

IN SEARCH OF THE SEMANTIC VALUE(S) OF AN OCCURRENCE: AN EXAMPLE AND A FRAMEWORK

1. INTRODUCTION

The semantic phenomena discussed in this paper, although pervasive in Natural Language, are often discussed in different frameworks, and therefore their status and importance varies from theory to theory. This paper attempts to sketch a general framework; due to space limitation, only the main ideas will be developed, and we believe that these ideas will be easier to grasp if we concentrate on one word, which will be used in most of our examples. We have selected the french word *examen* (*exam*, *examination*), but the phenomena under discussion would have been as well described on other usual nouns.

The plan of the paper is as follows: section 2 presents examples of sentences where what could be considered as a single word sense in a lexicon, nonetheless corresponds to a wide set of semantic values; section 3 develops the main features of our framework, namely considering inferences to be central to Semantics, carrying them out at variable depth, taking them to be defeasible; section 4 insists on a specific phenomenon, called ‘co-presence’ by which, contrary to the usual semantic theories, the occurrence of a word is not interpreted as a single entity; section 5 discusses some consequences for a computational implementation of this framework.

2. EXAMINING *examen*

The word *examen* has roughly at least three main senses: a general observation, e.g. *examen de la situation* (*situation survey*), a medical test, e.g. *vos examens sont bons, vous pouvez rentrer chez vous* (*your tests are fine, you can go back home*), and a school/university exam. All the occurrences of *examen* in this paper concern this last sense.

(1) L'examen aura lieu demain.

The examination will take place tomorrow.

- (2) Paul a laissé l'examen de système sur le bureau de Jean.
Paul left the operating system exam on Jean's desk.
- (3) L'examen est trop long. Il ne tient pas sur une page.
The exam is too long. It cannot be written on one page.
- (4) L'examen était facile.
The exam was easy.
- (5) Cet examen a toujours lieu en juin.
This exam always takes place in June.
- (6) L'examen de fin d'année commence mardi.
The final exam begins on Tuesday.

Even if (1)-(6) concern the same sense of the word *examen*, nevertheless the semantic value of each occurrence is very different. To be brief, the occurrence in (1) refers to the process of testing candidates; in (2), to the paper on which the subject of the exam is written; in (3), to the text of this subject; in (4), to the content of the questions; in (5), to a set of events, one for each year; in (6) to a sequence of events which take place on different days.

These examples (and the list can easily be extended) illustrate the multiplicity of interpretations that a word sense can take according to its context of occurrence. From the point of view of the lexicon, they show that it would be impractical (and probably even impossible) to enumerate all the semantic values that a single word sense might get when the context varies. Symmetrically, from the point of view of the interpretative process, they give evidence for the failure of the classical assumption, that the problem of finding the semantic value of an occurrence amounts to 'disambiguation', i.e. to merely deciding which one, in the enumeration of word senses in the lexicon, is the proper word sense corresponding to that occurrence.

The creative use of words in context - which is pervasive in Natural Language - must be accounted for. This issue is well known, and a lot of recent works (Pustejovsky, 1995; Briscoe and Copestake, 1995; Kayser and Abir, 1995; Ostler and Atkins, 1991; Amghar et al., 1996; Pollard and Sag, 1987; Nunberg, 1995; Pernelle, 1998; Fass, 1991; Hobbs et al., 1988) attempt to compute dynamically the appropriate interpretation rather than assuming a closed list of prespecified senses among which the good choice has to be done.

But that is not exactly our point. As a matter of fact, the above sketchy explanation of all examples (1)-(6) might give the double impression of:

- the existence of a semantic universe, i.e. of an ontology given a priori, which corresponds to a domain sliced into categories (or types) often organized in a lattice in which the semantic interpretation has just to grip the appropriate piece (according to the context). Inferential mechanisms, such as coercion, would then merely improve the basic principle of composition in allowing to reach a category different from the ones which are immediately accessible from the words of the text. Accounting for the previous examples would then require roughly the following categories: ‘text’, ‘information content’, ‘paper’, ‘specific-process’, ‘generic-process’, ‘iterative-process’ to be accessible from the word *examen*.
- the existence for each sentence of an ultimate semantic representation, representing its meaning, in which each word occurrence has **one** mapping linked to a given category.

In the next section we develop an alternative to these views.

3. SKETCH OF A FRAMEWORK

We think that there cannot exist an universally valid ontology, or set of categories: the interpretation of a text can, within limits, require to create or modify the categories initially known; moreover, the ontology to be used is conditioned by a given task. And even if the task is fixed, it can be performed in many ways, more or less deeply (see 3.2 below). Different parameters, such as the hearer / reader’s competences, the situation of enunciation, the communication intention, come into play to determine the ‘level’ of understanding.

That leads us to consider semantics as essentially based not on **reference** to a prior universe, but on **inference**.

3.1. *Inference: the core of semantics*

The basic fact is that, when humans read a standard text T, they draw more or less the same set of inferences; this can be - and has actually been - experimentally checked: there is a wide agreement among the readers on the conclusions that follow from T. Furthermore, it is noteworthy that the readers make practically no difference between the propositions which are in some sense embodied in T, and those which can only be derived by adding implicit but obvious information. This is so because the readers, while reading T, have access to a shared body of knowledge that we henceforth refer to as **public knowledge**.

So, we consider that interpretation can be considered as the ability to draw inferences from texts. This ability can be judged according to the more specific task consisting in answering some questions about the text.

With this point of view and for illustration, let us reexamine some of the previous examples.

The inferences to be drawn from (1) should include:

- (1a) The students who take this examination have probably received some days ago a notification indicating where and when the examination takes place; they expect to receive tomorrow a list of questions, that they are supposed to answer; they will know shortly thereafter whether they have been successful or not.
- (1b) An examiner (or an invigilator) will be present tomorrow, ...

From (4):

- (4a) Probably, many students have finished before the end of the examination.
- (4b) Probably, they will have good marks, ...

Placing the inference at the core of semantics does really matter: other approaches agree on the importance of inferences, but they treat them in a module that operates on a representation which is the result of an inference-less semantic phase, often a translation from natural language utterances to logical forms ; this conception is illusory, since inference is clearly needed at all stages of interpretation; even simple nominal phrases cannot, in spite of their common structure, be given a proper representation without inference, e.g. *the tomorrow examination*, *the math examination*, *the Baccalauréat examination* refer respectively to a time, a subject and a grade.

3.2. *Inferences at variable-depth*

Inferences can be carried on more or less deeply. Consider (6) for example: a rather superficial reading may obtain:

- (6a) An interval of time, called final examination, has its beginning point on Tuesday.
- (6b) The students who take it will then have finished their year's training programme.

But a lot of other inferences are accessible too, if the need to derive them arises, e.g.:

- (6c) The exam period will stretch over several days.
- (6d) During this period, the students will not attend lectures.
- (6e) During the last days before Tuesday, they are likely to spend most of their time revising their notes, ...

The depth of the required inferences depends on several factors, such as the identity of who utters the sentence, when, to whom. According to the amount of these parameters known to the reader, (s)he will go deeper or not in his/her inferences, particularly to find out the assumed purpose of this utterance. For example, in (2), if *Jean* is known to refer to the invigilator, the question 'Why did Paul leave the exam on Jean's desk?' should yield the answer 'In order for him to make copies of it and hand them out to the students at the beginning of the exam', while otherwise this answer should not be available.

3.3. *Inference rules*

A part of public knowledge is expressed by means of domain-specific inference rules (a) which are expressed using symbols that represent categories (or semantic values). Some other rules (b) relate word occurrences to internal symbols¹ and link these symbols to semantic values.

At the beginning of the interpretation process, only the inference rules (b) that have word occurrences in their premises are applicable; they determine **semantic values** in their conclusion. At that point, inference rules using semantic values in their premises (a) become accessible as well.

Inferences are not drawn once and for all: they can be changed after a deeper analysis and/or after information is found further in the text; as a matter of fact, new information may require to go back (in physically re-reading, or just in rethinking what had been understood);² similarly, asking new questions can force the reader to go deeper in his/her interpretation and thereby to realize that some parts were mistaken.

¹ Which are of a different kind from the previous ones.

² If sentence (4) is followed by 'so we changed the marks scale because we did not want that most candidates have the maximum', we will withdraw inference (4b).



<http://www.springer.com/978-1-4020-0175-8>

Computing Meaning

Volume 2

Bunt, H.; Muskens, R.; Thijsse, E. (Eds.)

2001, VI, 306 p., Hardcover

ISBN: 978-1-4020-0175-8