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On *Something Similar*

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The use of expressions *something similar/something like that/and the like* is a pervasive feature of spoken natural language, and thus must be accounted for if we hope to develop a semantic account of dialogue. These expressions exhibit an anaphoric type dependency, but at the semantic-pragmatic level rather than the syntactic level. The meaning of these utterances depends upon the context of utterance: if the meaning of the utterance is regarded as fixed, then utterances which intuitively are coherent receive incoherent interpretations. To model what happens with utterances containing these phrases, we require both a formal theory of discourse structure, and accessibility to the lexicon.

1. Introduction

In this paper, we will be concerned with the expression *something similar*. On the one hand, the use of this expression is justified by a number of Gricean Maxims: they make the utterance much briefer than it would be if the speaker was completely explicit (compare (1a) and (1b), below), and occasionally make it more likely that the expression is true. On the other hand, this expression would seem to violate the Gricean Maxims of Manner

“Avoid obscurity and ambiguity”, since it seems to make an utterance more vague, but in fact, we have strong intuitions as to what counts as “something similar” in different contexts¹. And so, if asked, we can provide fairly solid judgements about which objects count as similar in a particular context. So for instance, (1c) is not a potential gloss for (1a) in the way that (1b) is.²

- (1) a. If it rains, you need an umbrella or something similar.
 b. If it rains, you need an umbrella or a raincoat or a poncho or...
 c. #If it rains, you need an umbrella or a typewriter or a sprig of parsley or...

The interpretation of *something similar* involves an implicit comparison between two or more elements, and its interpretation is only possible because of the presence of an expression implicitly or explicitly mentioned earlier in the discourse. Unlike in the case of a pronoun, the treatment of this expression cannot be done with a mere coindexing and counterindexing at some level of logical form, as might be hoped with the related phrases the *same/something else*. That is, a syntactic approach to the treatment of the *same/something else*, illustrated in (2a) or (2b) below, cannot be simply extended to treat the phrase *something similar*; thus the absurdity of the indexing in (2c)³:

- (2) a. M. ate [cake]_i, and J. ate [the same]_i
 b. M. ate [cake]_i, and J. ate [something else]_{j≠i}
 c. M. ate [cake]_i, and J. ate [something similar]_{j≈i}

A mere counter-indexing will not work in cases such as (2c), since there are restrictions upon which types of things x_j might be. These restrictions

¹ Not in the sense that any two people would choose the same referent, but in the sense that any two people should acknowledge the appropriateness of each other’s choice.

² Here and henceforth we will use # not to indicate syntactic deviance, but rather pragmatic infelicity.

³ For illustrative purposes, we use \approx to denote similarity.

are not just based on the pragmatic restrictions as to what is edible. The quasi-indexing “ $j \approx x$ ” employed in (2c) does not capture anything meaningful about our intuitions as to what constitutes similarity in a particular context. It is not the indices which are similar, but the objects referred to by the expressions. Furthermore, the interpretation of something similar might be context independent (3a,b) or context-dependent (3c):

- (3) I’m looking for a piano or *something similar*
- a. I need to practice scales at home
 - b. I want to play some music with my friends c
 - c. I would like to furnish an empty corner in my living room

Without needing to ask, we naturally could assemble the following sets that we might tentatively call COMPARISON CLASSES⁴

(3a) = {organ, clavichord, harpsichord...}

(3b) = {trumpet, guitar, violin, tuba...}

(3c) = {sofa, dresser, shelf,...}

The question is: how do we get these classes? If we associate a different feature to the contexts in (3), we might distinguish three types of similarity claims, namely CONSTITUTIVE SIMILARITY (3a), CATEGORICAL (FORMAL) similarity (3b), and FUNCTIONAL SIMILARITY (3c). The first two are closely related in that both sets are constructed by taking a specific property P from the lexicon. This statement calls for a lexical approach of the phenomenon. By contrast, the latter needs some amount of world-knowledge and pragmatic capacities, and consequently, justifies a discourse approach. Accordingly, *something similar* in (1a,b) is context-independent and any alternative in the comparison class might be stated as a true/false statement. For the contexts as (3c), the truth or falsity of the

⁴ This term is used as “standard of comparison” in some theories of vagueness in order to apply a property to an entity when gradable adjectives are used.

proposition containing any expression referring to an entity similar to the object to be compared is not at issue, and the result of the COMPARISON CLASS is strongly dependent of the context of the utterance involving *something similar*.

2. Similarity: general remarks

2.1 Similarity in cognition

What makes two objects similar is crucially relevant in cognitive psychology, in models of memory, or in learning and recognition tasks, and as epitomized by Tversky (Tversky, 1977, p. 327): “Indeed, the concept of similarity is ubiquitous in psychological theory”. According to (Gentner & Medina, 1998) it is via similarity comparisons between concrete objects that the child is led to make abstract rule-like generalizations. An important issue is then the relation between categorization or the structure of our concepts and similarity.

Experimental psychology suggests that two objects (two stimuli) can be deemed similar, if they either share a certain number of features (attributional similarity), or if a relation can be established between them (relational similarity), in which case the common feature is a relational one (Gentner, 1983; Gentner, 1989; Goldstone et al., 1991).

Obviously, the most natural modelling of similarity is the geometrical model in which objects are represented as points (a, b, c, \dots) in a mental coordinate space, with the measure of the distance of two points a and b $\delta(a, b)$ and a mapping $\delta(a, b) \rightarrow \mathbb{R}^+$: the smaller the distance between two points $\delta(a, b)$, the more similar the objects they represent are.

However, Tversky (1977) shows that the axioms on which these models rely namely:

- Minimality defined as $\delta(a, b) > \delta(a, a)$: the similarity between an object and itself is constant and $\delta(a, a) = 0$
- Symmetry defined as $\delta(a, b) = \delta(b, a)$
- Triangle inequality: $\delta(a, b) + \delta(b, c) > \delta(a, c)$ ⁵

are inadequate. Consequently he is led to define the similarity between two objects a and b as a ternary function f , whose arguments are respectively the set of features common to a and b , $\{A \cap B\}$, the set of features that belong to a but not to b , $\{A - B\}$, and the set of features that belong to b but not to a , $\{B - A\}$:

Tversky's definition of similarity:

$$s(a,b) = f(\{A \cap B\}, \{A - B\}, \{B - A\})$$

Then a similarity scale s between these objects can be defined as:

$$(4) \quad S(a,b) = \theta f(\{A \cap B\}) - \alpha f(\{A - B\}) - \beta f(\{B - A\}) \text{ for some } \theta, \alpha, \beta, > 0$$

in which θ, α, β are weighting parameters depending on the task to be performed and on the stimuli. $S(ab)$ is then the combination of the measures of the common and of the distinctive features of a and b . In this modelling, similarity then is no longer a metric but is related to the number of features common to the objects compared.

2.2 Similarity: A motivation of our approach

Although Tversky's approach of similarity solves most problems geometrical approaches could not solve and was corroborated by numerous experiments, Goldstone et al. (1991) show that some counter-examples can be found that contradict some of the axioms Tversky's model is based on. More crucially, the main problem with Tversky's model is that it is based on the assumption that the similarity relation is monotonic, monotonicity being defined here as:

Monotonicity:

$$s(a,b) > s(a,c) \text{ whenever}$$

⁵ This inequality results from the property of triangles: in any triangle, the measure of each side is smaller than the sum of the other two sides and greater than their difference. Only the first part of this property is used here then.

1. $\{A \cap C\} \subset \{A \cap B\}$,
2. $\{A - B\} \subset \{A - C\}$,
3. $\{B - A\} \subset \{C - A\}$

The problem is that a monotonic relation of similarity here is too weak and inadequate as it rules out the possibility of inferences being defeased as the context develops. What we need is to interpret every element of a sentence in the context it appears in, but also account for the way each element adds to this context. Hence the use of a dynamic discourse approach like SDRT and nonmonotonic reasoning.

Second, considering words as feature clusters leads to a taxonomic and static view of the lexicon which cannot account for the fact that words can have different meanings depending on the context. Adjectives for instance, take on different meanings depending on the nature of the head they modify, witness the various senses of *fast* in a *fast typist*, a *fast motorway*, a *fast lane* or a *fast algorithm*. As Jackendoff (1983, p. 71) puts it, “goodness in a knife is different from goodness in a nurse, and a big mouse is smaller than a small elephant”. What is needed then is a representational language that is specified enough to capture the core meaning of a word, with a rich internal structure and specific operations to account for the polymorphism of words. This is why we want to use a Generative Lexicon (GL) (Pustejovsky, 1995). Even if there is a close interaction between semantics and pragmatics, we consider that a clear divide must be maintained between the two domains. One way to put these domains together for the treatment of the expression *something similar* is to assume that the former might determine whether an instance belongs to a fixed category (i.e. the lexical meaning of the word referring to an object). The latter will give us a clue about which contextual factors are at issue for interpreting an instance as being a member of a class of objects according to their functionality.

2.3 Remarks on functional similarity

What we call *functional similarity* is not a real similarity claim, but rather a linguistic tool used by the speakers whose purpose is to draw attention

to a possible contextually appropriate COMPARISON CLASS. A set acknowledged as constructed with objects whose functionality is as good as a mentioned related object regarding the functionality in a given context. A true functionality claim is one for which a description might be located in the lexicon. Importantly, this distinction makes a connection between functionality *per se* (5a), and functionality in evaluated contexts (5b):

- (5) a. An abacus is a calculating device. Mine is lost now, but I need something similar for my trip to the market
- b. My abacus was a lovely paper-weight. Mine is lost now, but I need something similar for my desk at the office.

In discourse (5a), we can reasonably assign the feature *calculating* to the lexical entry for abacus. The fact that this information also occurs in the discourse context makes it possible for someone who had never heard of an abacus before to correctly understand the phrase *something similar* in (5a). In (5b), there is no reasonable way we can assign hold-down-paper to any part of the lexical entry of ‘abacus’⁶. Any object heavy enough to hold down paper and light enough not to crush a desk is a candidate for the distinctive feature hold-down-paper. By preferring this characteristic (and also the feature of aesthetic adequacy), we correctly get the interpretation of something similar in (5b) to be a member of the set {sea shell, rock, brass statuette,...}. This kind of examples brings to light the philosophical notion of “family resemblance” (Wittgenstein, 1953; Goodman, 1951; Goodman, 1972), “imperfect community difficulty”. Roughly speaking, the problem is that similarity is not a transitive relation, and even though we might say that two objects, *a* and *b* are similar in the same respect, feature or property, we can assert that *a* is similar to *b*, that *b* is similar to *c*, etc. but perhaps we cannot affirm that *a* is similar to *c*. Finally, we could construct a similarity class with objects that are not similar in the same respect. The reasoning behind these discourses reflects that, in contexts like (5b), any object *x*

⁶ We could do it anyway, but as was hinted at above that would open the door to all sorts of information about objects becoming part of the lexicon. Instead, the solution might be to use world knowledge to supplement the semantic issues.

belonging to the comparison class, might be used as having a similar function F as the object which serves as reference in a specific context. However, this does not entail that it is true that there is similarity between both entities. This fact is illustrated by the following invalid entailment:

- (6) P₁. A sea shell is functionally similar to an abacus (in context C)
 P₂. An abacus is a calculating device
-
- C. #So: a sea shell is a calculating device too

However, we should accept the entailment when x has a real similar function as the reference object (for instance, “The magic remote control provides a *similar function* as a mouse controlling a PC” or “A gun has a *similar function* as a rifle”). The COMPARISON CLASS is thus created with the intention that some of the entities proposed might stand-in (or act as a substitute for) the object referred to in the discourse context (i.e. an abacus). In such occasions, the proposed set is a way to help an agent to achieve his goals⁷.

3. Background assumptions

As suggested by McCawley (1970), “similar” is restricted by clauses of the form *in that S*. McCawley (1970) made some observations on the transitive and intransitive uses of *similar* with respect to clauses of the form *in that S*. One of them is that “I conjecture that “similarity” is a shared property which the speaker assumes will generally be accompanied by shared properties beyond the ones that trivially follow from the given one” (McCawley, 1970, p. 557). That was one of the criticism that Goodman

⁷ This might be seen as closely related to adjectives modified by *enough*. Bierwisch (1989, p. 94) points out that dimensional adjectives (*long, short, old, young*) modified by *enough* involve both a certain desired value and a norm with regard to C (the average property with respect to C or for Cs). That is, x is Adj *enough* for this purpose. Analogously, in constructions like (3c or 5b), in saying that something is similar to a piano, the speaker suggests that an object x is similar *enough* for a specific purpose in a given occasion, but without asserting that x has been created for it.

addressed to Carnap's system (Carnap, 1969):

Similarity is, of course, similarity in *some respect* or *other*; if two things are similar they are similar in some 'respect' -i.e, they have a common quality. When however, we say that more than two things are all similar in one respect we are in effect saying not only that each two are similar but also that some "respect" in which any two are similar is the same as that in which any other two are similar. (Goodman, 1951, p. 108; emphasis is ours)⁸

- (7) a. Max and Fred are similar
 b. Max is similar to Fred
 c. Max and Fred are similar [in that [_s they both admire LW]]

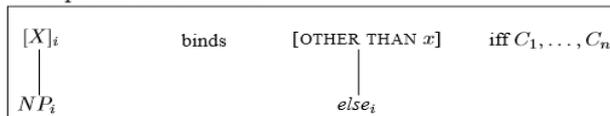
For Culicover and Jackendoff, the anaphoric properties of the expressions *X else* are encoded by means of an implicit anaphor α hidden in the lexical conceptual structure of *else*.

Culicover and Jackendoff (1995; 2005) argue that binding (the assignment of reference to a semi-referential element) is regulated not at any syntactic level, but at the level of Conceptual Structure (cs), which precedes syntax in the derivation of a sentence. The argumentation builds on the assumption that expressions like *something else* contain a hidden variable element α (such that else other than α) which is interpreted like other semi-referential elements, i.e. through binding. Unlike Culicover and Jackendoff (1995; 2005), who locate the covert anaphoric element exclusively within the else part⁹:

⁸ The same claim is found in Loux (1978, p. 47): "the alleged incompleteness of resemblance-claims. . . sentences of the form "a resembles b" are always incomplete. . . If we are to complete their sense we have to indicate the respect in which the resembling objects are alike". And recently, Peacock (2009) and MacBride (2002) claim that there is not incompatibility by asserting that objects may be the same yet different, since the respect in which we say two objects are the same is not the respect in which we say they are different.

(8)

Conceptual Structure:



(9)

a. Peter ate an apple and Mary ate something $else_{j \neq i}$ b. [...] Mary ate something other than α

Applying these assumptions we will analyze *something similar* as having a hidden anaphor at the level of logical form (in (10c) we leave aside the representation of the intensional verb¹⁰).

(10)

a. I'm looking for a piano or *something similar*b. [...] a piano_{*i*} or something similar to α_i [$\alpha_i = \text{piano}$]c. $\exists x \text{ similar}(x, \lambda y. \text{piano}(y))$

This is closely related to comparative constructions involving gradable predicates:

(11)

a. (I've met) someone taller than me

b. $\exists x \text{ taller}(x, \text{me})$

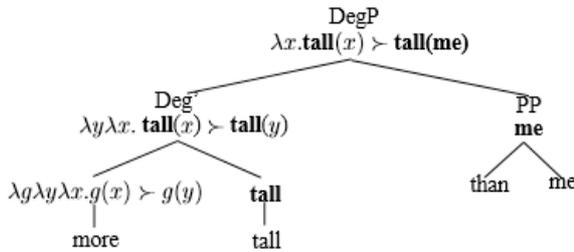
According to Kennedy (1999; 2007), gradable predicates denote measure functions; that is, functions from individuals to degrees:

(12) $[[\text{DEG } pos]] = \lambda g \lambda x. g(x) > d_s$

⁹ Isac and Reiss (2004) propose that this covert anaphoric element is actually contained within both the X part and the *else* part. For instance, *someone else* is analyzed as: *someone* = $\exists x \text{ person}(x)$; *else* = $\text{person}(x)$, where $x = x_1, x_2, x_3, \dots, x_i, \dots$ and x_i is coindexed with the antecedent (p. 141). This expression has been analyzed within Free-Variable Semantics in Kubota and Uegaki (2009) and associated with focus in Zwart (1984).

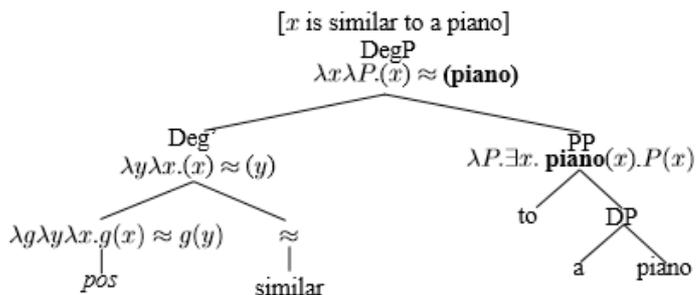
¹⁰ Obviously we admit that the domain is not empty.

Thus, asserting, for instance, that x is a tall P , is to say that x is a P that is tall relative to the standards for P s (i.e. for a jockey, for a baseball player or for a cat). Consequently, the assertion does not entail that x must be tall relative to other COMPARISON CLASSES. Now, following Kennedy (2007, p. 5) analysis of comparatives, we get the following representation for (11):



“The amount of height of x is greater than the amount of height of the speaker according to a standard contextually determined”. Similarly, asserting that something is similar to a piano can be interpreted as follows, where we replace for illustrative purposes only, $>$ (*taller*) or \geq (*as tall as*) by \approx for equal or similar¹¹. Now, if we apply Kennedy’s approach to comparatives, and leaving aside the quantifier “something” and also assuming that the anaphoric link has been resolved, we could represent the semantics of the clause “ x is similar to a piano” as follows:

¹¹ von Stechow (1984) proposes a fine-grained analysis of comparatives, amending some formalities in Kennedys approach, Graff, (2000) uses $! >$ instead of \geq and a NORM, instead of \mathbf{d} , NORM combines with a measure function to yield a function from properties to degrees on the scale associated with the measure function. That is, $(\text{NORM}(G))(P)$ is the norm, or typical, amount of G -ness for things with property P . Alrenga, (2006), analyzing the denotation of LIKE and DIFFERENT, states that they map pairs of individuals onto their associated scales according to the number of differences or similarities that exist between the pairs members (relative to a given set of properties). Those pairs that possess more differences are ordered more highly by DIFF, while those that possess more similarities are ordered more highly by LIKE. There are other variants of Degree-Based approaches, however we think that they would not affect the problems raised by comparisons involving functional similarities in evaluated contexts.



Roughly speaking, the amount of similarity between x and a piano is similar or equal according to a standard contextually fixed property P . It is reasonable to believe that in contexts as (3b,c), and also for functional similarity *per se*, by making some adjustments to the Degree-based theories, we will get a COMPARISON CLASS which might be contextually appropriate (i.e. the amount of similarity between two entities according to a standard or property contextually given)¹². However, a serious problem arises when confronting to contexts like (3c) which we repeat below. How could we measure the similarity between, for instance, a piano and a lamp in such contexts? For instance, usually people do not walk with a screwdriver in their pockets, but in many occasions we need one (to fix a screw of the glasses, to open a laptop or a camera...), and a dialogue like the following is common:

- (13) A. [...] Now, I would need a screwdriver or *something similar*
 B. Well, I have {a knife, the keys of my house/car, several coins...}
 if (it) can help you

First of all, we should construct a degree scale for every object to be compared, then we have to make a selection of the degree scales contextually relevant. That is, establishing a high-order similarity between scales and allow a single scale for these objects in order to calculate a direct

¹² This has been explored in Alrenga (2006) for the semantics of *like*, and taking a set or family or properties contextually relevant.

comparison among them. Proceeding so not only will we open the door to Goodman's criticism that everything is similar to everything else, but also we must accept that vagueness is inherently ascribed in the notion of degree itself. Secondly, let us assume that we can find the most salient property for the context of (3c), as being a furniture of a certain size. Then, we might determine a size s relative to the context in order to obtain a class x such that $\lambda x.\text{size}(x) \geq \text{size}(\text{piano})$. We will probably get a COMPARISON CLASS close to: {sofa, dress, desk...}. However, if the speaker proposes, for instance, a sculpture or a statue, it will be false in this context. The same goes with a bed, if we want to furnish our living room. Some objects in the class will be better choices than others for purely pragmatic reasons, and the truth-value plays no role in such contexts. That is why we take these considerations to be "world knowledge" issues, rather than linguistic issues. That is to say, the amount of similarity between a piano or a statue, and a screwdriver and a coin, is purely goal-context dependent.

3.1 Approach and goals

Basically, in our approach we will use the two following tools. First, a Generative Lexicon (see §4) and second a version of *Discourse Representation Theory* (DRT), known as *Segmented Discourse Representation Theory* (SDRT) (see §5.1).

We will propose a unified account of the different types of similarity discussed so far. In order to do so, we will assume that at the level of logical form, *something similar* is interpreted as [something similar [to x with respect to P]], where x is linked by an antecedent implicitly or explicitly currently available in the discourse or the linguistic context, and P is a property selected among a set of relevant properties according to the discourse context.

We will take two main axioms from Lascarides and Copestake (1998, pp. 404-405) whose function is to relate the lexicon with the pragmatic component: *Defaults Survive* and *Discourse Wins* (see §6). The former captures the idea that, in normal circumstances, generalizations in the lexicon apply at the discourse level. The latter ensures that when pragmatic information and lexical processing conflict, the discourse processing wins:

1. *Defaults Survive*: $*\phi > \phi$
2. *Discourse Wins*: $(*\phi \wedge \sqsupset (KB_h, \psi)) > \psi$

The form $*\phi$ will be included in the *Discourse Representation structure* (DRS) (see §6) conditions and its semantics establishes that ϕ is suggested by the lexicon as a *default* property. Regarding the second axiom, it states that if a nonmonotonic conclusion ψ obtained from “hard information” in the knowledge base ($\sqsupset (KB_h, \psi)$) conflicts with the lexical default, then ψ overrides this default (see §6). As pointed out in Lascarides and Copestake (1998), *Discourse Wins* can refine the information obtained by the lexicon¹³. Taking into account these axioms, we will extend them to include similarity. Moreover, the relevant property will be computed by maximizing the relation of parallel between the discourse segment containing *something similar* and its discourse constituent antecedent. More specifically, we will exploit the notion of *Maximal Common Theme* (MCT) (see §5.2), used within SDRT framework. That is, in resolving parallel constructions, there is a preference to produce the MCT of related constituents for which *Parallel* (see §5.1) is maximized when there is a common theme and it is as maximal as is compatible with informativeness (Asher et al., 2001).

4. A theory of the Lexicon

4.1 Motivations for the need of a lexicon

The problem of understanding sentences making similarity claims becomes one of determining which property P is relevant in each context. At first glance, this problem seems to be resolvable by using information from the lexicon. For instance, consider the example in (14) below:

(14) If it rains, you need an umbrella or *something similar*

We look at the lexical entry for umbrella, find the property which is most

¹³ As a reviewer remarks, sometimes there is no winner. In such a case, no interpretation is possible.

relevant, and use it. Given a lexical representation for *umbrella*, we take the property ‘provide_shelter’, and abstract to the class of objects which have it as a potential property. This choice was not arbitrarily made. It is the most likely choice for the word ‘umbrella’, given the context “If it rains...”. But even without the contextualizing phrase “If it rains...”, this feature would probably be selected. Generally, it is the most specific property of an object that should be chosen as the one which determines which objects are similar to it¹⁴. This means that if there is a property which that object has and most other objects lack, that property is favored. Evidence for this comes from considering examples in which a property is explicitly stated as applying to an object. For example, compare (15a) and (15b) below:

- (15) a. John bought a CD_i and Peter bought *something similar*_i
 b. John bought a [Madonna CD]_i and Peter bought [something similar]_i

In (15a) we intuitively get that Peter bought something from the class $\{x|CD(x)\} \cup \{x|record(x)\} \cup \{x|cassette(x)\} \dots$; that is, the class of objects that can be used to record music. In (15b) we get that Peter bought something from the class $\{x|CD(x) \wedge on(x, pop_music)\}$.

However an object may have more than one fairly specific property. Notice that the basic properties of an object do not change, it is the sense of a lexical item which is variable. Furthermore, the discourse context is able to change which property is selected. We cannot assume that it is just a single property in each case which is at issue, rather we need to be able to find out which properties are typically possessed by different objects in order to determine the meaning of the phrase with *something similar*. This presupposes a system with a rich lexical semantics knowledge. That is, what is needed is a representational language that is specified enough to capture the core meaning of a word, with a rich internal structure and specific operations to account for the polymorphism of words. This is why we want to use a Generative Lexicon (from now on GL) (Pustejovsky, 1995). Even if

¹⁴ As an artefact, it is built, created to potentially satisfy a specific purpose. We thank an anonymous reviewer for this remark.

there is a close interaction between semantics and pragmatics, we consider that a clear divide must be maintained between the two domains. One way to put these domains together for the treatment of the expression *something similar* is to assume that the former might determine whether an instance belongs to a fixed category (i.e. the lexical meaning of the word referring to an object), as illustrated in (3a,b). The latter will give us a clue about which contextual factors are at issue for interpreting an instance as being a member of a class of objects according to their functionality in a specific context (cf. 3c).

4.2 A Generative Lexicon

In a GL the meaning of a lexical item is distributed over three levels of representation¹⁵:

$$\alpha = \langle A, E, Q \rangle$$

Here α is a lexical item, A is the argument structure, E the event type, Q is the qualia structure. The lexical representation of α is then:

$$(16) \quad \left[\begin{array}{l} \alpha \\ \text{ARGSTR} = \left[\begin{array}{l} \text{ARG}_1 = x \\ \dots \end{array} \right] \\ \text{EVENTSTR} = \left[\begin{array}{l} E_1 = e_1 \\ D - E_i \\ \dots \end{array} \right] \\ \text{QUALIA} = \left[\begin{array}{l} \text{CONSTITUTIVE} = \text{what } x \text{ is made of} \\ \text{FORMAL} = \text{what } x \text{ is} \\ \text{TELIC} = \text{function of } x \\ \text{AGENTIVE} = \text{how } x \text{ came into being} \end{array} \right] \end{array} \right]$$

The ARGSTR describes the arguments and their types which are

¹⁵ We also admit that the types associated with lexemes are based upon a hierarchy organized in an ontology. Thus, following (Pustejovsky, 1995, p. 85), we assume the existence of a relation of inheritance of types.

involved in the predicates of the QUALIA: they are identified as true arguments (ARG_i) if they are denoted by the lexical item, or if they must be syntactically realized (for instance in the case of verbs) but they are identified as default arguments ($D-ARG_i$) if they participate in the semantics of the item via the predicates of the Qualia Structure without being denoted by this item.

In the same way as the ARGSTR describes the arguments and their types, the EVENTSTR, whose origin can be found in (Kamp and Reyle, 1993, p. 668) describes the events and their types (according to Vendler (1967)) which are involved in the predicates of the QUALIA (i.e. states, activities, accomplishments, or achievements). Then they are identified as true events (E_i) if they are denoted by the lexical item, or default events ($D-E_i$) if they are involved in the QUALIA, and hence are part of the semantics of the lexical item, without being denoted by this lexical item. They are ordered by a precedence relation R .

For our purposes, the most important here is the QUALIA. The basic intuition is that word meaning is organized over qualia roles whose function is to provide the basic behavior of lexical items in their linguistic context. The information contained in a word is represented by a set of predicates encoded in four roles: the FORMAL role, (which distinguishes an object from a larger domain –physical characteristics–, e.g. orientation, magnitude, shape, color..., taxonomic relation *isa*, ‘is a kind of’), the CONSTITUTIVE role (internal constituency of the object, e.g. material, weight...), the AGENTIVE role, (which indicates the factors involved in the creation of the object¹⁶ and the TELIC role (which defines the function or purpose of the object). The general representation of qualia structure is then as indicated in the figure below¹⁷:

¹⁶The TELIC feature may be complexified so as to embed both an AGENTIVE and a FORMAL role. This is the proposal made by Bassac and Bouillon (2001), motivated by the fact that an artifact must be used in order to fulfill the function it was designed for; for instance a knife must be used in order to cut anything it was designed to cut, hence the predicate *use* as default predicate encoded in the embedded AGENTIVE:

(17)

$$\left[\mathbf{T} = \left[\begin{array}{l} \mathbf{F} = \mathbf{P}(\mathbf{x}) \\ \mathbf{A} = \mathbf{use}(\mathbf{y}, \mathbf{x}) \end{array} \right] \right]$$

(18)

$$\left[\begin{array}{c} \alpha \\ Q \left[\begin{array}{l} \text{FORMAL} = x \\ \text{CONSTITUTIVE} = \textit{part.of}(y, x) \\ \text{AGENTIVE} = R(e_1, z, x) \\ \text{TELIC} = R'(e_2, w, x) \end{array} \right] \end{array} \right]$$

It is the qualia structure that captures the basic properties of lexical types: for instance the nouns *rock* or *stone* are natural types whereas nouns like *novel* or *computer* are artifact types.¹⁸

The difference is that for the former types, as they have no function (except in specific contexts) the TELIC role is left undefined, whereas in the latter types it is specified and the function of the object is encoded in it. This opposition is manifested in the opposition of the following pairs: *he enjoyed the *rock / novel* or *a good *rock / computer / writer*. This lexical representation thus can be thought of as a reserve of types that will be available to license some syntactic environments.

The relevant part of the lexical information contained in a word is distributed as indicated below which integrates the various structures previously described, so that the general representation of any lexical item α is now:

¹⁷ As can be seen, our representation is Davidsonian as an extra event argument is added in the predicates encoded in the AGENTIVE and TELIC roles. However it differs from a strict Davidsonian representation in so far as the main event is decomposed into sub-events.

¹⁸ Pustejovsky (2001) proposes a hierarchy of types in order to distinguish natural and functional (artifactual) types and also complex types. For instance, NATURAL TYPES: predication from the domain of substance; e.g. application of the FORMAL and/or CONSTITUTIVE qualia roles (*rock, water*); FUNCTIONAL TYPES: predication includes reference to either AGENTIVE or TELIC qualia features (*knife, teacher*); COMPLEX TYPES: formed from natural and functional types by product type between entities (*school, book*).

(19)

$$\left[\begin{array}{l} \alpha \\ \text{ARGSTR} = [\text{ARG}_1 = x : \tau] \\ \text{EVENTSTR} = \left[\begin{array}{l} E_1 = e_1 : \pi \\ E_2 = e_2 : \pi' \\ \text{REST} = \dots \\ \text{HEAD} = e_i \end{array} \right] \\ \text{QUALIA} = \left[\begin{array}{l} \text{FORM} = x \\ \text{CONST} = \left[\begin{array}{l} \text{part_of}(x, y) \\ \text{or} \\ \text{made_of}(x, y) \end{array} \right] \\ \text{TEL} = \text{function_of}(e_i, x) \\ \text{AGENT} = \text{creation_of}(e_j, x) \end{array} \right] \end{array} \right]$$

Basically a GL is a typed decomposition formalism: as we have seen, in this formalism each predication is distributed into as many sub-predicates as there are sub-events in the Qualia structure. The interpretation of a predicate is then like the expression given below in which *F*, *A*, *T*, and *C* are respectively the FORMAL, AGENTIVE, TELIC, and CONSTITUTIVE roles:

(20)

$$\underbrace{\lambda x_n \lambda x_{n-1} \dots \lambda x_1}_{\text{ARGSTR}} \underbrace{\lambda e_m \lambda_{m-1} \dots \lambda e_1}_{\text{EVENTSTR}} \underbrace{(\text{Q}_F \wedge \text{Q}_A \wedge \text{Q}_T \wedge \text{Q}_C)}_{\text{QUALIA}}$$

The lexical representation of the noun ‘umbrella’, should be considered as an artifactual object-created, made or brought about by some human activity (Pustejovsky, 1995). To represent artifacts which at the same time are physical objects, there is a unique type which combines both FORMAL and AGENTIVE values : ‘artifact_tool’. The lexical representation for “umbrella” with the considerations above, gives us the following typed feature structure.¹⁹

¹⁹This is an abbreviated version of the lexical entry for “umbrella”. We only include those portions of the typed structure which are relevant for our analysis.

$$(21) \left[\begin{array}{l} \textit{umbrella} \\ \text{ARGSTR} = \left[\begin{array}{l} y : \textit{artefact} \\ \dots \end{array} \right] \\ \text{EVENTSTR} = [\dots] \\ \text{QUALIASTR} = \left[\begin{array}{l} F = \textit{umbrella}(y) \wedge \textit{collapsible}(y) \\ \text{CONST} = \textit{gore}, \textit{handle}, \textit{grip}, \textit{rib} \\ \text{TELIC} = \left[\begin{array}{l} F = \textit{use}(e_1, x, y) \\ A = \textit{provide_shelter}(e_2, x, y) \end{array} \right] \end{array} \right] \end{array} \right]$$

Its interpretation results from the conjunction of the FORMAL and TELIC values of the qualia:

$$(22) \lambda x[\textit{artifact_tool}_F(x) \wedge \lambda y \lambda e[\textit{provide_shelter}_T(e, y, x)]]$$

Not only does the Qualia Structure of a lexical item provide information about the semantics of this item, but it also differentiates the quantificational force of the elements that are encoded in the various roles. By definition the sub-event that corresponds to the predicate encoded in the AGENTIVE is existentially quantified. This is summed up in the figure below:

$$(23) \left[\begin{array}{l} \mathbf{v} \\ \text{QS} = \left[\begin{array}{l} F = \dots \\ A = \exists eR[(e, x, y) \wedge Q(e, z) \dots] \\ T = \dots \end{array} \right] \end{array} \right]$$

Contrary to the sub-event which corresponds to the predicate encoded in the AGENTIVE, the sub-event which corresponds to the predicate encoded in the TELIC role, by definition too, receives a modal interpretation, as indicated below:

$$(24) \left[\begin{array}{l} \mathbf{v} \\ \text{QS} = \left[\begin{array}{l} F = \dots \\ A = \dots \\ T = \Diamond[\dots] \end{array} \right] \end{array} \right]$$

In other words, this expresses that the AGENTIVE is extensional whereas most importantly the TELIC role is intensional.²⁰

5. *Something similar* and discourse structure

5.1 Discourse attachment, isomorphism and parallelism

We assume that there is a closed interaction between rhetorical relations and discourse structure, in order to illustrate how lexical representation and discourse structure interact, we will assume a *Segmented* DRT (SDRT) approach in what follows.²¹ Extending Kamp's DRT (Kamp and Reyle, 1993), SDRT takes a set of Discourse Relations as *Parallel*, *Contrast*, *Cause*,...²² to relate utterances or speech acts involved in the discourse segments. Accordingly, the interpretation of these discourse relations yields their semantic effects. This is encoded by rules of the form: $R(\alpha, \beta)$ where α and β are variables which represent labels (i.e. markers for speech acts). Moreover, there is a distinction between semantic (content-level or propositional) and pragmatic (operating on epistemic attitudes associated to speech acts) relations. We might say that the labels are the discourse referents for speech acts. Building a discourse structure is thus a process in which each discourse segment (i.e. elementary DRSS and sub-DRSS) is related to another discourse segment to get an SDRS (the representation of the discourse making explicit how the segments are linked by Discourse Relations). SDRT uses a non-monotonic logic, *Commonsense Entailment* (Asher and Morreau, 1991), which exploits default conclusions. This mechanism is known as *Discourse in Commonsense Entailment* (DICE)²³. These inferences are useful when one has incomplete or partial

²⁰ Even though similarity is not a transitive relation (see §2.3.), it would be possible to consider telic similarity as expression of equality between two TELIC roles, which would lead to a transitive relation. However this is not our option as will be seen later on for reasons we explain.

²¹ (Asher, 1993; Asher and Lascarides, 2003).

²² This is also acknowledged by other discourse approaches (Hobbs, 1985; Mann and Thompson, 1988), among others.

²³ (Asher and Morreau, 1991; Asher and Lascarides, 1995).

information, which is usual in many contexts. *Commonsense Entailment*, CE, is a quasi-modal approach to non-monotonic reasoning. We introduce here some notational conventions, corresponding to DICE formalism, and which we will use in this paper. Let $\langle \tau, \alpha, \beta \rangle$ be the update function, where τ represents the text, α is an open node²⁴ which is updated with the representation β of the current sentence by means of a discourse relation with α . Let $\alpha < \beta$ mean the precedence relation between constituents α and β , and, $R(\alpha, \beta)$ denotes that the discourse relation R holds between constituents α and β . Finally, the defeasible implication $>$ where $\phi > \psi$ means “if ϕ , then normally ψ ” (Lascarides & Asher, 1993). That is to say, if the content of the constituent β must be attached to the constituent α , where α is already part of the discourse structure τ ($\langle \tau, \alpha, \beta \rangle$), then a rhetorical relation holds between α and β .

Assuming that *something similar* makes evident the intended parallelism, we may establish the following axioms for discourse attachment:

Basic Attachment:

$$\langle \tau, \alpha, \beta \rangle \wedge \text{similar}(x, y, P)(\beta) \rightarrow [\langle \tau, \alpha, \beta \rangle \wedge \text{Parallel}(\alpha, \beta)]$$

Parallelism:

$$\langle \tau, \alpha, \beta \rangle \wedge \text{something similar}(\beta) > \text{Parallel}(\alpha, \beta)$$

The first axiom determines that when the semantic content and structure of two constituents indicate similarity in some degree, then we attach both constituents with *Parallel* discourse relation. More specifically, the constituent containing *something similar* is resolved by means of two underspecified variables. The first one establishes the anaphoric link between the target and the source. The second is meant to pick up a relevant property among a set of appropriate properties contextually fixed. That is, we will give the following content to *something similar* as follows: $[\text{similar}(x, y, P), y = ?, P = ?]$ ²⁵. The second axiom establishes that the

²⁴ (Asher, 1993; Asher and Lascarides, 1995; Webber et al., 2003; [Webber, 2006])

²⁵ This representation is closely associated to VPE constructions within DRT framework (Asher, 1993; Hestvik, 1995; Asher et al., 2001).

expression something similar introduces the Parallel discourse relation with its antecedent in the discourse. Notice that this is defeasibly inferred, under the assumption that no other contextual information contradicts this choice of relation. Moreover, this expression imposes constraints during discourse processing by virtue of its anaphoric properties.

Within SDRT, some discourse relations between constituents exploit *Embedding Trees*, which makes explicit the logical structure of the constituents together with the way these are related. DRS-subordination and the discourse structure are represented by means of the symbol \leq . In order to show the formal tools we will assume henceforth, we will borrow the following definitions from Asher (1993):

Definition: For any constituent α discourse subordinated (\leq) to a constituent β in some SDRS K the embedding tree of β down to α is the tree $\langle B, \leq \rangle$, where $B = \{x : x \leq \beta \text{ and } \alpha \leq x\}$, \leq is the partial ordering determined by the discourse subordination on B .

Definition: For any constituent α the *embedding tree* of $\alpha = h\langle A, \leq \rangle$, where $A = \{x : x \leq \alpha\}$, and \leq is the partial ordering determined by discourse subordination on A .

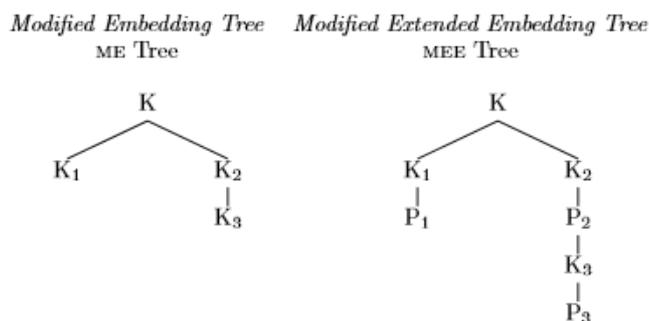
Definition: Let $\tau = \langle A, \leq \rangle$ and $\tau' = \langle A', \leq \rangle$ be two trees. $\theta : \tau \rightarrow \tau'$ is a *tree isomorphism* from A onto A' iff θ is a bijection and $\forall \alpha, \beta \in A (\alpha \leq \beta \text{ iff } \theta(\alpha) \leq \theta(\beta))$.

Definition: $\tau^* = \langle A^*, \leq \rangle$ is a *Modified Embedding Tree* (ME tree) of an embedding tree $\tau = \langle A, \leq \rangle$ iff

- (i) $A^* \subseteq A$
- (ii) $\text{root}(\tau^*) = \text{root}(\tau)$
- (iii) $\leq_{A^*} \subseteq \leq_A$
- (iv) $\forall x (x \text{ is a leaf of } \tau^* \text{ iff } x \text{ is a leaf of } \tau)$

For instance, two constituents will stand in a *Parallel* relation if and only if there is a bijection from the embedding tree of one to the embedding tree

of the other. Since Parallel admits degrees (i.e. scalarity), some constituents are not completely symmetrical to others, but there are only some part(s) of a segment that are related. Finally, Asher (1993, p. 356) includes the so-called *Modified Extended Embedding Trees* (MEE) in which Predicative-DRS (or quasi-constituents) is introduced as a tree node beneath each constituent. Thus, discourse relations may be established between quasi-constituents by mapping nodes of the one type onto nodes of the same type. This mechanism will be useful for our purposes, since the expression *something similar* must be linked to the right predicative drs in order to be interpreted, if the discourse is coherent. The trees below illustrate both type of Embedding trees:



Let's first take the simple discourse below to illustrate discourse attachment.

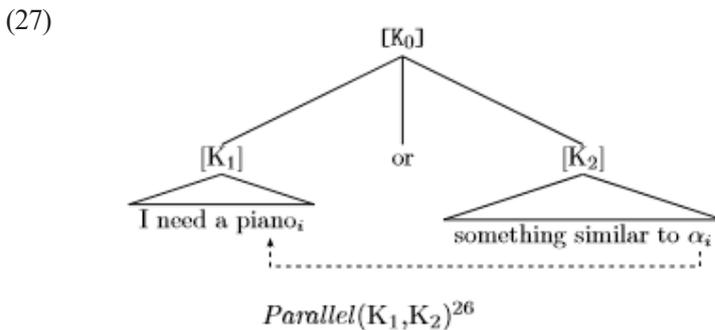
- (25) I would like to play some music. I need a piano or *something similar*

As we have said, we analyze the expression *something similar* by means of a parallel-dependent anaphor, which is not explicit in syntax, and which needs to be resolved. At the level of logical form, VP is applied for both NPs, the licensing NP and the target. We treat the disjunction as polymorphic, which means that when it selects NPs we get a complex disjunction. The result when combined with the VP will yield a disjunction

of two objects of the appropriate sort. That is, we assume that the expression *something similar*, allows us to get a logical form where the VP is applied for both NPs, the licensing NP and the target. This yields the following structure:

$$(26) \quad [_{IP} \text{ I need } [_{NP1} \text{ a piano}_i] \text{ or } [_{IP} \text{ I need } [_{NP2} \text{ s. similar to } \alpha_i]]]$$

Parallelism allows us to recover the content of α_i in a very simple manner. Since this expression involves an interpretation of a missing element in the syntactic structure, a suitable antecedent must be found. A first step is to recover the content of the missing part, α_i , through “reconstruction”, and it appears that it is identified in the NP *piano*. This specifies anaphoric dependency at the syntactic and discourse structure level, but not its interpretation. That is, at this level we can only get a discourse tree in which both constituents, the source and the target, are linked by a parallelism discourse relation by virtue of two parallel expressions in them. Thus, we are not going further than the discourse tree below.



In what follows, we are going to discuss the notion of *theme* as a criterion to determine the content and interpretation of the underspecified variable *P* and consequently the set of expressions denoting the objects that might be appropriate in the context.

²⁶ In Asher and Lascarides (2003), the Alternation discourse relation should be included in those cases; that is, *Alternation*(K_1, K_2).

5.2 Maximal common theme and similar properties

Claiming that a parallel discourse relation holds between the discourse segment containing something similar and its discourse antecedent is tantamount to saying that two constituents, K_1 and K_2 are structurally and semantically similar. Since Parallel is a scalar discourse relation, we aim to maximize structural and semantic similarity²⁷. In resolving parallel constructions, there is a preference to produce the *Maximal Common Theme* (MCT) of related constituents for which Parallelism is maximized when there is a common theme and it is as maximal as is compatible with informativeness (cf. Asher, 1993, p. 285)²⁸

Maximal Common Theme

Given two DRS's K_1, K_2 the MCT is a drs T such that $K_1 \rightsquigarrow T$ and $K_2 \rightsquigarrow T$, and for any other T' such that $K_1 \rightsquigarrow T'$ and $K_2 \rightsquigarrow T', T \rightsquigarrow T'$.²⁹

We propose, then, the following constraint applied to similarity claims:

Similarity Constraint:

In resolving similarity within a pair of discourse referents, prefer the choice that produces a more specific common theme in the same context.

Maximizing parallelism forces a match between the content of both clauses, the source and the target. As will be seen immediately, this means that we must assign the strongest compatible property between the object

²⁷ We are assuming here semantic similarity as it has been used for ellipsis phenomena, as in Sag (1976), Hobbs (1985), Hobbs and Kehler (1997), Dalrymple et al. (1991), Fox (2000) Kehler (1993), Asher et al. (2001), and Asher and Lascarides (2003).

²⁸ In Asher et al. (2001, page 6) following the definition given in Asher (1993) a theme is defined as follows: The *theme* for a DRS is used when from this drs some information has been removed or generalized by the operations specified above. In other words, if $K \rightsquigarrow K'$, then we say that K' is a *theme* of K . The ordering based on \rightsquigarrow is used to define a *Maximal Common Theme* (MCT).

²⁹ Notice moreover that this maximization corresponds to a maximal bijection between two embedding trees.

denoted by the NP in the antecedent clause, and the object(s) contextually relevant in order to semantically reconstruct the NP in the clause which contains the target *something similar*. It could be asked why this constraint is phrased in terms of finding a single property. Why should we not prefer to find the objects which match as many possible properties? The answer is that we do not treat properties as atomic – compound properties might possibly be the most specific common property in a given context. In fact, a compound property (e.g. big & hairy) is more likely to be chosen over an atomic property (e.g. big) since the compound property is more specific than the atomic property. The only thing that prevents properties from becoming infinitely compound for every instance is that we only take properties explicitly mentioned in the discourse (in the form of adjectives) and properties taken from the lexicon.

As noted before, we are interested in picking the most specific theme given the context. This is a strong assumption, but it is plausible to establish that among the objects potentially acceptable are those which satisfy the context. We take specificity as being close to degrees of felicity, since even though Parallel could be satisfied, some expressions might be maximally or minimally felicitous in a given discourse context. Hence, the denotation of *something similar* is the following:

Definition:

something similar might be interpreted intensionally as denoting instances of an unspecified element of a family of contextually relevant properties.³⁰

We will associate the following semantics to *something similar*:

1. $[[\text{similar}]]^c = \lambda x \lambda y [\text{similar-to}(x,y)]$
2. $[[\text{similar}(x,y,\{P_1, \dots, P_n\})]]^c \leftrightarrow (P_1(x) \wedge P_1(y), \dots, P_n(x) \wedge P_n(y))$
3. $[[\text{something similar}]]^c = \lambda x \lambda y \lambda P [\text{thing}(y) \wedge \text{similar-to}(x,y,P)]$

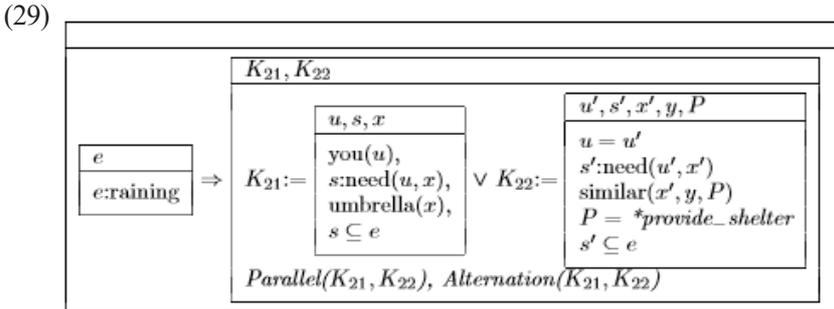
³⁰ The crucial point here is that the context provides the selection- restriction over the set of entities with respect to a set of specific properties.

6. Accounting for some data

Let us consider the following discourses:

- (28) a. If it rains, you need an umbrella or *something similar*.
 b. If you have an assistant, get an umbrella or *something similar* to bounce your flash

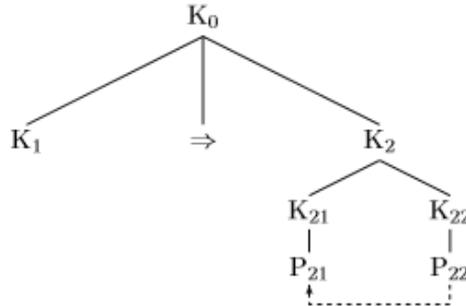
which is represented as follows³¹:



Each constituent expresses a proposition content. These propositions, then, must be available as potential antecedents during discourse processing. In order to do so, ME trees have been extended to include a representation of VP denotation in the source (the so-called *modified extended embedded trees* or MEE trees defined above). This mechanism inserts the appropriate Predicative-DRS in beneath the node of the tree that represents that constituent. This Predicative-DRS will be the propositional representation of the VP. Thus, to the SDRS above we can associate the MEE below:

³¹ For a full description of how (29) is derived from (28) see (Asher, 1993; Asher & Lascarides, 2003). Note that here \Rightarrow and \vee operate much as they would in standard first order logic.

(30)



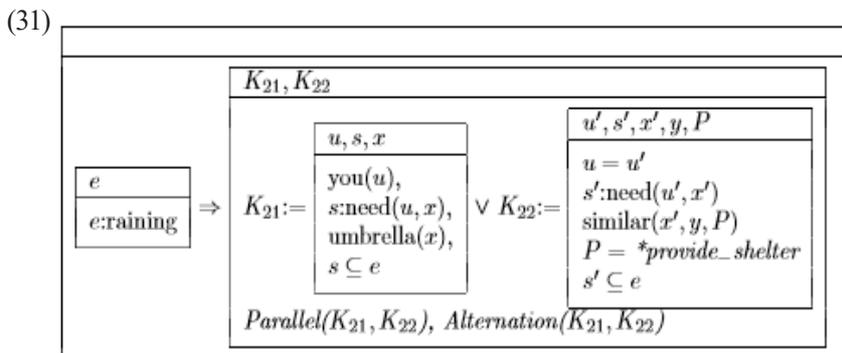
Notice that our semantics does not specify which property, among a set of properties, is selected in a given context. More specifically, the question is then, what is the most specific property with respect to the context? The simplest case for resolving ‘ $P = ?$ ’ is when the property we are interested in is taken strictly from lexical, rather than discourse information. In some cases, we can take it that there is only one particularly important property of an object, and so when similarity claims are made involving that object, this property is naturally favored. As we have already said (cf. §1.4) we will take from Lascarides and Copestake (1998) two basic axioms whose function is to relate the lexicon with the pragmatic component: *Defaults Survive* and *Discourse Wins*. Taking into account these axioms, we will extend them to include similarity. First, let us consider the former (where $*\phi$ is associated to lexical information contained in α):

Similarity Defaults:³²

$$[\text{Parallel}(\alpha, \beta) \wedge \text{similar}(x, y, P)(\beta) \wedge * \phi] > P = \phi$$

So now (28) can be fully resolved to:

³² Notice that Qualia’s construction rules out conflicts of types inside the qualia.



That is, applying Similarity Defaults, in K_{22} we introduce the condition “similar(x',y,P), where P is resolved by taking a property from the lexicon (e.g. provide-shelter). Lets consider again the discourses in (3) repeated below:

- (32) I’m looking for a piano or *something similar*.
- a. I need to practise scales
 - b. I want to play some music with my friends
 - c. I would like to furnish an empty corner in my living room

For the discourse in (32) the COMPARISON CLASSES have to be constructed by establishing similarities with a “piano”. The lexical entry for this expression is represented as follows:

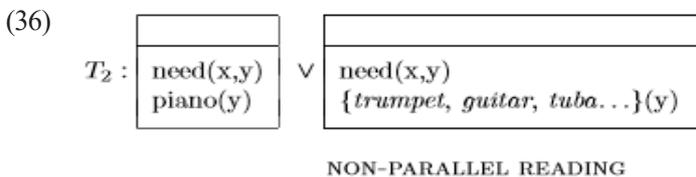
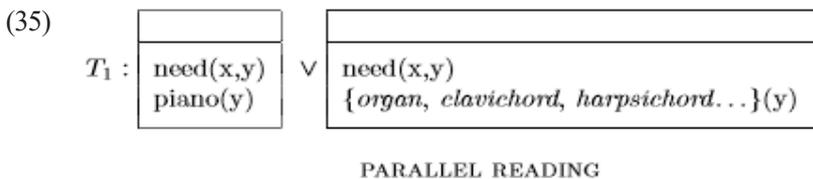
- (33)
- | | |
|--------------|--|
| piano | TYPESTR: [ARG1 = \boxed{x} musical_instrument] |
| EVENTSTR: | [D-E1 = $\boxed{e_1}$ transition
D-E2 = $\boxed{e_2}$ process] |
| ARGSTR: | [D-ARG1 = \boxed{y} human
D-ARG2 = \boxed{w} human] |
| QUALIA: | [FORMAL = \boxed{x}
CONSTITUTIVE keyboard, pedals,...
TELIC = play_act($\boxed{e_2}, \boxed{y}, \boxed{x}$)
AGENTIVE = make_act($\boxed{e_1}, \boxed{w}, \boxed{x}$)] |

Now, the question arises how to analyze (34a) and rule-out (34b), examples in which there are at least two members of a COMPARISON CLASS:

- (34) a. I need a piano, an organ or *something similar*
- b. † I need a piano, a cabbage or *something similar*

In (34a) the elements in a comparison class share a lexical property, which makes the similar relation a transitive relation, due to the identity of the TELIC quale: organ \approx piano \approx x. In (34b) this is not the case, the elements in the comparison class don't share any common property in the telic quale. In a nutshell, the identity of the TELIC quale creates the domain in which the \approx -relation is transitive.

Thus, representation (33) allows us to resolve discourses in (32a,b). The CONSTITUTIVE feature will be the property selected in order to get the comparison class for (32a). That is, in the SDRS we will have the condition: $P = *keyboard$, and for the discourse in (32b): $P = *musical_instrument$. Accordingly, there will be two potential interpretations for (32a,b), both satisfying the constraint on Parallelism and Defaults survive axiom. This gives rise to two MCTs below:



According to *Similarity Claim*, we should pick up the most specific theme according to the discourse context. In such a case we have $T_1 \rightsquigarrow T_2$.

Thus, applying the definition of MCT, the parallel reading is preferred over the non-parallel reading. By contrast, for the example in (32b), there is an identity of the TELIC quale with respect to all type of musical instruments. For the example in (32c) however a new COMPARISON CLASS is constructed via discourse structure and world-knowledge. It seems that the role of piano as furniture-wall, or decorative-furniture is preferred in this case. In order to account for this *non-lexical* preferred interpretation, we extend *Discourse Wins* for similarity claims:

Discourse Wins-2:

$$[\text{Parallel}(\alpha, \beta) \wedge \text{similar}(x, y, P)(\beta) \wedge (*\phi \wedge \sqsupset (KB_h, \psi))] > P = \psi$$

Applying Discourse Wins-2, we obtain the following readings:

(37)

$T_1 :$	<div style="border: 1px solid black; width: 100%; height: 100%;"></div>	∨	<div style="border: 1px solid black; width: 100%; height: 100%;"></div>
	<div style="border: 1px solid black; width: 100%; height: 100%;"></div>		<div style="border: 1px solid black; width: 100%; height: 100%;"></div>
	<div style="border: 1px solid black; width: 100%; height: 100%;"></div>		<div style="border: 1px solid black; width: 100%; height: 100%;"></div>
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PARALLEL READING

(38)

$T_2 :$	<div style="border: 1px solid black; width: 100%; height: 100%;"></div>	∨	<div style="border: 1px solid black; width: 100%; height: 100%;"></div>
	<div style="border: 1px solid black; width: 100%; height: 100%;"></div>		<div style="border: 1px solid black; width: 100%; height: 100%;"></div>
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NON-PARALLEL READING

This axiom establishes that no matter what property is given by the lexicon, if there is a property ψ defeasible inferred from the discourse structure itself or from the KB (e.g. *furniture*), then this information overrides lexical information (e.g. *musical_instrument*). Again, the preferred interpretation will be controlled by maximizing a parallel reading instead the non-parallel one.

6.1 Parallelism and other discourse relations

We have analyzed similarity claims by means of the most frequent expression in ordinary language. The point of departure has been that when a discourse is coherent, we expect that there will be a connection between the contents and inferences made by interpreting a discourse segment that is used in order to interpret the next one. On this view, a discourse segment containing *something similar* has been interpreted as [something similar to α] which entails discursively that the expression α and its antecedent are *parallel elements*, and correlatively the objects referred to by these expressions are interpreted as similar. More precisely, there exists a default rule according to which there is a Parallel discourse relation between *something similar* and its antecedent. Then one need not be committed to the claim that there is only one discourse relation between discourse segments.

Now a question arises. Are Parallel discourse relation and the phrase *something similar* exclusively coupled? Our answer to this problem is that we want the two levels of discourse coherence and interpretation to be distinguished. As far as discourse coherence is concerned, Parallelism is not the only possible discourse relation. What we are arguing for is that interpretation is impossible without this discourse relation. Anyway this does not mean to say that Parallel is the only discourse relation involved. Moreover, as noticed by (Moore & Pollack, 1992; Webber, 2006) intentional and informational structures are not isomorphic. Informational structures include semantic relations between facts, beliefs, situations, eventualities, etc. and intentional structures concern pragmatic relations between what a hearer is trying to accomplish with one part of a text with respect to another (cf. Webber & Prasad, 2009, p. 173). Consider the examples below:

- (39) a. [α I'm not happy with the chair I got here last time]. [β I don't want to buy *something similar*]
- b. [α Last year one of her gifts was a cookery book that she loved] but [β I don't want to get *something similar* again this year]³³

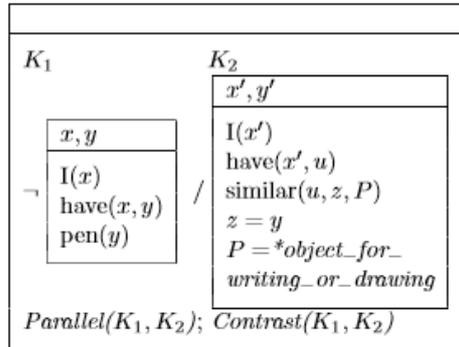
For the examples in (39) we might establish a distinction between an informational or semantic level and an intentional or pragmatic level. Accordingly, in (39a) at the content-level discourse relations, $Result(\beta, \alpha)$ can be inferred. The similarity claim in (39a,b) is made according to a structural and semantic parallelism between something similar and its antecedent in the discourse, *chair* in the former, and *cookery book* in the latter. In the first case we get that the speaker doesn't want to buy any type of chair (this choice is primary favored by the lexicon and captured by the axiom *Defaults Survive*), and for the second the similarity is related to do-it-yourself books (inferred by world-knowledge and ensured by *Discourse Wins* axiom). The presence of *but* in (39b) signals a Contrast discourse relation between the discourse segments.

Even Parallel and Contrast relations might “overlap” in the same discourse. For instance:

(40) I don't have a pen, but I have *something similar*

After update revision, we would have the following SDRS:

(41)



In such a case, the Parallel relation is *nested* within a Contrast relation between K_1 and K_2 , denoted explicitly by the discourse marker *but*. According to our approach K_1 and K_2 support both relations but their

³³ <http://www.boards.ie/vbulletin/showthread?p=58096881>

scopes are different. While Parallel has narrow scope (i.e. the anaphoric link between a pair of parallel elements, *pen* and *something similar*, making possible the construction of a parallel *theme*), the scope of *but* extends over the DRS corresponding to the whole negated constituent K_1 , yielding a contrasting *theme* in virtue of their different polarity assignment.

6.2 Quantified contexts

Let us take another discourse in which other discourse relations are involved, and particularly a quantified constituent with the expression *something similar*:

- (42) A: Obama, like Hillary Clinton, speaks at about half normal speed. He speaks four or five words and then pauses. His major technique is never to say anything you can disagree with. He gets you nodding in assent and then piles on the empty phrase and the value words—yes we can, our moment is now, etc. etc. The value words were drilled into you in the public schools—fairness, justice, peace, healing the planet, etc. And so you respond positively to these words, and particularly when Obama raises his voice with emotion. That is how they hook you into assent.

To some degree every politician does *something similar*, but since Franklin Roosevelt the techniques have been used with more and more effectiveness, and so today we have very little discussion of issues.³⁴

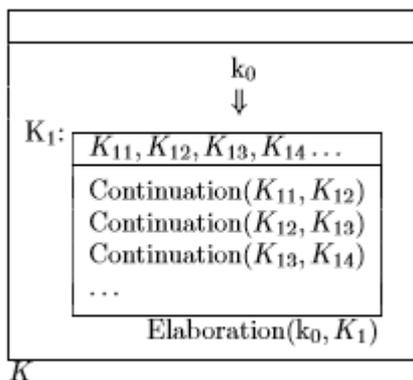
This discourse shows that the Parallel discourse relation interacts with other structural discourse relations, like *Continuation* and *Elaboration*. Constituents in (42) are a Continuation of the topic introduced by the first sentence, which constitutes the explicit topic. Continuation is a discourse relation which requires *topic-based updating*³⁵ where a constituent summarizes different DRSs attached by Continuation. The topic for

³⁴ <http://newworldorderuniversity.com/?p=216>

³⁵ See (Asher, 1993, Chapter 7) for details.

constituents supporting Continuation will be a constituent, k_0 , denoting the common topic of the SDRS. This topic dominates a complex DRS (i.e., the constituents attached by Continuation), and this is signified by the operator \Downarrow . Thus, the complex DRS is an Elaboration of a common topic, i.e., $\text{Elaboration}(K_0, K_1)$. To this point we have constructed the following discourse structure:

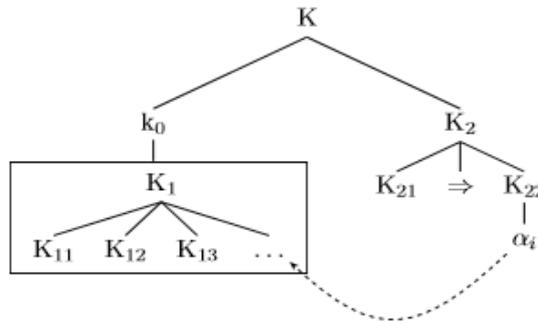
(43)



That is, the discourse structure is about *speaking normal speed* and a set of constituents which tell us what he did. The next sentence, K_2 , introduces a Parallel relation, as *something similar* indicates. Therefore, it is assumed that there must be Parallelism between K_2 and its attachment point. The attachment site must be open and Discourse free³⁶. Attaching K_2 to $K_0 \Downarrow K_1$, the content of the *topic* must be updated in order to summarize what *Obama, Hillary Clinton* and *every politician* have in common. This would be that of $\text{Continuation}(\text{topic}(k_0), K_2)$. This is shown in the tree below:

³⁶ This corresponds to the openness constraints as described in Polanyi (1985), Asher(1993) and, B.L.Webber (1991). Intuitively, the constraint states that the open constituents are those on the right hand side in a discourse-tree structure

(44)



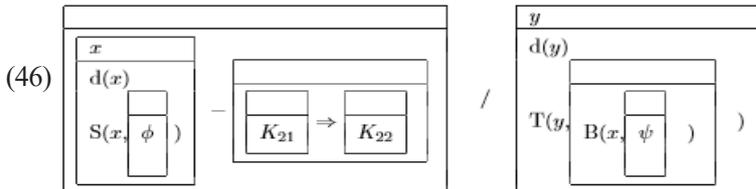
As illustrated above, the interpretation of the variable α_i , introduced by *something similar*, would be the sum of all the predicative-DRSs already introduced.

6.3 Propositional attitudes

In some cases, in our corpus, *something similar* takes propositional attitudes as a correlate. The discourse below is an example:

(45) [...] Durkheim, for example, appears to have thought that religious practices can symbolize social reality because, though the agent is not consciously aware of what they symbolize, he or she may be unconsciously aware of it. Lévi-Strauss, I think, believes *something similar* [...] ³⁷

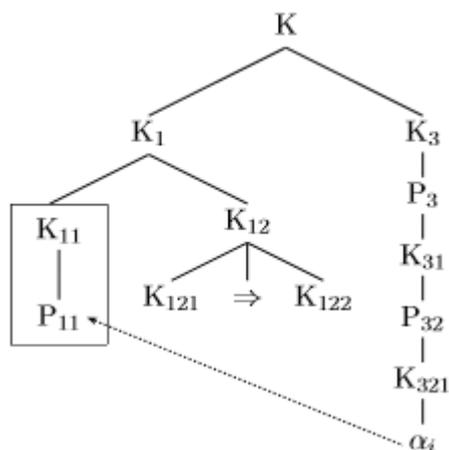
The simplified sdrs is given in (46):



³⁷ Kwame Anthony Appiah, (2005), “African Studies and the Concept of Knowledge”, in *Knowledge Cultures: Comparative Western and African Epistemology*, Bert Hamminga (ed.,) Ed. Rodopy B.V. p. 28.

And its MEE is provided in (47):

(47)



In (47), α_i finds its antecedent in the constituent containing the object of the matrix verb (e.g. *religious practices can symbolize social reality*).

7. Opaque contexts

Some other examples exhibit opaque contexts as (48) below:

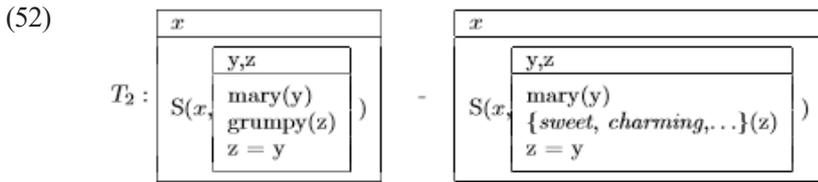
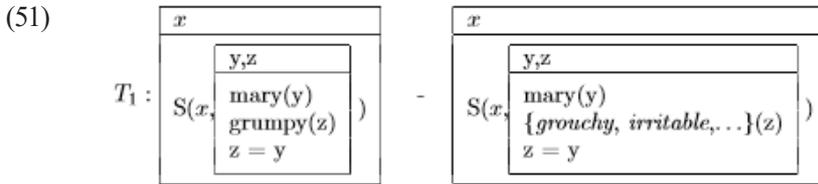
(48) John said that Mary was grumpy and Peter said *something similar*

In our corpus, these contexts are illustrated by the following discourses:

(49) “Phonetic laws are inexorable and blind. This axiom is usually attributed to Professor Osthoff, although Schleicher had already said something similar long before. Professor Osthoff’s words are: Die Lautgesetze wirken blind, mit blinder Nothwendigkeit. ‘Sound laws are blind; they rule with blind necessity’”.³⁸

³⁸ Michel Bréal (1991), *The Beginnings of Semantics: Essays, Lectures and Reviews*, George Wolf (Ed.), Stanford University Press, p. 233.

(50) “Lie told often enough becomes the truth”. Often attributed to Vladimir Lenin. William James said something similar: “There’s nothing so absurd that if you repeat it often enough, people will believe it.”³⁹



In these cases, we should apply an intensional property. That is, for the examples like (48), it is the meaning of the expression which functions as antecedent of *something similar*, and not the object referred by it. The interpretation of P will be appropriate if P is “being a synonym expression” (i.e. synonymy as describing similarities between meanings of different terms of the lexicon). Thus, $T_1 \rightsquigarrow T_2$

8. Final remarks

The basic problem dealt with in this paper is the semantics of the phrase *something similar* and we have been led to enquire about what it means for this expression to refer to two objects declared similar: we have argued that two objects are similar if they share a specific property which allows them to equally satisfy a context. For our purposes, the crucial observation has been how similarity claims satisfy coherence, and how indetermination can be subsumed in degrees of parallelism. Obviously, we accept the “vagueness”

³⁹ Comment on www.ask.com

carried by *something similar*, however we have tried to argue for a rich notion of discourse content, in which both semantic and pragmatic aspects of information are included in order to reasonably solve the interpretation of *something similar* via constraints that are contextually fixed.⁴⁰

What is novel in our approach, compared with mainstream analyses of vagueness, is that we deal with functional similarity, which cannot be dealt with at phrase level like in classical degree-based approaches. Similarity claims have been analyzed by resorting to the most frequent expression in ordinary language. The point of departure has been that when a discourse is coherent, a connection is expected between the contents of a given discourse segment and inferences made in order to interpret the next one. On this view, a discourse segment containing *something similar* has been interpreted as [something similar to α] which entails discursively that α and its antecedent are parallel elements, and correlatively the objects referred to by these expressions are interpreted as similar. This allows us to provide an explanatory account for the incoherence of the type of constructions illustrated in the examples in (53) below:

- (53) a. *John is tall_i and Peter is [something similar to tall_i]
 b. *John drinks too much_i and Peter drinks [something similar to too much_i]
 c. *This book_i, whose author wrote [something similar to this book_i], is a hit
 d. *Whoi does Peter think you bought [something similar to who_i]?

Regarding *something similar* and gradable adjectives, it can be asked whether our analysis can be extended:

⁴⁰ As pointed out by Bosch (1983, p. 196):

When the speaker has something definite in mind he wants to say, the concepts he employs are completely defined with respect to his own context model at that moment.

Following Bosch's claim, if the addressee finds a concept vague, it means he has not yet found the correct reconstruction of the relevant parts of the speaker's context model.

- first, to the predicate *similar* and
- second, to constituent of form [SOMETHING + ADJ + COMPARATIVE]

As regards the first question, the answer is double, as *similar* can receive both an absolute value and a relative value. In the former case, there is a semantic minimum norm which is enough to determine what counts as similar in a given context. In this case, the traditional degree approach is enough to account for these uses of *similar*. However, in the latter case, *similar* has a relative and context-dependent interpretation: here discourse/pragmatic knowledge is needed to interpret what counts as similar.

As regards the second question, the answer is yes. For instance, in example (54) below:

(54)

$$\dots \textit{something} \left\{ \begin{array}{l} \text{larger} \\ \text{bigger} \\ \text{smaller} \\ \text{longer} \\ \dots \end{array} \right\} \textit{than} \left\{ \begin{array}{l} \text{a motorcycle} \\ \text{a turkey baster} \\ \text{a portable pc} \\ \text{a book} \dots \end{array} \right\}$$

the complement following “*than*” explicitly acts as a referent used to construct a COMPARATIVE CLASS. In this case, what is solely needed is lexical knowledge provided by the reserve of types contained in the QUALIA structure.

Finally, as is obvious from our previous remarks, our analysis heavily relies on the notion of context, and the question naturally arises as to what counts as the relevant context: is it the linguistic context? Is it the discourse context? Or is it the pragmatic context? In our approach, similarity claims are not ontologically given, but discourse constructed and updated. Similarity thus results from a matching between pragmatic knowledge and discourse context. Furthermore, our analysis would gain from a unified account of all cases of similarity, absolute and relative. This would mean that something of the degree approach could be incorporated in the lexicon, namely the

notion of minimal degree. Our intuition here is that this could naturally be integrated in the FORMAL quale of an adjective. Obviously, this would raise the crucial problem of the nature of the information contained and expressed in the lexicon.

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