

representation of linguistic knowledge, although his main concern is extensibility. His English generator, KING, uses a simple control scheme that exploits the rich linguistic representations in a separate, frame-based, hierarchical system. The section on grammars and grammatical formalisms present detailed papers on everything from the relevance of Tree Adjoining Grammars to generation (by Aravind Joshi) to a formal model of systemic grammar (by Terry Patten and Graeme Ritchie). There is also a detailed description of a generator, by Harry Bunt, that uses pragmatic information.

The final sections primarily contain the contributions of the psychologists. Koenraad De Smedt and Gerard Kempen propose what is surely the first true computational model of sentence production that mimics the incremental nature of human production. Their model, which includes a monitoring component, captures various phenomena, such as hesitations, syntactic deadlock, and self-corrections, including modifications to conceptual structures.

Another contribution by Willem Levelt and Herbert Schriefers, explores stages of activation of lexical properties such as sound form and conceptual conditions. One of the more interesting aspects that they address is how a lexical item checks if its conceptual conditions are satisfied. They extend the earlier idea of matching a core sense to include checks on specificity of meaning.

One final paper is worth mention. Karen Kukich's paper presents a connectionist implementation of part of her stock market report generator. This is important, but preliminary, work on architectures that could liberate generators from serial processing schemes. However, we should not throw out our previous serial schemes just yet.

On the whole, this book provides an important source for research on many aspects of natural language generation. Although the contributions are not of uniform quality and level of detail, most are very good.

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NOTE

1. The views expressed in this review are the author's and do not necessarily reflect the opinions of SRI International.

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THE LINGUISTIC BASIS OF TEXT GENERATION

Laurence Danlos

(Centre National de la Recherche Scientifique, Paris, France)

(Studies in Natural Language Processing)

Cambridge University Press: Cambridge, England, 1987, x+222 pp.

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Reviewed by

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In this book Laurence Danlos has been able to achieve a nice balance between straight linguistics and straight computer science (artificial intelligence). She uses a detailed linguistic analysis as the basis for a text generation system. In doing so, she has managed to come up with ideas of interest to both fields.

The book describes the methodology behind a generation system whose aim is to produce "good" texts from semantic representations of what is to be conveyed. Danlos says that there are two kinds of decisions that must be made to do this:

- Conceptual decisions (e.g., what order should the information be presented in, what should be made explicit and what implicit?); and
- Linguistic decisions (e.g., where should sentence boundaries be made, what words should be used, what syntactic constructions?).

Danlos rather convincingly defends a claim that all of these decisions are dependent on each other. For instance, a decision to order the information in one way will limit the choice of syntactic constructions available (which in turn will limit lexical choice) and vice versa. In addition, there is no a priori reason why priority should be given to one of these decisions over the others. The priority decision concerning a particular semantic relation can only be made within a particular domain after detailed linguistic analysis. In order for the generation system to work, it must capture the available conceptual and linguistic choices. Danlos advocates encoding the choices in two structures, and illustrates how the choices are determined and resulting structures used for texts concerning direct causal relationships (between an ACT and RESULTing state) within the terrorist domain. The two structures she advocates are:

1. A lexicon grammar that is specific to a particular domain and semantic relationship and encodes the possible simple sentences (lexical items) that can be used to express concepts in the domain (e.g., the act and result in a direct causal relationship such as a murder attempt); and
2. A discourse grammar that is specific to a particular semantic relation and encodes the remaining choices.

For instance, for a direct causal relationship, once the simple sentences that express the ACT and RESULT have been chosen, the choice of syntactic structure, the ordering of information, and the number of sentences still remain. Moreover, not all combinations of these choices yield acceptable texts. The discourse grammar encodes the acceptable choice combinations for the semantic relationship.

Thus, in order to build a generation system which is able to handle some particular semantic relation, one must first do a detailed linguistic analysis to find the simple sentences that could be used to convey the information (and encode this in the lexicon grammar), and next do another linguistic analysis to see how these simple sentences can be combined, ordered, and syntactically presented so as to convey the semantic relationship (and encode this in the discourse grammar). Once the analysis has been done, the generation system can use these two grammars to do generation. It is the case, however, that the two grammars encode choices that are mutually dependent. Thus a choice in one will limit the available choices in the other. The priority of these decisions can only be determined within a particular domain. In applying this generation model to several domains, Danlos is extremely thorough and insightful.

While one would hope that the domain dependence that Danlos advocates is not necessary, her analysis is quite convincing. Throughout the book she points out areas where "general principles" used by others must actually be operationalized in a very domain-dependent fashion. Thus the usefulness of such principles is called into question.

In all I found the book to be most interesting. As a computer scientist I found the book's linguistic analysis very helpful. It forced me to look at generation from a new point of view. I would expect that linguists will have a similar reaction because of the book's strong commitment to processing. I believe that Danlos has been able to successfully straddle the fence that lies between these two fields. In doing so, she has made a real contribution to both.

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COGNITIVE SCIENCE: AN INTRODUCTION

Neil A. Stillings; Mark H. Feinstein; Jay L. Garfield; Edwina L. Rissland; David A. Rosenbaum; Steven E. Weisler; and Lynne Baker-Ward
(Hampshire College and University of Massachusetts, Amherst, MA)

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The study of cognitive science in modern terms is an emerging field and the term itself evokes many discussions regarding its nature. For instance, what are critical aspects of its study, and to what degree can certain traditional disciplines contribute? Given these facts, this book makes a significant contribution to providing a basic overview of current cognitive science. But I am not reviewing it strictly for its contribution to the study of cognitive science. Instead, I am reviewing it here as it might be used for an introduction to natural language processing (NLP) or to issues which are relevant to computational linguistics. The attempt will be to focus only on issues that are related to language and its processing. However, since there are areas where the separation of language and cognition in general are impossible, there will be some related description of the cognitive discussions.

The overall presentation of the material is at a level that is easily accessible to students unfamiliar with the problems raised. Specifically, for persons beginning the study of language as a part of cognition, including its acquisition, its processing, and aspects of its knowledge base, I find the discussions very adequate in most respects. Because the chapters are individually authored, there is some disparity in style and type of information contained, but for most chapters this can be overlooked.

First, I will raise some problems that I found with the text that might influence its selection. Of critical import to a book such as this is a chapter that attempts to integrate what has been presented separately. This is lacking here and I feel is a serious omission. Having one final chapter that pulls together the threads of commonality that have been described throughout is very important for new students in a field. Even having suitable pointers between chapters as cross-reference to where another viewpoint of the same problem is presented would be helpful. This also is not done; the reader is left to infer such relationships. Without significant guidance from someone who is knowledgeable across several of the disciplines, seeing the parallel and interrelated research efforts is not a trivial task, but is necessary to fully grasp the problems faced in cognitive science