

it is tempting to suggest that a different treatment in the user-access issues of lexical entry, word processing for post-editing, and fail-soft outputs might have affected the outcome favorably.

*Jonathan Slocum, "A machine(-aided) translation bibliography"*

The third paper in which Slocum was involved is a bibliography of machine translation, including machine-assisted translation and terminological studies. Perhaps the most up-to-date piece in the volume, this is another candidate for periodic updating, and constitutes by itself a sufficient justification for acquiring the volume.

*Machine translation systems* is a valuable collection of papers gathered with a view toward relating the research models with both commercial production needs and existing production systems. The criteria for success of a system-oriented project must, as Slocum maintains, focus on the comparison of system performance against human performance, taking into account the processes that both methods share. It is hoped that the perspectives of this volume will persist, whether in future collections, or in an updated version of this one.

*John S. White* has been involved in machine translation research and development since 1977, and was project manager of the METAL project from 1984 to 1986. His address is: Planning Research Corporation, 1500 Planning Research Drive, McLean, VA 22102.

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## NATURAL LANGUAGE PROCESSING

**Hugh M. Noble**

(Robert Gordon's Institute of Technology, Aberdeen)

Oxford: Blackwell Scientific Publications, 1988, xii + 240 pp.

(Artificial intelligence texts)

ISBN 0-632-01502-0, \$33.50 (sb)

[Editor's note: This book is reviewed twice.]

*Reviewed by*

*Elena Pascaleva*

*Bulgarian Academy of Sciences*

Useful survey books devoted to problems of natural language understanding and computational linguistics make use of several main approaches to the presentation of the material:

- Illustrating concrete research with a chosen formalism in order to achieve a gradual introduction to the subject matter (depth-first approach).
- Analysing a number of most representative contemporary methods of presentation and processing of linguistic knowledge in order to cover the whole range of achievements in the field (breadth-first approach).
- The two above-mentioned modes of description can be combined with the enumeration of problems that

are still unsolved but crucial for the progress of research.

Noble's book *Natural language processing* is a successful combination of all three approaches, each of them dominating in different parts of the book.

Part 1 presents a description of an extremely simple NLP system by means of the ATN formalism and the programming language POP-11 (partly Prolog, too). The result of the operation of the system—which later is described consistently in a highly limited microworld, adhering to the principle "from the simple to the complex"—is the parsing of basic English syntactic structures of the simple sentence. The presentation is a typical illustration of the first approach listed above. The author displays an admirable ability to introduce the reader to serious linguistic problems, each of them worthy of separate treatises (e.g., the formalized description of the English temporal systems) within a microworld consisting of three points, connected by a line.

Part 2 is an enquiry into the semantics of NLP systems (making use of the second approach). Several alternative means, already successfully adopted in AI systems, are proposed. These proposed means are aimed at overcoming the incompleteness of the linguistic description proposed in Part 1. For the purpose of successively acquainting the reader with these means, the following model of presentation is used: every new approach suggests means of overcoming the failures of the previous one. The order is thus: case grammar, frames, scripts and plans, and conceptual dependencies. At this stage, the illustrations do not contain concrete programs, but rather only examples for the operation of the basic formalisms.

Part 3 (where application aspects have definitely moved to the background) is an attempt to analyze various aspects of real NLU, i.e., natural language understanding by people. Raising the slogan to work out a theory of semantic presentation, already unlimited by concrete microworlds, and at the same time proposing a formalism of his own for such a presentation, the author leaves the field of AI systems and enters the sphere of the cognitive and pragmatic. A large number of problems are touched upon: perception, motivation, causation, models of communication, knowledge acquisition, metasemantic problems, cognitive aspects of truth, falsehood, negation, quantification, and others. Since only 73 pages are devoted to this huge amount of problems, the author obviously only manages to draw our attention to summits that are yet to be conquered, not only through CL and AI, but also through general linguistics. The height of these summits clearly demonstrates the distance that is yet to be covered in order to achieve real NLU modeling.

Though extremely concise, the presentation in this part of the book, with the impressive range of problems discussed brought together by a unified philosophical

treatment, is of interest for a large number of specialists.

The other two parts of the book make it a good textbook, too, mainly of AI and for computer scientists above all, having access to POP-11 (as well as VAX, Sun, Hewlett-Packard, Apollo, or Gould machines). The number of possible users of the book would probably have been significantly larger if Prolog had been the main programming formalism used.

Because of the various degrees to which mathematical and programming formalisms are mastered by students of linguistics, one cannot give a definite answer as to the best textbook on CL to be used. These differences in the depth of penetration in each other's field are a natural consequence of the interdisciplinary nature of the subject.

*Elena Pascaleva* is senior researcher in the Linguistics Modelling Laboratory, Centre for Informatics and Computer Technology at the Bulgarian Academy of Sciences. She works in the fields of machine translation and natural language processing. She also teaches computational linguistics in the Faculty of Letters of Sofia University. Her address is: Sofia 1113, Akad. G.Bontchev str. 25A, CICT-BAS, LLM, Bulgaria.

*Reviewed by*  
*Dan Fass*  
*Simon Fraser University*

When a book appears with a general title like *Natural Language Processing* and the claim that it will be "invaluable reading to undergraduates . . . as well as to professionals specialising in this area," anyone interested in natural language processing (hereafter NLP) will probably want to know its contents. A book like this represents, in a way, all of us working in the area and presents the area to people seeking an introduction to it.

Sadly, this is a disappointing book. The book's title, the blurb on its back cover, and its introduction give a misimpression of its actual contents. The book, it is claimed, fills a gap: whereas other books on NLP "tend . . . to be orientated towards research reports, reprinting these without much analysis or comparison," Noble's book, it is claimed, "describes different approaches as a coherent progression, characterised by increasing complexity and richness of semantic description."

However, there have been a series of books that survey different approaches to semantic and syntactic analysis in NLP, e.g., Tennant (1981), Winograd (1983), Harris (1985), Grishman (1986), and Allen (1987); Barr and Feigenbaum (1981) and Shapiro (1987) give shorter overviews of NLP and related topics; Schank and Riesbeck (1981) and Sowa (1984) offer particular views of semantic description in NLP (Sowa's book also provides an extensive review of NLP research); and there are several edited collections of articles on NLP

(e.g., Lehnert and Ringle 1982; Grosz, Sparck Jones, and Webber 1986). Of these, the bibliography of Noble's book lists only Winograd's, Harris's, and Schank and Riesbeck's books (the most recent reference is 1985).

The blurb and introduction are correct in that, even with the books mentioned above, a gap exists that needs filling: there is relatively little critical analysis or comparison of research in NLP in semantics and pragmatics. However, Noble's book does not fill this gap. Instead, the book's three parts cover the following. Part 1 focuses on just one approach to syntactic analysis, augmented transition networks (ATNs). Part 2 emphasizes basically just one approach to semantic description, Schank's Conceptual Dependency (CD) theory and later work added to it. In Parts 1 and 2, programming examples are given in the language POP-11, which is described briefly in the one appendix. Part 3 discusses some problems in semantics and NLP and ends with the author's personal view of NLP.

If Noble's book offered a comprehensive and original critical analysis of the syntactic and semantic approaches and an interesting, unusual view of NLP then the book's title and claims might be overlooked, but it does not offer such an analysis or view. And unfortunately what is presented is marred by vague or unacknowledged references to other people's ideas and systems, unsubstantiated claims, misapprehensions, errors, and inconsistencies. Below is a sample of each.

Perhaps the book's main problem is that subject after subject is introduced without citing any references. This is unhelpful, especially in an introductory text. No references appear in the descriptions of, for example, time and tense (pp. 39–55), case grammar (pp. 106–114—no mention of, e.g., Fillmore), frames including frame inheritance and frame demons (pp. 115–121—no reference to Minsky or others), and naive physics, "the term used to describe everyday knowledge of the physical behaviour of the world" (p. 145—Hayes not cited). A further example:

Another aspect of the microworld approach which gives some disquiet is the tendency to define objects in terms of their properties in a rather inflexible way. A man does not cease to be a man if he loses his legs. The identity of an entity is not simply a function of its properties (p. 145).

No references are given, though Brachman (1985), for example, discusses just this.

To give an example of an allusion made to a system: Chapter 16 mentions "one well-known system which used a 'blocks world' " (p. 144) without ever saying in the chapter that the system is Winograd's SHRDLU program or referencing his (1972) book. The bibliography, however, references Winograd's book (p. 221) and mention is made of "Winograd's 'blocks world' system" allowing a novice reader to guess that the "well-

known system" mentioned back on page 144 was Winograd's. Another example:

It may seem strange to include spatial relationships in a list of outstanding problems, because there have been a number of systems developed which appear to solve this problem quite successfully (p. 149).

No references are given to any systems.

The following quotations give an idea of the unsubstantiated claims made in the book:

Alongside the flourishing exploitation of established techniques, a fundamental rethink of the approach to natural language processing is currently in progress among research workers. It is recognised that in order to progress we must backtrack to a more elementary level, and develop a theory of semantic representation which is not over simplified by being restricted to a limited context or 'micro-world' (p. 143).

This is a considerable claim, yet the book does not state which researchers have been doing this rethinking and developing this new theory of semantic representation.

The theory of conceptual dependencies has been influential, and has been used as the foundation for a number of interesting systems which have achieved a limited measure of success. Although it has an ad hoc flavour which is philosophically unsatisfactory, it addresses questions of meaning and interpretation which have been largely avoided by many other NL systems (p. 126).

This quote begins Chapter 14 on "Conceptual Dependencies." The first reference to any people in CD theory is made seven pages into the chapter. What "interesting systems" are being referred to? No systems are mentioned in the chapter. Who has suggested that CD theory has "an ad hoc flavour?" What "questions of meaning and interpretation" have been largely avoided in other NL systems? We are never told.

The book also contains some misapprehensions. For example, Chapter 12 on "Frame-Based Systems" says that: "Special languages have been developed to facilitate the use of frames, of which the best known is FRL (Frame Representation Language)" (p. 120).

Surely, KRL (e.g., Bobrow and Winograd 1977) and KL-ONE (e.g., Brachman and Schmolze 1985) are better known (incidentally, no references are cited for FRL). Another misapprehension is that "the total vocabulary of Basic English" is "about 600 words" (p. 216); its core vocabulary is 850 words (Richards 1943, p. 20ff).

On a more superficial level, though quite distracting all the same, is the number of spelling and typographical errors, missing or superfluous words, incorrect citations, and style inconsistencies.

In sum, a better title for the book might be, say, "How to Implement Some Techniques from Natural Language Processing in POP-11" because that is the

gap that the book fills in the NLP literature. However, if beginners are looking for an introduction to NLP or professionals are looking for an overview of the area, they might well consider looking to Grishman (1986), Allen (1987) or Shapiro (1987).

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*Dan Fass* is a postdoctoral fellow at the Centre for Systems Science, Simon Fraser University, working in the field of semantics for natural language processing. Fass's address is: Centre for Systems Science, School of Computing Science, Simon Fraser University, Burnaby, BC, Canada V5A 1S6. E-mail: fass@cs.sfu.ca