DISCOURSE STRATEGIES FOR DESCRIBING COMPLEX PHYSICAL OBJECTS

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ABSTRACT

In past work, discourse strategies, identified through analyses of naturally occurring texts, have been used in computer systems to guide a generation system in deciding what to say. In this paper, we describe the use of discourse strategies to guide the generation of descriptions of physical objects. In particular, we present a new type of strategy, the process strategy, which provides directives on how to trace the underlying knowledge base. Since the system has a set of possible strategies that can be used to generate descriptions of physical objects, we identify how a strategy can be selected based on information about the user and show how a system can combine several strategies in a single description so that it chooses the most appropriate strategy at each point in the generation process.

1. INTRODUCTION

In previous work, researchers (e.g., McKeown, 1982, 1985; Mann, 1984; McCoy, 1986; Kukich, 1985; Weiner, 1980) have identified and formalized the structure of naturally occurring texts for particular goals or situations as discourse strategies. These strategies have been employed in computer systems to guide the generation process in deciding what to say and how to organize it. One commonality of strategies presented in the past is that they impose a structure on the knowledge base which is used to produce text. That is, the structure of the generated text is based on an abstract characterization of patterns occurring in many texts and is not dependent on the structure of the underlying knowledge base. We term this type of strategy a declarative strategy.

By examining texts which describe physical objects, we found that they exhibit a type of structure that differs from that captured in the discourse strategies previously formalized. In this paper, we present a new type of strategy that encodes this new structure. The key characteristic of this strategy is that it consists of directives on how to trace the underlying knowledge base to select textual content. We term this type of strategy a procedural strategy. The structure of the text produced by a procedural strategy mirrors the structure of the knowledge base in ways dictated by the strategy. In contrast, texts produced by declarative strategies mirror the abstract pattern represented in the strategy, not the knowledge base. Both types of strategies are important, and a generation system can produce a greater variety of texts if it can make use of both. We show how a procedural and a declarative strategy can be used in combination to produce a single description of a complex physical object.
2. DECLARATIVE STRATEGIES IN NATURAL LANGUAGE GENERATION

Declarative discourse strategies are typically composed of rhetorical predicates. Rhetorical predicates are the means available to a speaker to present information, and characterize the structural purpose of a sentence. They have been discussed by a variety of linguists (Grimes 1975, Shepherd 1926) and computational linguists (Hobbs 1978, 1980, McKeown 1982, Mann 1984) who have also referred to them as coherence or rhetorical relations. Researchers construct declarative strategies by analyzing naturally occurring texts. The main method used in such text analysis is to decompose a text into propositions (or clauses), classifying each proposition as a predicate. The combination of predicates appearing in texts with the same discourse structure is identified as a discourse strategy. A few predicates, based on Grimes's and Shepherd's definitions, are shown in Figure 1.

1. Identification: Description of an object in terms of its superordinate.
   Example: This bear is a koala bear.

2. Constituency: Description of the sub-parts or sub-entities.
   Example: The telephone consists of a transmitter, a receiver and a housing.

3. Attributive: Associating properties with an entity.
   Example: Beth's teddy bear is black and white.

4. Cause-effect: A cause-effect relationship between two events or relations.
   Example: The soundwaves strike the diaphragm and cause it to vibrate.

5. Comparison:
   Example: The loudspeaker works in the opposite way to the microphone.

6. Elaboration:
   Example: The diaphragm was originally invented by Thomas A. Edison.

7. Renaming:
   Example: The current goes through the coil, called the 'primary coil'.

Figure 1. Rhetorical predicates used in this analysis

In earlier work on text generation, McKeown (1982) found that certain combinations were associated with discourse purposes such as providing definitions, comparisons, and descriptions. Mann (1984) identified a large number of rhetorical nucleus/satellite combinations found in a variety of texts. Similarly, McCoy (1986) identified combinations of rhetorical predicates that are appropriate for correcting different types of user misconceptions.

As an example, consider the constituency strategy which McKeown found could be used both to provide definitions and to describe the type of information available in a knowledge base. It can be characterized by the following four steps and is represented formally as shown in Figure 2.

1. Identify the item as a member of some generic class
2. Present the constituents of the item to be defined
3. Present characteristic information about each constituent in turn
4. Present additional information about the item to be defined.