Modeling adjectives in GL: accounting for all adjective classes[1]

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Abstract

Appearing in different positions in the sentence, as a modifier of the noun or as complements of verbs, adjectives, more than any other POS, can take different meanings depending on the linguistic context they occur in. But, despite the different complex phenomena involved in the linguistic behavior of adjectives, most research developed on this POS has focused on very specific phenomena, such as sense change or secondary predication. In this paper we analyze and model adjective classes, identifying their characterizing features and putting forth a proposal for representing them in the lexicon. We discuss adjective representation in GL, delineating modeling strategies to accurately represent all adjective as complex and dynamic objects, showing how lexical representations can account for the relevant syntactic and semantic behavior of these items.

1 Introduction

Despite all the different complex phenomena involved in the linguistic behavior of adjectives, most work developed on this POS has focused on sense change (see Bouillon (1998) and Amaro (2002) for sense change analyses in the Generative Lexicon framework).

In this paper we do not focus on a specific phenomenon involving adjectives, but rather analyze and model this POS as a class, identifying its characterizing features and putting forth a proposal for representing it in the lexicon. In order to achieve this objective, we adopt the GL framework (Pustejovsky, 1991; Pustejovsky, 1995), since this model links the different modules of Grammar in a very intuitive way, allowing for a simultaneously thorough and economic modeling of the data.

We start by presenting a description of the most relevant aspects involved in the linguistic behavior of adjectives, in section 2, identifying several different adjective classes based on the syntactic and semantic contrasts displayed by the lexical items belonging to this POS. Based on the generalizations obtained from the data, in section 3 we discuss adjective representation in GL, delineating modeling strategies to accurately represent all adjective classes in the lexicon as complex and dynamic objects, showing how the lexical representations we propose account for the relevant syntactic and semantic behavior shown by these adjective classes.

2 Adjective classes

There are several possible ways of classifying adjectives in a coherent way: semantic based classifications, syntactic based classifications, classifications regarding the relation holding between the adjective and the modified noun, and so on. However, as our work on this issue progressed, it became clear that only a combination of syntactic and semantic criteria could offer interesting insights concerning adjective linguistic behavior, particularly in the identification of the relevant common features that characterize adjectives.

Considering that "meaning cannot be completely divorced from the structure that carries it" (Pustejovsky, 1995:5), we used structural distinctions, i.e. adjective syntactic behavior, as a starting point for the characterization of this POS. Regarding the way adjectives relate to the noun they modify, we consider two classes: **property ascribing adjectives** (in (1)), which add a restriction to the set of properties denoted by the modified noun; and **non-restricting adjectives** (in (2)), which behave like semantic operators.

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(1) the blue book
'*that is both a book and a blue thing*'

(2) the false diamond
'that is not a diamond but seems like one'

Unlike the larger class of property ascribing adjectives, such as *blue*, that attribute properties to the modified noun, non-restricting adjectives, like *false*, do not deal with the restrictions introduced by the noun, but somehow change the way these restrictions apply to entities in the world to make up the NP referent. These contrasts in adjective-noun combination become apparent in the paraphrases presented underneath **Error! Reference source not found.** and **Error! Reference source not found.**.

Being a larger class, property ascribing adjectives are also less homogeneous. Demonte (1999) identifies subclasses of property ascribing adjectives, proposing a classification based on adjective intrinsic meaning, as well as on a combination of syntactic and semantic criteria. Two subclasses are considered – **descriptive adjectives** and **relational adjectives** –, each displaying specific semantic and syntactic properties (see Mendes (2006) for a detailed discussion on adjective classes).

Besides the syntactical behavior distinguishing these adjective classes, there is a clear contrast in the way they relate to the noun they modify. Descriptive adjectives, on the one hand, ascribe a single property, setting a value for an attribute. Relational adjectives, on the other hand, introduce a relation between the modified noun and a domain exterior to it (a set of properties corresponding to the characteristic features of another noun).

(3) the red dress
(there is an X which is a dress & a red object)
$dress(X) \wedge red(X)$

(4) the alimentary industry
(there is an X which is an industry & has a relation R1 with food)
$industry(X) \wedge R1(X,food)$

Looking at (3) and (4), we see that, while *red* sets the value of the **colour** attribute of *dress* to **red**, *alimentary* does not ascribe a single property, but introduces a relation between *industry* and a set of properties corresponding to the characteristic features of another noun: *food*. In fact, the way adjectives in (3) and (4) relate to the modified noun is quite different. Ascribing a singular property usually corresponds to an incidence relation of this property in the nominal referent, while dealing with sets of properties usually entails more complex and diversified semantic relations.

Ideally, these syntactic and semantic properties would be encoded in lexical models. The SIMPLE project, for instance, addresses the semantics of adjectives, identifying a set of features for classifying and describing adjective behavior. The classes proposed are not homogeneous, however (cf. Peters & Peters (2000)). In the WordNet framework (Miller (1990); Fellbaum (1998)), among other approaches [2], Mendes (2006) delineates a strategy to encode adjectives in lexical-conceptual networks. Her proposal is particularly concerned with the empirical motivation of the modeling strategies used. She mirrors adjectives definitional features[3] in the database, thus allowing for adjective classes to emerge from the network of relations.

Here, we argue that it is possible to enable a principled account of the way the meaning of compound expressions is built, by further specifying information on event and argument structures. We adopt the GL framework, as it straightforwardly links the different modules of Grammar, allowing for a simultaneously thorough and economic modeling of the data.

3 Adjectives in GL

One of the crucial aspects of Pustejovsky's (1995) approach is that it focuses on demonstrating how the syntactic and semantic behavior shown by adjectives can be derived from the semantic information encoded in adjective qualia structures. So, although this author does not thoroughly propose representation strategies for all adjective classes, he provides tools to model adjectives in the lexicon so that their linguistic behavior can be predicted.

In order to develop strategies for representing adjective classes in GL, we first concentrate on the semantic nature of adjectives. Following authors like Parsons (1990)[4], Pustejovsky (1995)

[2] See, for instance, Miller (1998) and Hamp & Feldweg (1997).

[3] A combination of syntactic and semantic features along the lines of those described in this section.

[4] We follow Parsons (1990:192) on this subject, as he supports his argumentation in favour of considering adjectives to contribute with a state to the semantic structure of sentences in which they occur on contexts with adverbial modifiers, which isolate the state introduced by the adjective, hence distinguishing it from the entity introduced by the modified noun.

and Bouillon (1998) we argue that adjectives denote states[5].

Assuming that all descriptive adjectives are state-denoting words, we begin by identifying the distinctive features characterizing adjective subclasses, pursuing a discussion on the role played by adjectives in the construction of NP denotation. Each subsection culminates with a proposal for modeling adjective classes in the lexicon, so that their linguistic behavior is accounted for and predicted from their lexical entries.

3.1 Descriptive adjectives

Following authors like Keenan & Faltz (1980), Chierchia & McConnell-Ginet (1990) and Demonte (1999) we argue that descriptive adjectives combine with the modified noun to produce a new nominal structure which denotes a subset of the extension of that noun. Hence, adjective-noun combination in this case amounts to set intersection. Taking the example in (1), *book* denotes the set of entities in the world that are **books**; *blue* denotes the set of entities in the world that are **blue**; and *blue book* denotes the set of entities in the world that are simultaneously **books** and **blue**, i.e. all entities that are in the intersection of the first two sets.

Ascribing a single property to the noun they modify, by setting an attribute associated to this noun to a given value, most descriptive adjectives do not modify nouns as a whole, but rather take a single aspect of its meaning and modify it. This single aspect is determined by the adjective selection restrictions and either corresponds to an object of a given semantic type – see *round* – or to a certain meaning component, a particular qualia role – cf. *good*.

The AVM below represents the lexical entry of *round*. The state denoted by the adjective is encoded in the Event Structure (EVENTSTR) and specified in the Qualia Structure (QUALIA). With regard to the selection restrictions imposed by the adjective, these are encoded in the Argument Structure (ARGSTR): as *round* characterizes an entity with regard to its **shape**, and only physical entities have **shape**, we argue that *round* selects a physical entity as its internal argument.

$$\begin{bmatrix} \textbf{round} \\ \text{EVENTSTR} = [\text{E1} = \textbf{e1 : state}] \\ \text{ARGSTR} = \begin{bmatrix} \text{ARG1} = \begin{bmatrix} \textbf{...} \\ \text{QUALIA} = [\text{FORMAL} = \textbf{x : physical entity}] \\ \textbf{...} \end{bmatrix} \end{bmatrix} \\ \text{QUALIA} = [\text{FORMAL} = \textbf{round\_shape(e1, x)}] \end{bmatrix}$$

Let us consider now the example of *good*, illustrated in (5). Saint-Dizier (1998) analyses the French adjective *bon* (good) in GL, identifying and representing 5 different senses. However, his analysis fails to account for two simple intuitions: the meaning of *bon* (good) does not show significant changes across the 5 senses proposed; and the differences identified derive from the semantic content of the modified noun. In fact, this author states that "*bon* can be combined with almost any noun in French, and […] would need as many different readings as there are functions for objects" (Saint-Dizier, 1998: 2).

(5) a. a good knife.
= a knife that cuts well
b. a good teacher.
= a teacher that teaches well

Data in (5) make apparent that *good* modifies the function of the noun: the **cutting event** in (5)a and the **teaching event** in (5)b. The modeling tools available in GL allow us to straightforwardly represent this information in the lexical entry of *good*: if we consider that *good* selects for the telic role (TELIC) of the nouns it modifies, we can put forth a single underspecified representation, covering all the possible meanings.

$$\begin{bmatrix} \textbf{good} \\ \text{EVENTSTR} = [\text{E1} = \textbf{e1 : state}] \\ \text{ARGSTR} = \begin{bmatrix} \text{ARG1} = \begin{bmatrix} \textbf{...} \\ \text{QUALIA} = [\text{TELIC} = \textbf{e2}] \\ \textbf{...} \end{bmatrix} \end{bmatrix} \\ \text{QUALIA} = [\text{FORMAL} = \textbf{positive evaluation(e1, e2)}] \end{bmatrix}$$

Assuming this is the lexical entry for *good*, if we combine it with a noun like *knife*, the unification of the telic role of the noun with the second argument of the **positive evaluation** introduced by the adjective becomes apparent, this way explaining the reading of *good knife* as *a knife that cuts well*.

Finally, although adjectives often contribute to the construction of NP denotation by set intersection, that is not always the case.

(6) a. This animal is a small elephant.
b. This animal is small for an elephant.
c. This animal, that is not small, is a small elephant.

[5] Bouillon (*op. cit.*) claims that there are some exceptions: adjectives like *fast* do not denote states, but events. We will not discuss her approach in detail in this paper, for space limitations. However, the inexistence of relevant contrasts between most descriptive adjectives and adjectives like *fast* is apparent. Thus, we argue that all adjectives are the same type of semantic objects, i.e. states.

(6) shows that the denotation of the NP can depend, not only on the combination of the denotation of the modified noun with the property introduced by the adjective, but also on a comparison class. In her analysis of adjective readings, Demonte (1999) distinguishes absolute and relative adjective readings describing them as follows: in absolute readings there is no relation between the property denoted by the adjective and the group of objects that show that property (the modified noun); contrastively, in relative readings the property denoted by the adjective can only be interpreted in relation to the class of objects to which the modified noun belongs. Kamp & Partee (1995) formalize these contrasts in a set theory framework, determining that, in the case of absolute adjectives, NP denotation is calculated by set intersection (as illustrated in (7)a), while in the case of relative adjectives this is done by subsetting (cf. (7)b). As the latter somehow determine a section of the denotation of the modified noun, they have been designated as **subsective adjectives** in the literature.

(7) a. [green elephant] = [green] ∩ [elephant]
b. [small elephant] = [small elephant] ⊂ [elephant]

But how can we represent this difference in adjective semantics in the lexicon? Our proposal consists on modeling comparison class relativity in GL, introducing this information – which in Wheeler (1972) and Higginbotham (1985) was formalized in terms of a second argument in the adjective semantic representation[6] – in the constitutive role (CONST) of the adjective qualia structure. The motivation for representing the comparison class as a value of the constitutive role (CONST) consists on the fact that this information is part of the adjective meaning (see Pustejovsky 1995: 85), but not directly related to the property ascribed by it, represented in the formal role (FORMAL). It is nonetheless reflected in the number of arguments of the predicate encoded in the formal role (FORMAL). In our example, *small* ascribes a **reduced dimension** to the modified noun, but requires, as part of its semantic content, the definition of a comparison standard in order to be interpreted. This modeling strategy allows us to represent descriptive adjectives in a homogeneous way, preserving existing contrasts between subsective adjectives and other descriptive adjectives, made apparent both in the comparison standard encoded in the constitutive role (CONST) of the former and in the extra argument of the predicate denoted by it (see FORMAL).

$$\begin{bmatrix} \textbf{subsective adjective} \\ \text{EVENTSTR} = [\text{E1} = \textbf{e1 : state}] \\ \text{ARGSTR} = [\boxed{1}\ [\text{ARG1} = \textbf{x}]] \\ \text{QUALIA} = \begin{bmatrix} \text{CONST} = \textbf{relative to a class}(\textbf{e1}, \boxed{1}) \\ \text{FORMAL} = \textbf{adjective content}(\textbf{e1}, \textbf{x}, \boxed{1}) \end{bmatrix} \end{bmatrix}$$

This modeling strategy, formalized in the schematic template presented above, not only encodes relativity to a comparison class as one of the 'components' of adjective semantics, but it also establishes a link between the modified noun (the adjective internal argument) and the determination of the relevant comparison class in each context. This mutual dependence between the comparison class and the semantic type of the adjective internal argument is expressed in GL by the unification of their values, represented by $\boxed{1}$ in the AVM above. This way, the comparison class is always determined by the semantic type of the argument modified by the adjective, independently from it corresponding to the semantic type of the modified noun or to the semantic type of one of the 'meaning components' represented in its qualia structure. In order to illustrate our proposal let us go back to our example in (6) and look at the GL representation of the adjective *small*.

$$\begin{bmatrix} \textbf{small} \\ \text{EVENTSTR} = [\text{E1} = \textbf{e1 : state}] \\ \text{ARGSTR} = [\boxed{1}\ [\text{ARG1} = \textbf{x : physical entity}]] \\ \text{QUALIA} = \begin{bmatrix} \text{CONST} = \textbf{relative to a class}(\textbf{e1}, \boxed{1}) \\ \text{FORMAL} = \textbf{reduced dimension}(\textbf{e1}, \textbf{x}, \boxed{1}) \end{bmatrix} \end{bmatrix}$$

Since the comparison class is always determined by the semantic type of the argument modified by the adjective, if the adjective argument is instantiated by the noun *elephant*, as in (6)a, the comparison class will also be set to that same class of objects. So *small elephant* will denote the set of elephants that have a reduced dimension for an elephant.

[6] In order to account for this comparison class, Higginbotham (1985) develops an analysis in a configurational framework in which subsective adjectives have an extra argument that has to be saturated by the intension of the modified noun.

3.2 Relational adjectives

In section 3.1 we put forth empirically motivated strategies for modeling descriptive adjectives in GL, namely their ability to modify a single aspect of noun meaning rather than modifying nouns as a whole. Although relational adjectives are also property ascribing adjectives, they do not ascribe single properties. Like nouns, relational adjectives are associated to more complex qualities and usually entail more complex and diversified semantic relations between the set of properties they are associated with and the modified noun.

As pointed out by Bouillon (1998: 87), Pustejovsky's (1995) approach to adjective modeling in GL does not consider relational adjectives. In fact, English tends to use a different strategy to express the kind of content associated to relational adjectives: noun-noun modification. This contributes to a less salient role played by relational adjectives in English, when compared to Romance languages like French or Portuguese, and is surely not independent from Pustejovsky's reasons for leaving relational adjectives out of his analysis.

As made apparent in Mendes (2006), relational adjectives are considerably underspecified and all we can state in the lexicon to describe their semantic contribution is that they establish a relation between the modified noun and a set of properties that generally correspond to the denotation of another noun.

GL being a system of attribute-value matrixes, in which the value of any attribute can be another AVM, allows us to assume that certain values in the Qualia Structure of lexical items be complex values. We argue this to be the case of relational adjectives. Hence, we propose the following schematic template for representing relational adjectives in GL.

$$\begin{bmatrix} \textbf{relational adjective} \\ \text{EVENTSTR} = [\text{E1} = \textbf{e1 : state}] \\ \text{ARGSTR} = [\text{ARG1} = \textbf{x}] \\ \text{QUALIA} = \begin{bmatrix} \text{FORMAL} = \textbf{relates to}(\textbf{e1, x,} \begin{bmatrix} \textbf{noun} \\ \text{ARGSTR} = [\text{ARG1} = \textbf{y}] \\ \text{QUALIA} = \begin{bmatrix} \text{FORMAL} = \textbf{y : semantic type} \\ \text{CONST} = (\textbf{has\_part(y, k)}) \\ \text{TELIC} = \textbf{event1}(\textbf{e2, m, y}) \\ \text{AGENT} = \textbf{event2}(\textbf{e3, n, y}) \end{bmatrix} \end{bmatrix}) \end{bmatrix} \end{bmatrix}$$

As was the case with descriptive adjectives, we assume relational adjectives to denote a state that is then described in the Qualia Structure (QUALIA), where the contrast between descriptive adjectives and relational adjectives is made apparent. We argue relational adjectives denote an underspecified relation between the modified noun and a set of properties. More precisely, it is as if relational adjectives were relating two independent sets of properties: the set of properties characterizing the domain associated to each single adjective and the set of properties making up the denotation of the modified noun. Hence, the crucial aspect for an accurate characterization of relational adjectives amounts to their association to complex values, rather than simple properties. This is encoded in the formal role (FORMAL) of the adjective Qualia Structure, the set of properties introduced by the adjective being encoded as the third argument of the relation denoted by these adjectives. In order to illustrate our proposal, this way making it clearer, below we present the representation of adjective *marine*, where this semantic link with the noun **sea** is made apparent.

$$\begin{bmatrix} \textbf{marine} \\ \text{EVENTSTR} = [\text{E1} = \textbf{e1 : state}] \\ \text{ARGSTR} = [\text{ARG1} = \textbf{x}] \\ \text{QUALIA} = \begin{bmatrix} \text{FORMAL} = \textbf{relates to}(\textbf{e1, x,} \begin{bmatrix} \textbf{sea} \\ \text{ARGSTR} = [\text{ARG1} = \textbf{y : physical entity}] \\ \text{QUALIA} = [\text{CONST} = (\textbf{has\_part(y, water); has\_part(y, salt)})] \end{bmatrix}) \end{bmatrix} \end{bmatrix}$$

3.3 Non-restricting adjectives

Non-restricting adjectives are considerably different from the former adjective classes. These constitute a closed class, made up of a relatively small number of adjectives showing very specific properties, particularly in what concerns adjective-noun combination. The semantic nature of lexical items belonging to this class is so distinct from that of adjectives from the larger class of property ascribing adjectives that Kamp (1975) leaves them out of his "theory" of adjective meaning.

In the case of non-restricting adjectives, adjective-noun combination amounts to an operation which apparently changes the denotation of the modified noun. Thus, contrarily to what happens with property ascribing adjectives, adjective-noun combination in this case does not amount to set intersection, subsetting or establishing a relation between the modified noun and a domain that is exterior to it. Going back to our example in (2), *diamond* denotes the set of entities in the world that are **diamonds**; but *false diamond* does not denote any subset of the set denoted by *diamond*: it denotes a set that does not share a single element with it, the set of entities that are not diamonds, but share some of its properties, such as glitter or color, for instance. Hence, interpreting non-restricting adjectives as semantic functions that map the extension of the modified noun onto a new extension that does not have to be related to the original one in terms of set inclusion seems to be an accurate approach for characterizing this class[7].

Moreover, the semantic contribution of non-restricting adjectives can be expressed in terms of modality values, such as *possibility* or *necessity* of a certain state of affairs, or *exclusivity* or *exhaustivity* of a reference.

intension modifying adjectives	***modality***	***notation***
possible alleged	possibility	$\Diamond$
so-called supposed	contingency	$\neg \Box \wedge \Diamond$
false	negation	$\neg$
true	affirmation	$\neg \neg$
same	identity	=

[7] Demonte (1999) describes the role played by these adjectives as indicating "the way a concept or intension of a term applies to a certain referent" (Demonte, 1990:139).

In fact, as made apparent in the table above, it is possible to define the modal contribution of each non-restricting adjective, i.e. the value that will specify the particular semantic contribution it makes.

In order to mirror the semantic contribution made by non-restricting adjectives in the lexicon, we propose a strategy along the lines of Pustejovsky's (1995:222) representation of co-composition phenomena in causative verbs[8]. We propose that these adjectives embed the modified noun, more precisely some aspects of its meaning, into a modal context. Being so, we formulate the semantic contribution of non-restricting adjectives to modally embed the relevant expression from the semantics of the modified noun, as presented in the schematic template below.

$$\begin{bmatrix} \textbf{non-restricting adjective} \\ \text{ARGSTR} = \left[\text{ARG}_1 = \left[\text{FORMAL} = \boxed{1}\right]\right] \\ \text{QUALIA} = \left[\text{FORMAL} = f_1(\boxed{1}) = \textbf{semantic\_operator}\ \boxed{1}\right] \end{bmatrix}$$

This representation, as well as the one representing the NP *the alleged murderer* bellow, makes the distinct semantic nature of non-restricting adjectives apparent: these adjectives are functions which operate at the level of the internal structure of the noun, indicating the way the restrictions denoted by the modified noun apply to the referent. This is expressed in the representation we propose. Let us go through the example below in order to make our proposal clearer. In accordance with the schematic template argued to provide an accurate representation of non-restricting adjectives in the lexicon and its specific semantic contribution formalized in the table above, *alleged* determines a function which embeds into a modal context the 'meaning component' of the modified noun that distinguishes it within a larger domain (encoded in the formal role (FORMAL) of the Qualia Structure of the noun), stating that it is not necessary, though possible, that the referent denoted by the NP *o alleged murderer* belongs to the set of **murderers**.

[8] According to this author, in some constructions with causative verbs certain aspects of the semantic description of the complement are shared with the main predicate in a modally subordinate way. To represent this, Pustejovsky (*op. cit.*) embeds the relevant semantic aspects into a modal context within the formal role of the main predicate, hence deriving the appropriate reading.

$$\begin{bmatrix} \textbf{the alleged murderer} \\ \text{ARGSTR} = \begin{bmatrix} \text{ARG}_1 = \begin{bmatrix} \text{ARGSTR} = [\text{ARG}_1 = \mathbf{x} : human] \\ \text{QUALIA} = [\text{FORMAL} = \boxed{1}\, murderer(x)] \end{bmatrix} \end{bmatrix} \\ \text{QUALIA} = [\text{FORMAL} = f_1(\boxed{1}) = \neg(\Box\boxed{1}) \wedge \Diamond\boxed{1}] \end{bmatrix}$$

Assuming this allows us to model the following crucial aspects of non-restricting adjectives:

- their semantic nature: these are semantic operators, thus being associated to functions rather than to properties (see adjective formal role (FORMAL));
- their semantic contribution, which is formulated in terms of the modal embedding of the relevant meaning components of the modified noun (in our example, *alleged* places the value of the formal role (FORMAL) of the modified noun under the scope of negation ($\neg$), necessity ($\Box$) and possibility ($\Diamond$) operators).

Thus, we can straightforwardly encode non-restricting adjectives in the lexicon by replacing **semantic_operator** in the schematic template presented above with a more specific value, as formalized in the table above, which presents an illustrative set of non-restricting adjectives.

4 Final remarks

In this paper we establish modelling strategies for representing all adjective classes in GL, mirroring their specific distinguishing features in the lexicon and conforming to the contrasts displayed by the data. We adopted the Generative Lexicon framework, as this model of the lexicon links the different modules of Grammar in a very intuitive way, allowing for a simultaneously thorough and economic modeling of the data, particularly in order to enable a principled account of the different ways the meaning of compound expressions is built.

Putting the analyses available in the literature in parallel with the properties displayed by different adjectives, we showed how some adjective classes, particularly relational and non-restricting adjectives, call for alternative representation strategies. Designing such alternative modelling strategies resulted in the unified treatment of all adjective classes.

We started off with descriptive adjectives, which constitute the most representative adjective class and, thus, have been the most explored in the literature. Our main contribution with regard to this adjective class amounts to an integrated approach to descriptive adjectives, resulting from the thorough and empirically motivated discussion of several existing – though often partial – analyses of this adjective class. This integrated approach allowed us to arrive at a homogeneous representation for this adjective class:

- all descriptive adjectives were shown to be state-denoting lexical items, thus sharing a common semantic nature;
- descriptive adjectives have a stable meaning:

  - they modify a single aspect of noun meaning rather than nouns as a whole (cf. selection restrictions);

  - sense change in context results from combining this core meaning with the meaning of the lexical material they co-occur with, according to well-defined generative mechanisms (Selective Binding);

- contrasts in the way descriptive adjectives contribute to NP denotation are mirrored in lexical entries: subsective adjectives – characterized by entailing non-intersective readings – are accounted for in terms of relativity to a comparison class.

Pursuing the research on property ascribing adjectives, we went on to designing modelling strategies for representing relational adjectives, which are not considered in Pustejovsky's (1995) discussion of adjectives in GL. Our approach is based on these adjectives denoting complex qualities and entailing diversified semantic relations, rather than ascribing single properties. Given these characterizing features, we claim that members of this adjective class make underspecified semantic contributions:

- they establish a link between the modified noun and a domain that is exterior to it;
- we represent this in GL by stating that these adjectives denote a relation between the modified noun and a set of properties roughly corresponding to the denotation of another noun;
- we encode this in the formal role of the adjective as follows:

FORMAL = **relates to(e_1,modified_noun,domain_AVM)**

Finally, we focused on non-restricting adjectives, which do not denote properties and whose behavior is acknowledged to be closer to semantic operators than to more 'typical' adjectives. Left out of many analyses and theories – GL not

being an exception –, we also designed modeling strategies for representing non-restricting adjectives in the lexicon from scratch.

We treat non-restricting adjectives as functions that map the extension of the modified noun onto a new extension, which does not have to be related to the original one in terms of set inclusion. Concerning the modeling approach used with these adjectives:

- we express the semantic contribution of non-restricting adjectives in terms of modality values;
- we claim that non-restricting adjectives embed some meaning components of the modified noun into a modal context as follows:

$$\text{FORMAL} = f_1(\boxed{1}) = \textbf{semantic\_operator}\ \boxed{1}$$

- assuming this analysis, we only have to define the modal contribution made by each non-restricting adjective in order to accurately represent them in the lexicon (cf. table presented in section 3.3).

Moreover, we make apparent that putting a small set of economic generative mechanisms to work – unification, underspecification and information sharing between structures – allows us to account for complex linguistic phenomena such as relativity to a comparison class; selection restrictions; construction of meaning in context; and sense change.

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