On the Referential Competence of Some Machines*

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Abstract. The main reason why systems of natural language understanding are often said not to “really” understand natural language is their lack of referential competence. A traditional system, even an ideal one, cannot relate language to the perceived world, whereas – obviously – a human speaker can. The paper argues that the recognition abilities underlying the application of language to the world are indeed a prerequisite of semantic competence.

If a system of the traditional kind were appropriately endowed with the analytic abilities of a system of artificial vision, it would display (partial) referential competence: e.g. it would be able to verify sentences. In response to Searle’s objections to the so-called “robot reply”, the paper argues that such an integrated system could not be considered as essentially on a par with a purely inferential system of the traditional kind, unless one were prepared to regard even the human understanding system as “purely syntactic” (and therefore incapable of genuine understanding).

Key Words: natural language, vision, understanding, semantic competence, reference.

1. WHY MACHINES DO NOT UNDERSTAND NATURAL LANGUAGE

There are performances which stand in a criterial relation to understanding, in Wittgenstein’s sense. For example, if a person can summarize a text we say that he has understood it (whereas if he cannot, we doubt that he understood). If a person can answer questions concerning the topics a text is about, and his answers appear to be based on the information contained in the text, we say that person has understood the text – whereas if he cannot answer, it is legitimate to raise doubts about his understanding. If a person can correctly translate the text into another language, we say she understood (but if she cannot, and yet does know the second language, we are inclined to say that she did not understand). Such are the “paradigmatic” cases in which we say that somebody understands a text in a natural language: Wittgenstein (1953) would say that our use of such words as ‘understanding’ and ‘to understand’ is intertwined with such performances and the ability to carry them out. Of course, understanding is not identical with summarizing, or answering questions, or translating (or at any rate, it would be highly unnatural to say so). However, we probably learn
how to use the concept of understanding by learning how to assess such performances.

1.1. Natural-language understanding systems

Today, we have artificial systems which can carry out such tasks, with different degrees of success (for a recent survey, see Gazdar 1993). They are called “natural-language understanding systems” precisely because they are capable of one or the other among such performances. However, in spite of the fact that these systems can carry out the very performances on the basis of which we normally say of a human being that she understands a language, many would say that such systems do not really understand natural language.

Of course, the present systems are not as good as human beings at carrying out such tasks: their translations are often clumsy, their summaries unintelligent, the questions they can answer, relatively few in number (Gazdar 1993, pp. 162–163, 168). Moreover, the existing systems can (usually) carry out one or the other among such tasks: in contrast with human beings, they are either translators or question-answering devices or automatic abstractors. Finally, the range of texts that each system can process is strongly restricted, lexically at any rate. In order to overcome such limitations, more is required that just building huge lexical databases or integrating complex systems into one big system: we need to solve problems which have not even been formulated clearly so far, from metaphoric language to pragmatic competence and “contextual” knowledge.

However, even though the AI community is concentrating on these kind of limitations, I surmise that it is not essentially because of them that natural-language processing systems are said not to really understand natural language. To realize this, imagine we have been successful in building a very sophisticated “understanding” system of the standard type. Such a system would have a perfect syntactic analyzer, a vast lexical database, and a semantic interpreter capable of compositionally constructing fully analytic semantic representations: they would be as explicit as we need them to be in order for the system to carry out – thanks to a reasoning module – all the inferences that could be plausibly attributed to a competent, or even a very competent speaker. From ‘There are four elephants in the living-room’ our system would infer that there are four large animals in the living-room, that there are four elephants in the house, that there is an even number of elephants in the living-room, that there are higher mammals (to be more precise, proboscideans) in the living-room; it could even infer that the living-room’s furniture is likely to be badly spoiled. Let us call ‘inferential competence’ (Marconi 1987, 1991) a speaker’s ability to manage a network of connections among words, underlying such performances as semantic inference, paraphrase, definition, retrieval of a word from its definition, synonym-finding, and so forth; we could then say that the ideal system’s inferential competence would be satisfactory to the highest degree.