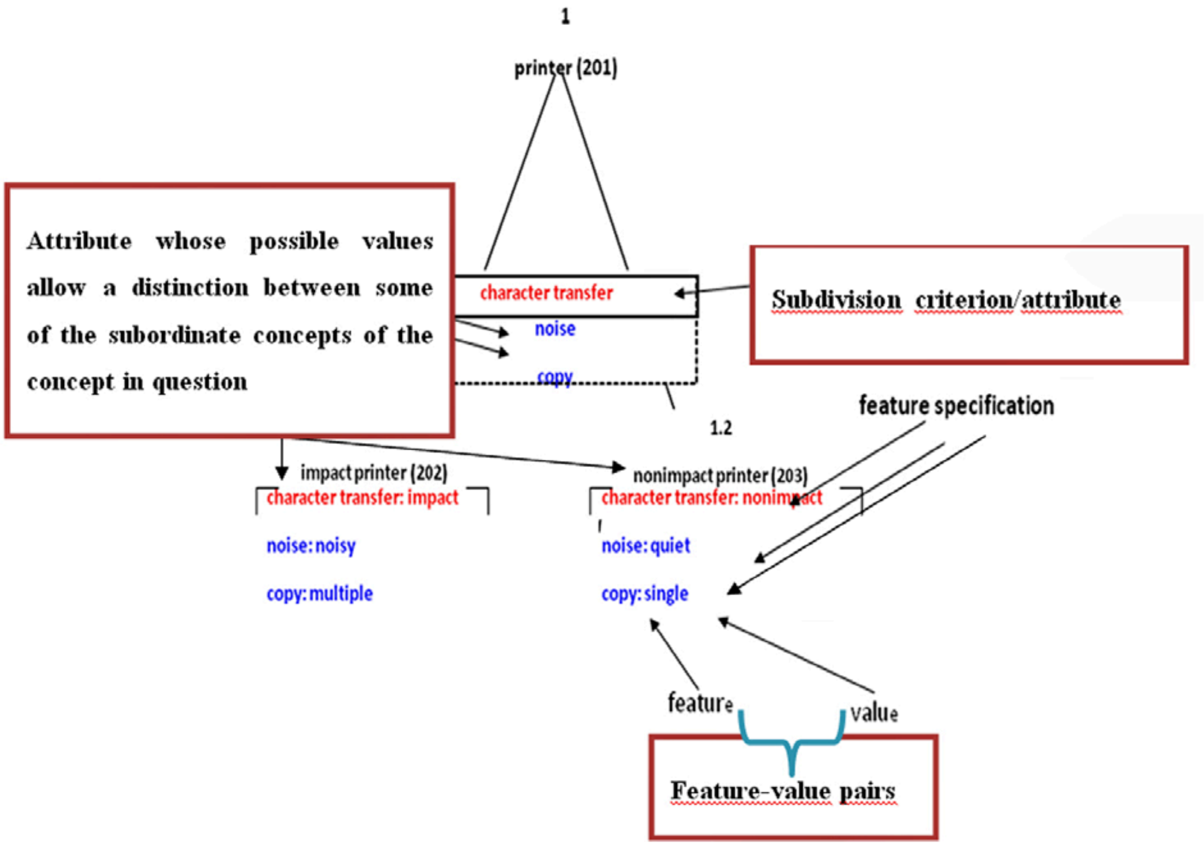


Figure 9. Subdivision criteria and feature-value pairs in the concept system of printer

The notions of feature-value pairs or characteristics and subdivision criteria in i-Term/i-Model, as already mentioned, are built on some of the principles developed in the CAOS prototype. Here we only mention some of the principles that build the basis for i-Term/i-Model and which can be applied to both domain-specific ontologies and general ontologies (Madsen et al. 2005). The principle of *Uniqueness of Dimension* (Madsen et al., 2008a) states that a given dimension may occur on only one concept in an ontology. This principle helps to create coherence and simplicity in the ontological structure since concepts characterised by primary feature specifications with the same dimension must appear as coordinate concepts on the same level having in common a superordinate concept. According to *uniqueness of feature specifications*, a feature specification may occur only once in a terminological ontology as primary and inherited feature specifications are inherited from superordinate concepts. On account of this principle, characteristics will always distinguish concepts and common characteristics should be located on a common superordinate concept (Madsen et al., 2008a). Finally, the principle of *grouping by subdividing dimensions* establishes that a concept (with only one mother concept) may contain, at the most, one delimiting feature specification; for example, a concept of level 2 or below must contain at least one delimiting feature specification:

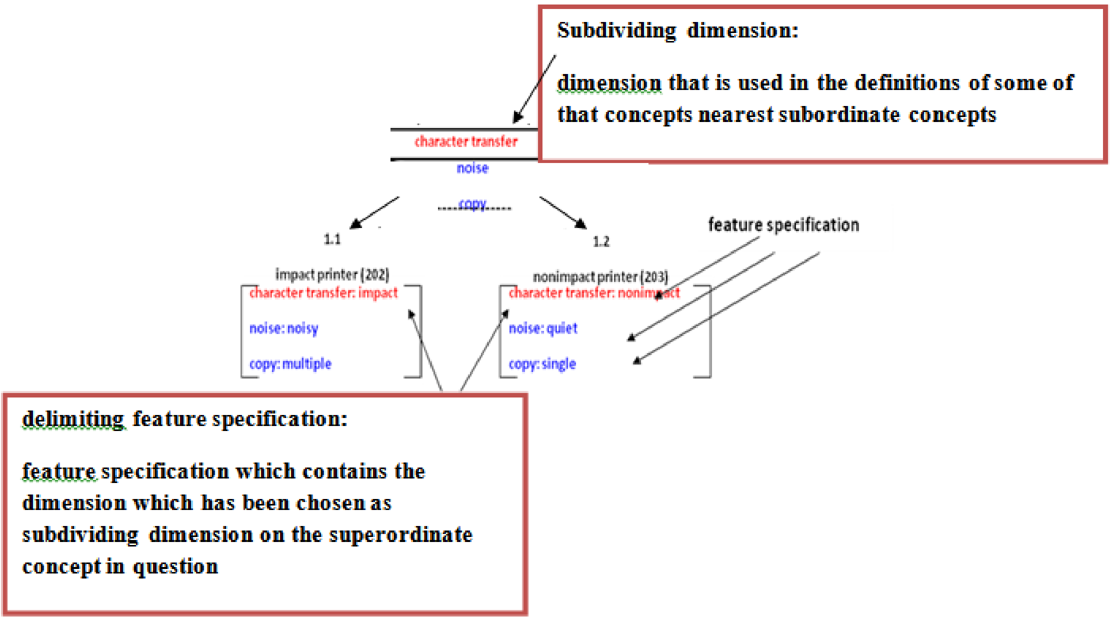


Figure 10. *Subdividing dimensions* and *delimiting feature specifications*

Next we will move on to show how definitions are elaborated in i-Term/i-Model. In i-Term/i-Model concept representation conveys an iterative process which implies: analyzing the concepts as well as placing them in draft concept systems in the form of hierarchies or networks on the basis of their characteristics, then drafting definitions, and, finally, refining concept systems as well as definitions. In this way, they arrive at consistent definitions referring to the superordinate concept (i.e. *genus proximum* or nearest kind) and followed by the delimiting characteristics.

In order to conclude this section, we would like to explain some aspects related to the nature of definitions in i-Term/i-Model. All analytic definitions (intensional, extensional and partitive) are related to concept systems, however, the intensional definition, which analyses the concept's characteristic features, is by far the most widely used in i-Term/i-Model[i] (Madsen et al., 2007). This type of definition implies, on the one hand, that a concept 'consists of' a unique combination of characteristics, and, on the other, that by the identification of these characteristics concepts can be explained and defined. On account of this definition, the superordinate concept and delimiting characteristics from their own concept can be read off. For example, *impact printer* is defined as: *A type of printer, which makes noise and can produce multiple copies* (Madsen et al., 2007).

Finally, in i-Term/i-Model concept representation implies analyzing the concepts on account of their characteristics of relational nature. On the contrary, in FungramKB concept representation is provided by two semantic properties, i.e. thematic frames (TFs) and meaning postulates (MPs) as explained in the following section.

[i] It is recommended to write intensional definitions in i-Term, however, the system technically allows the user to use any kind of method for defining concepts. i-Term does not provide any definition validation tools.

4.2 FunGramKB's Conceptual Meaning Representation: thematic frames and meaning postulates

In FunGramKB Ontology, concepts are not stored as atomic symbols but are provided with an internal structure consisting of semantic properties in the form of TFs and MPs and (Periñán & Arcas, 2007a).

On the one hand, a TF is a cognitive construct which specifies the number and type of participants involved in the cognitive situation portrayed by the event (Periñán & Arcas, 2007a). These participants are expressed by the variables (x1), (x2), etc. and their corresponding thematic roles (e. g. Agent, Theme, Referent, Goal etc.) in COREL, which is the metalanguage used in all cognitive modules. It is important to point out that in FunGramKB, unlike other ontologies, every event and quality is assigned one TF whereas this is not the case for entities (i.e. they are not assigned a TF). In the case of entities, the number and type of participants are determined by the events that are included as part of the definition of the entity as explained in the paragraphs below.

On the other hand, a MP is a set of one or more logically connected predications (e_1, e_2, ….e_n) that are cognitive constructs implying the generic features of the concept (Periñán & Arcas, 2004). FunGramKB employs concepts and not words for the formal description of meaning postulates, therefore a meaning postulate can be defined as a language-independent semantic knowledge representation (Periñán & Arcas, 2007b) and this results in a representation of meaning with great expressive power employing COREL notation. A MP is basically formed by: predications which represent features "e1, e2, e3 ..." and required arguments "x" and satellites "f" (e.g. Manner, Purpose, Location, Reason, Condition, etc.). In addition, MPs organise concepts and this implies that: i) all subordinate concepts share their superordinate MP, and ii) that the conceptual differences among subordinate concepts are encoded in the MP by means of distinctive features or *differentiae*.

To illustrate the above mentioned information, we propose the case of concept terminal $TOASTER_00. Before providing the MP and TF of this concept, we would like to point out that all the concepts in the Ontology have a cognitive dimension and are linked to one another by inheritance relationship, in such a way that each subordinate concept inherits the characteristics of its superordinate concept.

As far as cognitive dimension is concerned, the terminal concept $TOASTER_00 belongs to the metacognitive dimensions: #ENTITY > #PHYSICAL > #SELF_CONECTED_OBJECT > +ARTIFICIAL_OBJECT_00 > +SUBSTANCE_00> +SOLID_00> +MACHINE_00> +$TOASTER_00.

On the other hand, regarding inheritance relationship, $TOASTER_00 inherits the characteristics of its superordinate +MACHINE_00, like the rest of the subordinate concepts of the concept +MACHINE_00 (i.e. $REMOTE_00, $VACUUM_00, $CALCULATOR_00, $CAMARA_00, $COMPUTER_00 and $MOTOR_00):

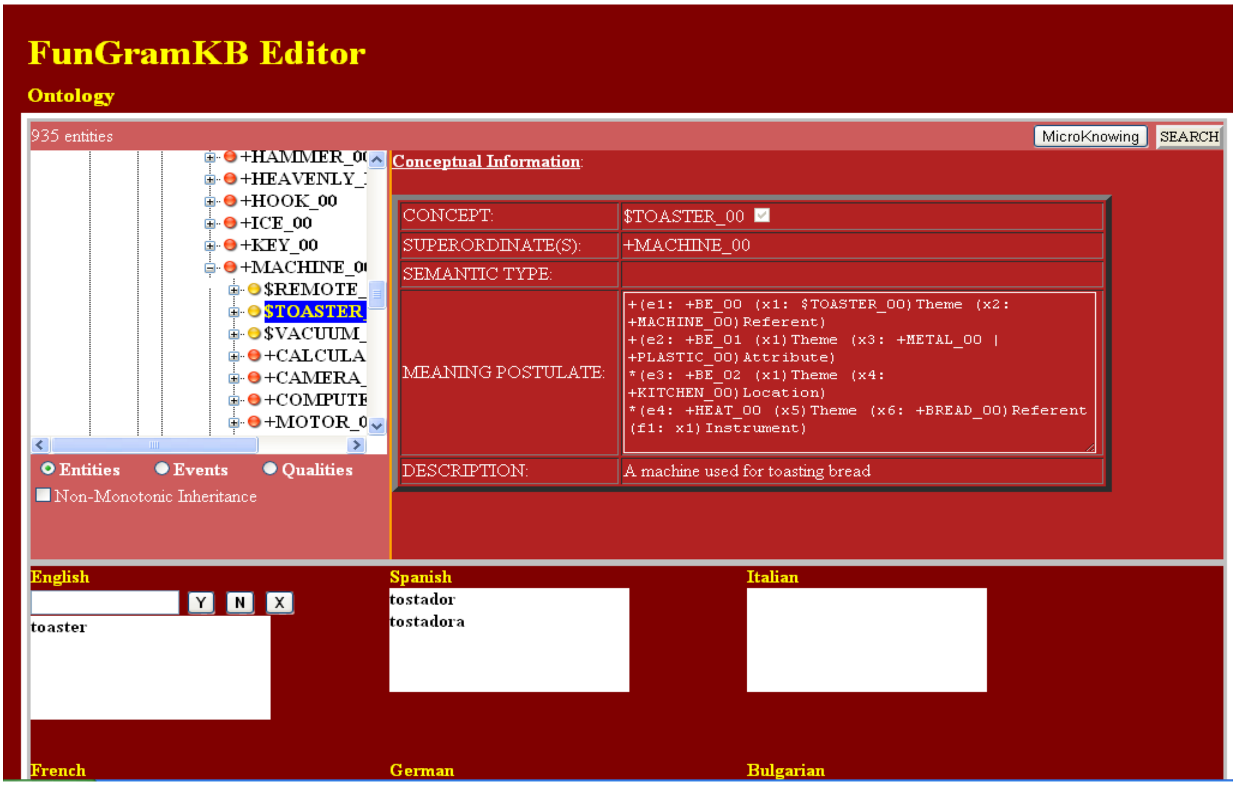


Figure 11. Inheritance relationships among concepts

Regarding the MPs and TFs, these are formalized using COREL notation as follows:

COREL	Natural Language
+(e1: +BE_00 (x1: $TOASTER_00)Theme (x2: +MACHINE_00) Referent)	e1: A Toaster is a machine.
+(e2: +BE_01 (x1)Theme (x3: +METAL_00 | +PLASTIC_00) Attribute)	e2: A typical toaster is of metal or plastic.
*(e3: +BE_02 (x1)Theme (x4:+KITCHEN_00)Location)	e3: A typical toaster is in the kitchen.
*(e4: +TOAST_00 (x5: +HUMAN_00) Theme (x6: +BREAD_00)Referent (f1: x1)Instrument)	e4: Someone toasts bread with a toaster.

Table 2. MP and TF of $TOASTER_00

As seen in Table 2, $TOASTER_00 contains the first predication of the superordinate concept +MACHINE_00. This predication specifies that "$TOASTER_00 is or belongs to +MACHINE_00", which is represented in COREL as follows: +(e1: +BE_00 (x1: $TOASTER_00) Theme (x2: +MACHINE_00) Referent). Furthermore, the concept $TOASTER_00 has some distinctive features included in the rest of predications and expressed in COREL: "is of metal or plastic", "is in the kitchen" and "Someone with a toaster toasts bread" (predications e2, e3 and e4 respectively).

In addition, a MP also includes the information stated in a TF by the co-indexation of the participants. As noted earlier, entities are not assigned a TF but the number and type of participants are determined by the events included in their MP. For example, in the first predication (e1) of $TOASTER_00, the presence of +BE_00 provides the thematic roles that must be interpreted according to the metacognitive dimension of #IDENTIFICATION:

(1) TF = (x1) Theme [x2] Referent [x3] Attribute

The thematic frame of +BE_00 depicts a situation in which three participants are typically involved: *Theme* refers to an entity that is identified by means of another entity, *Referent* makes reference to an entity that serves to define the identity of another entity and, finally, *Attribute* is the quality ascribed to an entity. The participants of the predication are represented by an indexed label *x* and the parentheses indicate that a particular participant is optional. For example, in the case of $TOASTER_00 the participant *Attribute* is not necessary in the construction of its MP. Therefore, a Calculator (x1=Theme) is a machine (X2 0 Referent).

In relation to terminal concepts, there is always a narrowing on the MPs of the basic concept. In this sense, the terminal concept $TOASTER_00 is a further specification of the basic concept +MACHINE_00. In the following example we can see the MP of +MACHINE_00:

(2) MP = +(e1:+BE_00(x1:+MACHINE_00)Theme(x2:+ARTIFICIAL_OBJECT_00 & +CORPUSCULAR_00 & +SOLID_00)Referent)
('a machine (x1 = Theme) is typically an artificial object, corpuscular and solid' (x2: Referent))

If compared with the MP of +MACHINE_00, the terminal concept $TOASTER_00 comes as a result of further specifying this basic concept: firstly, by specifying other attributes (x3: +METAL_00 | +PLASTIC_00), by adding the parameter location (x4: +KITCHEN_00) and, finally, by including the parameter Instrument (f1: x1).

In conclusion, when representing one of the meanings of a lexical unit, we are really representing the meaning of a concept. That is to say, handling lexical meaning as a cognitive representation which reflects the speaker´s shared knowledge about the referent linked to a given linguistic expression. This is why MPs are processed as a conceptual property in FunGramKB (Periñan & Arcas, 2004). Moreover, lexical units are associated with much more semantic information which becomes apparent in the meaning postulate of the concept to which that lexical units are linked. All in all, lexical units are always linked to one or more concepts in the ontology, and the same concept, in turn, is lexicalized by one or more words in the several FunGramKB lexica (Jiménez-Briones & Luzondo, 2011).

Based on the previous observations, we may argue that FungramKB is a knowledge base where MPs and TFs provide a rich conceptual description to which lexical units are thus associated.

5 Conclusions

In this paper we have proved that i-Term/i-Model and FunGramKB adopt a different approach to ontological organization and in particular, we have shown how both systems structure conceptual representation in a comparative way. In this scenario, i-Term/i-Model adopts a relational approach (i.e. associations among lexical units), whereas FunGramKB relies on a cognitive approach (i.e. description of semantic features or primitives).

In brief, in i-Term/i-Model concept representation is based on relations among related concepts and their characteristics, which not only differentiate related concepts but also group them by providing a general view of the whole group of concepts. Unlike i-Term/i-Model, FunGramKB provides a cognitive representation of lexical units by means of MPs and TFs understood as conceptual properties and the related concepts are not grouped together but concepts are arranged according to the taxonomic relation of subsumption (i.e. #ENTITY, #EVENT, and #QUALITY which account for nouns, verbs and adjectives respectively).

In addition, concept representation in i-Term/i-Model must be interpreted as an iterative process which involves, firstly, a draft and, then, a final version of the concept system and their definitions. In FunGramKB, there is a process of conceptual promotion and demotion whereby certain concepts (i.e. basic and terminal concepts) can be promoted and depromoted on account of their definitory potential.

Regarding definitions, both knowledge representation resources include the *genus* plus the specific or delimiting characteristics in i-Term/i-Model and FunGramKB respectively; through this combination the consistency of definitions is guaranteed. In both systems their definitions are of an analytical nature, are linked to the concept system and have a concise formulation. In this regard, it is important to note that unlike i-Term/i-Model, FunGramKB employs concepts and not words for the formal description of meaning postulates through the use of the COREL language.

Finally, we believe that the comparison of different ontological approaches is useful so that the different systems for ontological organization can reciprocally benefit from their advantages and disadvantages in order to improve their ontological organization.

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