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The configuration of a philosophical parameter in the subontology #ENTITY of FunGramKB: The case of axiology[1]

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Abstract

The Functional Grammar Knowledge Base *FunGramKB* (FGKB), on the one hand, is a multipurpose lexico-conceptual knowledge base for natural language processing (NLP) systems. It comprises three major interrelated knowledge level modules: lexical, grammatical and conceptual. At the conceptual level the core ontology is presented as a hierarchical catalogue of the concepts that a person has in mind. Here is where semantic knowledge is stored in the form of meaning postulates. On the other hand, axiology is considered to be a primitive, basic or key parameter, among others, in the architecture of meaning construction at different levels. This parameter can be traced back to the three subontologies in which FunGramKB can be split: #ENTITY for nouns, # EVENT for verbs, and #QUALITY for adjectives. In this paper we shall concentrate on the category # ENTITY and explore how the main categories and features of the axiological parameter (good-bad or positive-negative [+/-]) are represented and encoded within FunGramKB ontology, particularly inside semantic properties such as the meaning postulates.

1 Basic assumptions

In this study we start from two premises: the first one states that *valuation* is an inherent aspect of categorization. In fact, in the ontogenetic development of every human being, the

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first categorizations are valuations. The reason is that we are valuating beings. All our actions, our thinking, our attitudes and interactions with the world and with other people, but particularly our emotions are connected with or laden with certain values (Krzeszowski, 1997). Consequently, axiology is considered to be a primitive, basic or key parameter, among others, in the architecture of meaning construction at different levels in language (Hare 1952; Osgood, Suci, Tannenbaum 1957; Coseriu 1967; Pottier 1974; Krzeszowski 1990, 1993, 1997; Felices-Lago 1991, 1997; Cortés de los Ríos 2001; and many others).

In the second place, in the last few years the comprehensive theory of constructional meaning known as the Lexical Constructional Model (Mairal-Usón & Ruiz-de-Mendoza-Ibáñez 2008, 2009; Ruiz-de-Mendoza-Ibáñez & Mairal-Usón 2008, among others) has incorporated as part of its architecture *FunGramKB* (FGKB), which is a multipurpose lexico-conceptual knowledge base for natural language processing (NLP) systems (Periñán-Pascual & Arcas-Túnez 2004; Periñán-Pascual & Arcas-Túnez 2005; Mairal-Usón & Periñán-Pascual 2009; Mairal-Usón & Periñán-Pascual 2010; Periñán-Pascual & Mairal-Usón 2009; Periñán-Pascual & Mairal-Usón 2010). It is multipurpose in the sense that it is both multifunctional and multilingual. In other words, FGKB can be reused in various NLP tasks (e.g. information retrieval and extraction, machine translation, dialogue-based systems, etc.) and with several natural languages. This knowledge base comprises three major knowledge levels, consisting of several independent but interrelated modules: (1) Lexical level: *The Lexicon* stores morphosyntactic, pragmatic and collocational information about words. *The Morphicon* helps our system to handle cases of inflectional morphology. (2) Grammatical level: *The Grammaticon* stores the constructional schemata which take part in the bidirectional linking algorithm: semantics <-> syntax. (3) Conceptual level: *The Ontology* is presented as a hierarchical catalogue of the concepts describing semantic knowledge.[2] *The Cognicon* stores procedural knowledge by means of script-like schemata in which a sequence of stereotypical actions is organised on the basis of temporal continuity. *The Onomasticon* stores information about instances of entities and events. In FunGramKB, every lexical or grammatical module is language-dependent, whereas every conceptual module is shared by all languages. FunGramKB adopts a conceptualist approach to language, where the ontology becomes the pivotal module for the whole architecture.

As a consequence of the two previous premises, the valuation or axiological parameter can be traced back to the three subontologies in which the FunGramKB ONTOLOGY can be split: #ENTITY for nouns, #EVENT for verbs, and #QUALITY for adjectives (and some adverbs). In this paper we shall concentrate on the subontology #EVENT and explore how the main categories and features of the axiological parameter (good-bad or positive-negative [+/-]) are represented and encoded within the FunGramKB ontology. To do that, we should understand first how this ontology works on the basis of the following protocol: the FGKB Ontology stores semantic Knowledge in the form of thematic frames (TFs) and meaning postulates (MPs) by presenting a hierarchical catalogue of all the concepts (not ´words`, unlike FrameNet or MultiWordNet) that a person has in mind and works with two reasoning mechanisms: inheritance and inference, due to the fact that it is constructed on the basis of a deep semantic approach which not only displays concepts, but also defines them through a machine-readable metalanguage called COREL (i.e. *Conceptual Representation Language*).

Within each one of the three subontologies, FGKB also distinguishes three categories of

[2] The FGKB Core ontology is deemed as an IS-A conceptual hierarchy which allows non-monotonic multiple inheritance. This ontology is both universal and linguistically-motivated.

concepts organized hierarchically:

(a) Metaconcepts (e.g. #PHYSICAL, #COLLECTION, #EMOTION, #TEMPORAL, etc.), which form the upper level in the taxonomy, as a result of the analysis of the most relevant linguistic ontologies, i.e. DOLCE, SIMPLE, SUMO, etc.

(b) Basic concepts, preceded by symbol +, are used as defining units which enable the construction of MPs for basic concepts and terminals, as well as taking part as selection preferences in TFs: e.g. +BOOK_00, +DIRTY_00, +FORGET_00, etc. They can be employed to define any word in any of the European languages that are claimed to be part of the Ontology. The starting point for the identification of basic concepts was the defining vocabulary in *Longman Dictionary of Contemporary English* (Procter 1978), though deep revision was required in order to perform the cognitive mapping into a single inventory of about 1,300 basic concepts.

(c) Terminal concepts, which are headed by symbol $. Terminals are not hierarchically structured and do not have definitory potential to take part in MPs: e.g. $METEORITE_00, $VARNISH_00, $CADAVEROUS_00, etc.

Basic and terminal concepts in FGKB are provided with semantic properties which are captured by *thematic frames* and *meaning postulates*. Every event in the ontology is assigned one single thematic frame, i.e. a conceptual construct which states the number and type of participants involved in the prototypical cognitive situation portrayed by the event (Periñán-Pascual & Arcas-Túnez, 2007). Moreover, a meaning postulate is a set of one or more logically connected predications (e_1, e_2, … e_n), i.e. conceptual constructs that represent the generic features of concepts. As stated above, the basic concepts are the main building blocks of these types of constructs in the core ontology.

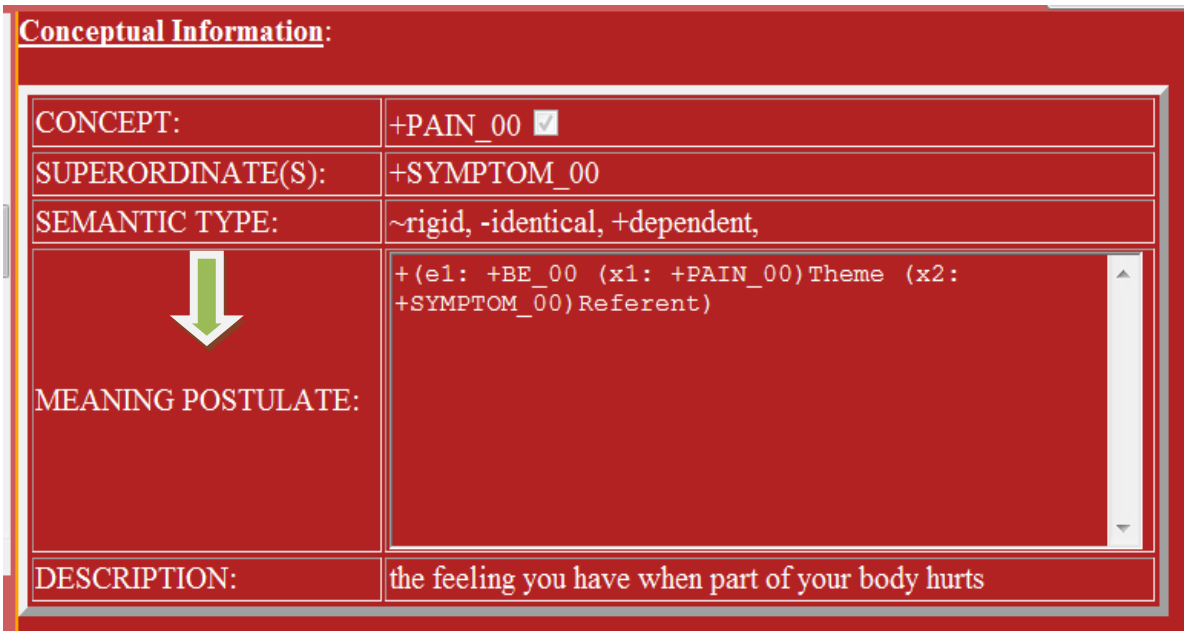

Figure 1. Meaning postulate of +PAIN_00 in FunGramKB

2 The axiological axis in the nominal lexicon

In the Functional Lexematic Model (FLM), Martín-Mingorance (1987), inspired by Coseriu

(1967), introduced the category CLASSEMES, which were defined as general pragmatic, semantic and syntactic determinations in the vocabulary or as a kind of grammar. He proposed some of them for the pragmatic module:

- focus
- speaker`s evaluation
- social norm, etc.
- aesthetic norm.

Faber and Mairal-Usón (1999) proposed four macro-organizational patterns which appear across a wide range of verbal domains: Space; Time; Sociocultural context and Axiological evaluation (positive/negative). The first two patterns basically affect verbs, but the last two are shared by verbs, nouns or adjectives. The axiological pattern basically referred to Krzeszowski`s Lakoffian approach based on a the three-level hierarchy of values (sensory experience, life and health, spiritual level) given by classical axiologists such as Max Scheler or Józef Tischner. However, our proposal of axiological evaluation is based on a series of axes and scales that contribute to outlining the prototypical features characterizing its structure.

The first axis is preconceptual, lexico-genesic and dual, referring to its polar nature:

Positive (+) *vs.* Negative (-)

The second axis refers to the varying degrees of positiveness or negativity that are essential to domains or lexemes:

Maximum-Medium-Low ___ Low-Medium-Maximum

Positivity (+) Neutral (0) Negativity (-)

The third axis proposes a Hierarchy of axiological dimensions at intralinguistic level which are a result of an intensive research on lexicographical sources (Felices-Lago 1997: 188).

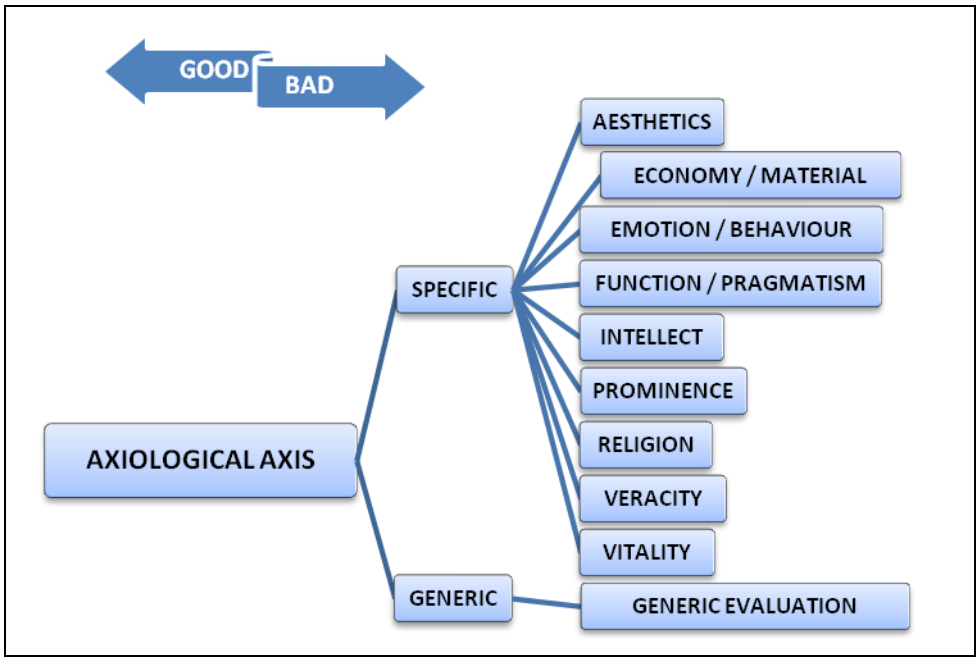

Figure 2. Hierarchy of axiological dimensions at linguistic level

3. Axiological representation and distribution in FGKB core ontology

Velardi et al. (1991) distinguish two well-defined strategies when describing meaning in computational lexicography: i.e. the cognitive content in a lexical unit can be described by means of semantic features or primitives (conceptual meaning), or through associations with other units in the lexicon (relational meaning). The former approach offers a stronger inferential power and guarantees the construction of a robust knowledge base applicable to most NLP tasks, consolidating thus the concept of resource reuse.

In FGKB, the meaning postulate (MP) is conceived as a property of basic concepts and terminals. Periñán-Pascual and Arcas-Túnez (2004) point out that current lexicalist models agree to handle lexical meaning as a cognitive representation reflecting the speakers` shared knowledge about the referent linked to a given linguistic expression. Therefore, when representing one of the meanings of a lexical unit, we are really representing the meaning of a concept. In consequence, an MP is a set of one or more logically connected predications, which are cognitive constructs carrying the generic features of the concept. If we apply a syntactico-semantic description to the participants, then a set of operators allows the machine to recognize well-formed predications.

If we link FGKB and the axiological parameter, in the following lines it will be observed how the axiological features are expanded and distributed throughout a set of semantic/ conceptual instruments (basic and terminal concepts, predications or satellites) and syntactic ones (predication operators such as polarity, quantification operators and logical connectors), in line with the process of stepwise conceptual decomposition characterizing FGKB.

3.1 Syntactic features of MPs: Operators

Quantification Operators:

A participant can be preceded by an operator (α), which applies a specific kind of quantification to the concept expressed as a selection preference.

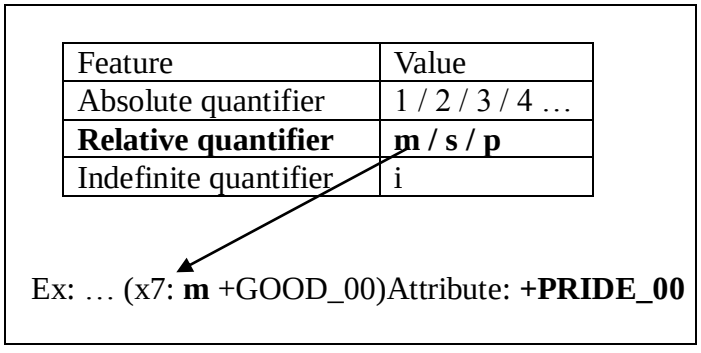

Figure 3. FunGramKB quantification operators

The quantification operators sensitive to axiological concepts are the relative quantifiers, particularly m, as it acts within the gradable semantic dimensions.

Predication operators:

Polarity operator *n* allows negative information to be explicitly stated. It is similar to *neg* in d-Prolog proposed by Nute (2003).

Feature	Value
Aspectuality	ing / pro / egr
Temporality	rpast/npast /pres/nfut/rfut
Epistemic modality	cert / prob / pos
Non-epistemic modality	obl / adv / perm
Polarity	**n**

Ex: +(e2: **n** +BE_01 (x1)Theme (x3: +LEGAL_00)Attribute): **+CRIME_00**

Figure 4. FunGramKB predication operators

3.2 Conceptual features of MPs: Predications and satellites

Only **basic concepts** can be used in Meaning Postulates to define terminal concepts or other basic concepts. A sample of axiologically-loaded basic concepts used in the meaning postulates of relevant units are shown as follows:

+IMPORTANT_00; +BEAUTY_00; +PLEASANT_00; +INTELLIGENCE_00; +WISDOM_00; +COURAGE_00; +CRUELTY_00; +DISLIKE_00; +DESIRE_00; +DESIRE_01; +FEAR_00; +PLEASURE_00; +LIKE_00; +PRIDE_00; +GOOD_00;+SADNESS_00; +SORROW_00; +DIE_00; +GOD_00; +WRONG_00; +FUNNY_00; +STUPID_00; +HAPPY_00; m +BAD_00; +COMFORT_00; +DANGER_00; +DAMAGE_00; +DAMAGE_01, etc.

These defining units that enable the construction of meaning postulates are limited to an inventory of about 1,300 units, which come mostly from defining vocabulary in *Longman Dictionary of Contemporary English*. They can be found in predications or satellites as it can be seen below:

Predications:

… (e5: +BE_01 (x5)Theme (x7: m +GOOD_00)Attribute) Referent: **+PRIDE_00**
*(e3: +BE_01 (x1)Theme (x3: +BEAUTIFUL_00)Attribute): **+FLOWER_00**
+(e2: n +BE_01 (x1)Theme (x3: +LEGAL_00)Attribute): **+ CRIME_00**
(e5: +DISLIKE_00 (x7)Agent (x4)Theme)): **+ DISLIKE_00**

Satellites:

(… (f1: x1)Manner)(e3: +BE_01 (x4)Theme (x5: +BAD_00)Attribute): **+ EVIL_00**
(f2: (e4: +BE_01 (x3)Theme (x7: +GOOD_00)Attribute)): **+HEAVEN_00**
(f1: (e3: +BE_01 (x4)Theme (x5: +DIFFICULT_00)Attribute)): **+PROBLEM_00**
(f1: (e4: +BE_01 (x4)Theme (x8: +HAPPY_00 | +NERVOUS_00) Attrib)): **+DRUG_00**

4 Results and conclusions

For reasons of space we can only offer a sample of the entire analysis carried out in order to assess the impact of the axiological classeme in the FunGramKB core Ontology. The most

relevant features can be summarized as follows:

1. There is no reason to consider #ENTITIES as less sensitive to the axiological parameter than #EVENTS or #QUALITIES, even though only 74 out of 929 #ENTITIES are sensitive to inherent axiological information in their MPs (8%) and are distributed among the two leading metaconcepts like this:

   #ABSTRACT 38;
   #PHYSISCAL 36.

2. +DAMAGE_00 and +DAMAGE_01 are the most recurrent axiologically-loaded basic concepts: 6 times. They are followed by +PLEASANT_00, 4 times, +PLEASURE_00 and also +DISLIKE_00 3 times each. But considering that +PLEASANT_00 and +PLEASURE_00 refer to the same concept (as a quality or as an entity), it can be maintained that the hedonic concept is the most prominent here, as they both account for 7 occurrences.

3. The concepts from the core ontology in the third axis or hierarchy of axiologically-loaded dimensions can be distributed as follows:

   A) GENERIC AXIS -
   PROTOTYPICAL EVALUATIVE CONCEPTS:
   +GOOD_00, m +GOOD_00, m +BAD_00.

   B) SPECIFIC AXIS

   1a) EMOTION/BEHAVIOUR:
   + PLEASANT_00, DESIRE_00, DESIRE_01, FEAR_00, +PLEASURE_00, +LIKE_00, +DISLIKE_00, +SADNESS_00, +SORROW_00, +PRIDE_00, +HAPPY_00, +COMFORT_00, +DANGER_00, +FREE_00, +SAFETY_00, +FAILURE_00, +SAD_00, m +SAD_00, LOVE_00, +NERVOUS

   1b) BEHAVIOUR/EMOTION:
   +COURAGE_00 , CRUELTY_00, +STUPID_00, pos+DAMAGE_00, +DAMAGE_00, +DAMAGE_01, +VIOLENCE_00, FRIGHTEN_00, +PROTECT_00, +FUNNY_00, +DEFENCE_00,+DANGEROUS_00, +DESTRUCTION_00, +IMPROVEMENT_00, +PUNISHMENT_00, +VIOLENCE_00 (+BATTLE_00; +FIGHT_00; +WAR_00), +COMPETITION_00.

   2) VERACITY:
   +WRONG_00; n +BE_01 +LEGAL_00, +LEGAL_00.

   3) VITALITY:
   +DIE_00, +, pos +DIE_00, +SICK_00, +ILL_00, +DEAD_00, +FEVER_00;+PAIN_00, +INJURY_00; +WOUND_00, +EFFORT_00, +SUFFER_00, +DEATH_00, +PROTECTION_00, +SEX_00, +HURT_00, +HARDSHIP_00.

   4) AESTHETICS:
   +BEAUTY_00, +BEAUTIFUL_00.

   5) PROMINENCE:
   +IMPORTANT_00, +VICTORY_00, +SERIOUS_00.

   6) RELIGION:

+GOD_00, +SAINT_00.

7) ECONOMY:
+MONEY_00.

8) INTELLECT:
+INTELLIGENCE_00, +WISDOM_00, +DIFFICULT_00.

4. Examples of axiologically-sensitive entities and their axiologically-loaded predications in meaning postulates. The case of some basic concepts included in +FEELING_00:

#ABSTRACT>> #ATTRIBUTE >> +ATTRIBUTE_00 >> PSYCHOLOGICAL_ ATT_00 >> +FEELING_00:

+DESIRE_00: +(e1: +BE_00 (x1: +DESIRE_00)Theme (x2: +FEELING_00)Referent) *(e2: +FEEL_00 (x3: (e3: +DESIRE_01 (x4: +HUMAN_00)Theme (x5)Referent)) Agent (x4)Theme (x1)Attribute)
+PITY_00: (f1: (e4: +BE_01 (x6)Theme (x7: +SAD_00) Attribute))Result)
+PLEASURE_00: +(e1: +BE_00 (x1: +PLEASURE_00) Theme (x2: +FEELING_00) Referent) *(e2: +FEEL_00 (x3: (e3: +LIKE_00 (x4)Agent (x5: +HUMAN_00) Theme) Agent (x5)Theme x1)Attribute)
$ELATION_00: +(e1: +BE_00 (x1: $ELATION_00)Theme (x2: +PLEASURE_00) Referent)
+SADNESS_00: +(e1: +BE_00 (x1: +SADNESS_00)Theme (x2: +FEELING_00) Referent) *(e2: +FEEL_00 (x3: (e3: +DISLIKE_00 (x4)Agent (x5: +HUMAN_00) Theme))Agent (x5)Theme)

5. Moreover, there are cases of non axiologically-sensitive entities, but axiologically-loaded predications in meaning postulates, as can be seen in this example:

(A) #OBJECT >> #COLLECTION >> +GROUP_00 >>+PEOPLE_00>> +POLICE_00

+POLICE_00: +(e1: +BE_00 (x1: +POLICE_00)Theme (x2: +ORGANIZATION_00) Referent) *(e2: +PROTECT_00 (x1)Theme (x3: +HUMAN_00)Referent) *(e3: +PROTECT_00 (x1)Theme (x4: +CORPUSCULAR_00)Referent)(e4: +HAVE_00 (x3)Theme (x4)Referent))

(B) #OBJECT >> #FEATURE >> +PART_00 >> +PLANT_PART_00 +FLOWER_00

+FLOWER_00: *(e1: +BE_00 (x1: +FLOWER_00)Theme (x2: +PLANT_PART_00) Referent) *(e2: n +LIVE_00 (x1)Theme (f1: +LONG_01)Duration) *****e3: +BE_01 (x1)Theme (x3: +BEAUTIFUL_00)Attribute)

6. In conclusion, the only axiological hierarchy that can be assumed at conceptual level is built into language and depends, for its relevance (positive or negative), on what is perceived by the vast majority of speakers of linguistic communities. The proposal to insert axiological notations in the FGKB ontology, in the lexica under construction or, alternatively, in other levels of meaning description in the Lexical Constructional Model (LCM) should be explored as a key factor for meaning construction.

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