AMERICAN JOURNAL OF COMPUTATIONAL LINGUISTICS
Microfiche 1
The Finite String
Volume 11 - Number 1 September 1974

GRAMMAR, MEANING AND THE MACHINE ANALYSIS OF LANGUAGE

Yorick A. Wilks

Routledge & Kegan Paul, London, 1972

Reviewed by Stuart C. Shapiro
Computer Science Department
Indiana University, Bloomington

The author states immediately that "the main purpose of this book is not to survey research efforts, nor is it to give a conceptual analysis of the words in the title, but to describe a system of semantic analysis." [p1] The reader does well to remember this, because, although there are 314 entries in the bibliography, and the first chapter on the system itself begins on page 92 of 172 pages of text, no comprehensive survey is given of the relevant literature. Indeed, such a survey would be a massive book in itself since it would include much work from computer science, linguistics, psychology, philosophy and logic. The literature that is discussed is presented only in support of the author's argument that the aim of language analysis is, and always has been, not the judgement of the degree of grammaticality but the explication of meaning. The bibliography and literature discussion also remind the reader of the slow pace of publishing. The book was published in 1972 and reports on work substantially completed by 1968 [5]. Except for one paper by Wilks himself, no bibliography item is more recent than 1969. The meaning in the text of "recent" must be understood in light of this fact.

Wilks makes one mistake in his background discussion that deserves comment since it leads him to reject a possible approach for a false reason. He, correctly, characterizes the Artificial Intelligence (AI) approach to the "problem of 'meaning and the machine'" [p. 3] as an attempt to get machines to "understand" languages, but he rejects this approach because he misunderstands one of the basic paradigms of AI--the Turing test [3]. Wilks misstates the Turing test [p. 5,6] in such a way that Weizenbaum's ELIZA program [4] passed the misstated test [2]. Wilks states that ELIZA "has passed Turing's test, and has done it by such simple minded procedures as to devalue the notion of 'understanding by machines' as an approach to the problem of 'meaning and the machine'...Weizenbaum's work has, from within AI itself, produced a disappointing answer for those who hoped that 'machine understanding' would provide a solution to the MT problem." [p. 6,7] Of course ELIZA did not pass Turing's test, and is accepted in the AI community as a demonstration of how much can be done by a program without understanding.

The semantic system Wilks describes, Computable Semantic Derivations (CSD), is designed solely to disambiguate word-senses. This is, for Wilks, the major task in language analysis since he sees the main aim of language analysis as explication of meaning and, "to be meaningful is to have one and only one of a number of possible interpretations...with respect to some dictionary." [pp. 23,30] For Wilks, a sentence like "Colorless green ideas sleep furiously" is meaningless not because it has no reading, but because it has several. It is possible to embed the sentence in a context that will give it a unique reading--therefore, a meaning, and it is possible to do this in several ways.

CSD does not produce a parse tree of the sentences it analyzes, although it does a small amount of what might be considered syntactic analysis. It also does not produce a representation of the "meaning" of the sentences, for example, of the sort adequate for a question-answering system. What it does is to assign word senses to the content words of the text and, by use of various combination rules, attempt to assign a single word sense to each word occurrence in the text. A word sense is represented by a "semantic formula" and a "sense description." A semantic formula is a list structure whose atomic elements are selected from a set of 53 primitive semantic classifiers. The sense description is a list of English words providing an informal description of the word sense. The semantic classifiers correspond to Katz and Fodor's semantic markers [1] and the sense descriptions to KF's distinguishers. The semantic formulae are, however, more complex than KF's simple lists and Wilk's combination rules are more complex than KF's projection rules, and apply across sentence boundaries. Wilks's system recommends itself by being embodied in a computer program that runs and produces readings of paragraphs of text. It is only when a theory is embodied in a running program that one can be sure that it is well defined and can discover what it predicts for any case.

Another strong feature of CSD is its Expand facility designed to model "our undoubted ability to recognize and understand words being used in a new, or possibly metaphorical, sense, as in Dylan Thomas's 'A grief ago'" [p. 54]. When a reading cannot be produced for a paragraph, Expand constructs a new sense for some word and attempts to resolve the paragraph using this new word sense. However, the new sense is always a sense of some other word in the paragraph [p. 167].

The book is not self-contained. Details of CSD which are necessary for a full understanding are contained not in the book but in the appendices of the earlier technical report [5] to which the reader is frequently referred. The book was also not proofread well. For example, page 83 ends at the end of a paragraph and page 84 begins in the middle of a sentence.

The CSD approach is presently being applied to machine translation [6;7;8]. It is radically different from other current approaches rooted in linguistics and logic. Its adequacy as a model awaits psychological testing. Its adequacy as a program has been demonstrated but so far only on a few small examples.

References

1. Katz, Jerrold, J., and Fodor, Jerry A. The structure of a semantic theory. Language 39 (April-June, 1963), pp. 170-210. Also in Fodor, Jerry A., and Katz, Jerrold J., eds. The Structure of Language, Prentice-Hall, Englewood Cliffs, New Jersey, 1964, pp. 479-518.

2. Special Interest Group on Artificial Intelligence of the ACM. ELIZA passes Turing test. SIGART Newsletter, no. 10 (June, 1968), pp. 15-16.

3. Turing, A.M. Computing machinery and intelligence. Mind 59 (October, 1950), pp. 433-460. Also in Feigenbaum, E.A., and Feldman, J., eds. Computers and Thought, McGraw-Hill, New York, 1963, pp. 11-35.

4. Weizenbaum, J. ELIZA--a computer program for the study of natural language communications between man and machine. Comm. ACM 9, 1 (January, 1966), pp. 36-45.

5. Wilks, Yorick. Computable semantic derivations. SP-3017, System Development Corporation, Santa Monica, California, January, 1968.

6. _____. The stanford machine translation project. Natural Language Processing, Rustin Randall, ed. Algorithmic Press, New York, 1973, pp. 243-290.

7. _____. Understanding without proofs. Proc. Third Int. Joint Conference on Artificial Intelligence, Stanford, California, August, 1973, pp. 270-277.

8. _____. An artificial intelligence approach to machine translation. Computer Models of Thought and Language, Schank, Roger C., and Colby, Kenneth Mark, eds. W.H. Freeman and Co., San Francisco, 1973, pp. 114-151.