A Theory of Reading*

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Introduction

Reading has been studied for decades, yet no theories exist which completely explain it. In particular, a type of knowledge-intensive reading, creative reading, has been practically ignored. Creative reading is the reading of texts which contain novel concepts. Nearly all reading will be creative to some degree; thus, any theory which overlooks this will be incomplete. By combining results from psychology, artificial intelligence, and education, we have produced a functional theory of the complete reading process, aimed at explaining creative reading.

Reading supertasks

In order to produce a functional theory of reading, we need to identify the tasks which the process must perform in order to produce the desired behavior. Related tasks are then grouped into supertasks. The supertasks presented below are the result of functional analyses of our own reading processes, backed up by extensive prior research in the areas of psycholinguistics (e.g., van Dijk & Kintsch 1983), reading comprehension (e.g., Black & Seifert 1981), story understanding (e.g., Rumelhart 1977), memory (e.g., Schank 1982), and metacognition (e.g., Flavell 1976).

Metacontrol integrates the other supertasks and includes focus control, which manages the depth of reading; time management; and suspension of disbelief, which enables a reader to accept a text which violates her/his world view. Sentence processing is responsible for low-level understanding, and includes tasks such as pronoun reference, syntactic parsing, and punctuation analysis. The story structure understanding supertask handles story structure details, including character and setting identification, plot description, and genre identification. The tasks making up the scenario understander are the event parser, which identifies agents, actions, states, objects, and locations; the agent modeler, which maintains models of the agents; and the device modeler, which forms models of objects. The explanation and reasoning supertask performs high-level reasoning and learning through the tasks of creative understanding, which attempts to understand novel concepts; interest management; belief management, responsible for managing the beliefs of the characters and the reader; explanation, which builds inferences; and metareasoning, which reflects on the reader's own actions. Finally, the memory management supertask handles memory storage and retrieval.

Conclusions

Our theory is implemented in ISAAC, a system which creatively reads science fiction stories. ISAAC deals with real stories and currently possesses the knowledge and processes to successfully understand Men Are Different (Bloch 1963), which contains novel concepts (sentient robots, the death of Mankind, space travel, etc.). Future work is focused on the addition of stories, as well as exploring issues in evaluation of both reading and creative performance.

Reading is a complex cognitive ability; through understanding the process, we gain a window into understanding general cognition. By making extensive use of the knowledge which exists within a story and by relying on a close interaction between the various reading supertasks, our theory is capable of modeling the reading process in a way which allows creative reading issues to be dealt with, a research goal not reached with earlier theories and models.

References


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