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ABSTRACT

It seems rather natural to admit that language use is governed by rules that relate signs, forms and meanings to possible intentions or possible interpretations, in function of utterance situations. Not less natural should seem the idea that the meaning of a natural language expression conveys enough **material** to the input of these rules, so that, given the situation of utterance, they determine the appropriate interpretation. If this is correct, the semantic description of a natural language expression should output not only the 'informative content' of that expression, but also all sorts of indications concerning the way this expression may be used or interpreted. In particular, the argumentative power of utterances is due to **argumentative indications** conveyed by the sentences uttered, indications that are not part of their **informative content** . This paper emphasizes the role of argumentation in language and shows how it could be accounted for in a formal Representation Semantics framework. An example of an analysis is provided in order to show the "system at work".

I. ARGUMENTATION AND THE SEMANTIC PROGRAM.

A.   What is linguistic in argumentation.

The theory of argumentation developped by Jean-Claude Anscombre and Oswald Ducrot is an attempt to describe some aspects of language that have not been carefully studied yet, in spite of their importance for linguistic theory, discourse representation, as well as simulation of understanding.

In their framework, utterances are seen to be produced in order to argue for some particular conclusions with a certain force, depending on the situation of utterance. Thus, when I utter

(1) This is beautiful but expensive

in front of a shop window and pointing to some item, I present my utterance as a reason for not buying this item, while if I say

(2) This is expensive but beautiful

I am giving a reason to buy the item[1].

Note that after uttering(1), I can perfectly walk into the store and buy the item : what is odd, in **normal situations** is to say (1')

(1') This is beautiful but expensive, and
therefore,   I   will   buy   it.

Anscombre and Ducrot unburied the old Aristotelician concept of topoi to describe the movement from the utterance to the conclusion. They take these topoi to be of the form :

(To) The more X is P, the more Y is Q.

where 'X is P' is the idea expressed by the original utterance, and 'Y is Q' is the argumentative orientation (the conclusion argued for by producing the original utterance in the particular situation in which it is uttered). In Raccah 84, I have argued for the adequacy of a slightly different form for the topoi, which takes into account the epistemical relation of the speaker to the premiss :

(T)   The more evidence I have in favor of X being P
The more arguments I have in favor of Y
being Q.

Topoi of this kind are shown to avoid problems with non-gradual properties and, I argue, are closer to the intuition we have about the argumentative process[2].

The description of argumentative connectives provides rules to select the argumentative orientation of a compounded utterance in function of the more basic utterances that they connect.

Thus, the analysis of (1), (1'), and (2) suggests the following description of the argumentative aspects of **but** :

in any utterance of P but Q, the presence of but

- requires that the utterances of P and Q be interpreted as oriented towards opposite conclusions,
- indicates that the complex utterance is oriented towards the conclusion towards which Q is oriented.

Following the example of Occam's -disposable- razor, I think that when there is a common property for all utterances of the same sentence, there ought to be, in the description of the sentence, some features that enable the utterance description to state this common property of the different utterances. In other words, at the output of the sentence semantics level of analysis, there ought to be something that should be taken as input to the pragmatic level and will enable it to formulate the argumentative properties common to all utterances of the same sentence. I call the study of this something "pre-argumentative analysis". The reason why I talk of "disposable" razor is that it is through utterance analysis that we discover the interesting properties of sentences. So that we need, for heuristic reasons, to use the pragmatic analysis in order to know what kind of output we want for the sentence analysis : we dispose of the razor only after using it...

B. **What is argumentative in semantics.**

In spite of this slight methodological incursion into pragmatics, my concern is for sentence semantic analysis. I postulate a semantic level of sentence analysis such that :

- no information about the world or the speaker's (or hearer's) beliefs are taken into account at this level;
- all of the **informative** meaning carried by the sentence can be represented at this level (in particular, the logical information as well as the conventional implicature ;
- the **pre-argumentative** aspects of the sentence are described at this level;
- the representation of meaning and the description of pre-argumentation are both **compositional** ;
- information about the world and beliefs only need to be added at the next level of analysis to get full interpretations of the utterances of the sentence.

Note that I do not claim that models of this kind have any psychological reality, not even any chance to be good candidates, as such, for computer simulating of understanding. Thus my claim of autonomy of semantics (including pre-argumentation) towards pragmatics is neither an ontological claim nor a claim of technical

efficiency, but rather an epistemic one. This way of analyzing language aims at answering some linguistic and methodological questions, and it is as such that I wish it be tested for its applicability to Artificial Intelligence.

Among the theories sharing these assumptions, I would like to speak about what I call **Representation Semantics** : a theory of meaning representation for sentences, inspired by Montague 73 for its formal aspects, but diverging from it in its more fundamental issues. Representation Semantics uses the tools developped by Montague but, instead of aiming at describing the meaning of a sentence, as a result of its semantic analysis, it only pretends to give, as its output, a representation of some aspects of its meaning : partial models of the presuppositional content, the informative content, **and the pre-argumentative content of the** sentence[1]. I use Karttunen and Peters' conventional implicature framework[2], as a pre-selection of possible models for representing the meaning of sentences. This is shown to avoid the classical paradox of the presupposition/entailment relationship[3]. Meaning representations for sentences include pre-argumentative features in such a way that, given the situation and the adequate topoi, the argumentation of an utterance -in that situation and within the corresponding cultural frame- of the sentence analyzed can be computed.

II. OUTLINE OF A THEORY OF MEANING REPRESENTATION.

A. **Ingredients.**

A detailed presentation of the theory would require a long and careful discussion of the concepts involved in it (some of which have already been discussed in Raccah 80, 82 and 83), a justification of their **raison d'être** and of their articulation within the theory. However interesting, these technical and foundational aspects do not fit this paper (both for material and strategical reasons). Nevertheless, I would like to briefly sketch the great lines of the analysis process suggested by the theory .

The following diagram should partially illustrate this point.
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[1]See Kamp 80, for the informative content ; Raccah 80 or 83 for the presuppositional and informative contents and Bruxelles-Raccah 83 and Raccah 84 for preliminary discussions about the pre-argumentative content.
[2]Karttunen and Peters 79.
[3]cf. Raccah 82.
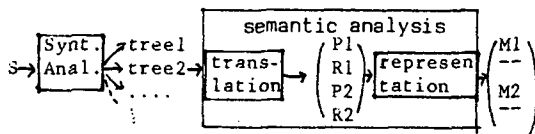
Where[1] :
S is a sentence¥1 expresses what is presupposed
P2 expresses what is asserted
R1 expresses conditions on argumentation
R2 expresses pre-argumentation
M1 is a model representing P1
M2 is a model representing P2.

Each sentence is given one (or more, if ambiguous) analysis tree by the syntactic module. Each tree is then 'decomposed' into four formulae : one for the presupposition, one for the asserted informative content, one for conditions on argumentation, and one for pre-argumentation. The first two 'decompositions' can be obtained by the use of Karttunen and Peters' method, inspired by Montague's translation function[2]. They both lead to the construction of a partial model, say one of the smallest models satisfying P1 for the presupposition, and one of the smallest models satisfying both P1 and P2, for what is asserted. An example of constructions of this kind is given by Kamp's discourse representations (Kamp 80)

B. Yes, but what about argumentation ?

Conditions on argumentation are imposed mainly by the use of connectives (like but, however, even, etc.). A semantic description of these connectives states, among other things, the relationship between the possible argumentative orientations of the utterances connected[3]. Formulae expressing these conditions on argumentation will only appear in sentences containing this kind of connectives, since I haven't found, as yet, simple sentences imposing conditions on argumentation. The form of this kind of formulae is shown in the discussion of the example.

Pre-argumentation is a theorical construct much harder to justify on empirical grounds than anyone of the other three[4]. Its theoretical justification, however, is easy to see : The topoi apply to some semantic indications in order to
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[1] Please recall that this process is not intented to be a model of how humans actually deal with language nor a suggestion about how a computer should be structured : it stems from an external epistemic view of language.

[2] See Montague 73, Karttunen and Peters 79, and Raccah 80.

form argumentative orientations of utterances. These indications cannot be equated with the informative content of the sentence, for two reasons :
(i) the same sentence, say "It is 8 o'clock", can be used in an argumentation whose premiss is 'it is late', as well as in an argumentation whose premiss is 'it is early'. We will have to take the sentence "It is 8 o'clock" to be pre-argumentatively ambiguous, while its informative content is not.
(ii) Adverbs of degree (rather, very, extremely,...) usualy do not modify the argumentative orientation of utterances (while they change the informative content of the sentence uttered) : they indicate the force with which the utterance, as it is presented, argues for the orientation. For example, if I say "This car is very expensive" as an argument for not buying it, it is not the very-expensiveness of the car that makes the argument, but its expensiveness; what the use of "very" says is that my arguments for not buying the car are stronger because my evidence for its expensiveness is stronger : in fact I even have enough evidence to say that it is very expensive.

Formulae expressing the pre-argumentation will also express the pre-argumentative value ascribed to it by these indications. The form of these formulae (which can certainly be improved) is $\{c\}_\iota$: where c is a logical expression (standing for the pre-orientation) and ι is an index standing for the pre-argumentative value.

III. AN EXAMPLE.

I will now show, in an example analysis of a particular sentence, how the theory builds descriptions of the different aspects of the meaning, and how these descriptions are connected to one another and to eventual pragmatic information, in order to allow an interpretation of the possible utterances of the sentence.

Suppose we want to analyse the sentence
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[3] This position, however, assumes the hypothesis that any utterance of a complex sentence containing an argumentative connective can be considered as a complex utterance, i.e. an utterance which can be decomposed into two utterances linked with this connective. See Bruxelles-Raccah 83 for a discussion of this hypothesis.
[4] Fortunately, this kind of justifications do not concern us here, but I realize that even the ugly notion of informative content seems to have more intuitive backup than this one : a story to be continued...

(3) The present king of France is very old but he plays Jazz.

in a cultural context where it is believed that
a) old people tend not to like Jazz, and
b) people who play Jazz tend to like it.

Note that there are very many other things believed about old people, such as (a')

(a') old people tend to be wise,

and many other things believed about people who play Jazz, such as (b')

(b') people who play Jazz tend to wake up late in the morning.

We will take the topos expressing (a) to be the rule :

(Ta) $\{O(x)\}_i \vdash \{\sim L(j,x)\}_i$

Where O stands for old, L for like and j for Jazz[1], and the topos expressing (b) to be the rule

(Tb) $\{P(j,x)\}_k \vdash \{L(j,x)\}_k$

Where P stands for play.

Suppose now that the analysis of (4)

(4) The present king of France is very old

gives the following four formulae :

P1(4) : $\exists x \forall y (K(y) \leftrightarrow y=x)$
P2(4) : $[V(o)](\gamma y K(y))$
R1(4) : 1
R2(4) : $\{O(\gamma y K(y))\}_v$

where K, $V(o)$ mean "present king of France", and "very old", $\gamma x P(x)$ means "the unique x such that $P(x)$", 1 is truth. P1(4) says that (4) presupposes that there is a unique entity which is the present king of France ; P2(4) says that (4) asserts that this entity is very old ; R1(4) says that (4) imposes no conditions on argumentation ; and R2(4) says that (4) is pre-oriented towards whatever conclusion can be infered from the present king of France being old, and that the conclusion will obtain with a force.

Similarily, suppose that the analysis of (5):
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[1] This is terribly sloppy (the symbolic language used is not defined) and incomplete (for instance, there should be an indication of conditions on the application of the topos), but it doesn't affect my purpose.

(5) He (the present king of France) plays Jazz

gives the following four formulae :

P1(5) : $\exists x \forall y (K(y) \leftrightarrow y=x)$
P2(5) : $P(j, \gamma y K(y))$
R1(5) : 1
R2(5) : $\{P(j, \gamma y K(y))\}_n$

with similar interpretation.

If, in addition, we have a formal description of but in accordance to what has been suggested in section I, we account, in a compositional way, for all of the four aspects of (3) which are examined here : let us see this in some detail.

The formal description of but is the following
P1 (X but Y) : P1(x) $\wedge$ P1(Y)
P2 (X but Y) : P2(x) $\wedge$ P2(Y)
R1 (X but Y) : Topos/R2 (Y) = $\sim$ Topos/R2 (x)
R2 (X but Y) : R2(Y)

where the first expression says that what is presupposed by X but Y is the conjunction of what is presupposed by X and what is presupposed by Y ; the second expression says that what is asserted by X but Y is the conjunction of what is asserted by X and what is asserted by Y ; the third expression says that the topoi that can be selected are those which are such that their application to the respective pre-orientations of X and Y leads to opposite formulae (i.e. such that the argumentative orientations of the corresponding utterances of X and Y are opposite); the last expression says that the pre-orientation of X but Y is that of Y.

Applying this description of but to (4) and (5) leads to the following description of (3) :

P1 (3) : $\exists x \forall y (K(y) \leftrightarrow y=x)$
P2 (3) : $[V(o)](\gamma y K(y)) \wedge P(j, \gamma y K(y))$
R1 (3) : $Topos/O(\gamma y K(y)) = \sim Topos/P(j, \gamma y K(y))$
R2 (3) : $\{P(j, \gamma y K(y))\}_n$

which corresponds to the actual interpretations of (3). In particular, this description correctly predicts that, without further information about the context of utterance, the pair of topoi that are naturally selected to interpret (3) is (Ta,Tb) rather than the other three possibilities mentioned here. In fact, to select (Ta,Tb') , we would have to believe that not to like Jazz and to wake up late in the morning are incompatible while believing that people who play Jazz tend to wake up late in the morning. If we wanted to select (Ta',Tb) we would have to believe that to be wise and to like Jazz are opposed : this is a possible

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choice, and an utterance of (3) where these topoi were forced by some additional contextual information would be likely to shock some people (including myself). Finally, if we wanted to select (Ta',Tb') , we would have to believe that to be wise and to wake up late in the morning are opposed : another possible choice, that might have more adepts than ~~then~~ the last one.

The theory is still young ; its formal version is even younger, and certainly very imperfect. However, it is the only theory on the "market" (and for that reason, the first one...) which examines this aspect of semantics, and offers a basis for a conception of a Natural Language Processor that might "grasp the idea" expressed by a text and not only retrieve pieces of information.

A computer version of a small fragment of French is now at study. The programming languages used for this study are PROLOG and LISP. The programming of syntax and of the informative aspects of semantics follows the ideas of Friedman and Warren 78 and 79 and of Hobbs and Rosenschein 78. For the pre-argumentative aspects and topoi rules, nothing had been done before and much remains to be done...

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