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Text generation

Using discourse strategies and focus constraints to generate natural language text

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Preface

There are two major aspects of computer-based text generation: 1) determining the content and textual shape of what is to be said; and 2) transforming that message into natural language. Emphasis in this research has been on a computational solution to the questions of what to say and how to organize it effectively. A generation method was developed and implemented in a system called TEXT that uses principles of discourse structure, discourse coherency, and relevancy criterion. In this book, the theoretical basis of the generation method and the use of the theory within the computer system TEXT are described.

The main theoretical results have been on the effect of discourse structure and focus constraints on the generation process. A computational treatment of rhetorical devices has been developed which is used to guide the generation process. Previous work on focus of attention has been extended for the task of generation to provide constraints on what to say next. The use of these two interacting mechanisms constitutes a departure from earlier generation systems. The approach taken here is that the generation process should not simply trace the knowledge representation to produce text. Instead, communicative strategies people are familiar with are used to effectively convey information. This means that the same information may be described in different ways on different occasions.

The main features of the generation method developed for the TEXT strategic component include 1) selection of relevant information for the answer, 2) the pairing of rhetorical techniques for communication (such as analogy) with discourse purposes (for example, providing definitions) and 3) a focusing mechanism. Rhetorical techniques, which encode aspects of discourse structure, are used to guide the selection of propositions from a relevant knowledge pool. The focusing mechanism aids in the organization of the message by constraining the selection of information to be talked about next to that which ties in with the previous discourse in an appropriate way.

This work on generation has been done within the framework of a natural language interface to a database system. The implemented system generates responses of paragraph length to questions about database structure. Three classes of questions have been considered: questions about information available in the database, requests for definitions, and questions about the differences between database entities.

The work described in this book was done at the University of Pennsylvania and would not have been possible without the help of a number of people who deserve special mention. First and foremost, is the influence of my advisor, Aravind K. Joshi, who provided many of the insights and much appreciated guidance throughout all stages of the work. I am also grateful to Bonnie Webber for her many helpful suggestions, pointers to relevant papers, and editorial comments. The implementation of TEXT was greatly assisted by Kathleen McCoy and Steven Bossie who designed and implemented portions of the system. Kathy developed a system which automatically generated a portion of the knowledge base and implemented the knowledge base interface. Steve designed and partially implemented the tactical component used in TEXT.

Many people read and commented on various sections of the manuscript. Barbara Grosz's comments on the chapter on focusing were particularly valuable. Norman Badler, Peter Buneman, Richard Korf, Michael Lebowitz, Eric Mays, Kevin Matthews, Cecile Paris, and Ellen Prince also contributed in this area. Finally, the detailed and insightful comments of the unnamed reviewers must be mentioned as these were extremely helpful in improving the text.

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