

Teaching Composition using Role Play and Feedback from Multiple Agents

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Abstract. Writing is an extremely difficult task because it requires the simultaneous solution of multiple, often conflicting constraints. This paper describes a two-component system which helps students write by helping them learn what the different constraints are, and how to address them. The first component is a 3D role-playing environment in which students control characters that are put in difficult situations. The second component is a natural language processing tool that gives feedback on what the student writes about the role-playing situation. Different types of feedback come from different agents, helping the student to distinguish between the constraints.

1 Introduction

Creating a written composition is a surprisingly difficult thing to learn to do well. By the time we learn to write, we have been speaking for many years. But the challenges of writing start in school, and for most of us, continue into adulthood. Why is writing so difficult? A leading researcher in composition suggests that the root of the problem is that the writers are influenced by so many constraints that they encounter difficulty in addressing them all at once [1]. Constraints range from basic mechanics of writing (spelling, grammar, punctuation) to larger measures of quality (coherence, relevance, interestingness). They also have a social aspect: What is the relationship between writer and reader? What does the writer know? What does the writer know about what the reader knows? How do the writer's and reader's use of language differ?

The aim of this project is to teach these concepts to students, but to do it in an engaging, and subtle way. This will be done using a system with two major components. One, called Ghostwriter involves a 3D role-playing environment which puts the students in a stimulating situation and gives them something compelling to write about. The other, Select-a-Kibitzer, gives them feedback from a variety of automated commentators. The promise of this work is twofold. It should improve student writing by making the students more aware of what they have to do in order to write well. More significantly, if students can come to grips with the problems of writing, their desire to write should also increase. And because writing is closely tied with learning, the students should be able to learn more effectively in general.

2 Voices in Composition

Flower and Hayes shifted attention from the products of writing to the processes of writing [2]. Flower more recently delved deeper into the nature of those processes [1]. Her work characterizes writing as the negotiated construction of meaning. She describes a variety of “voices” that speak during the process of composition. Voices correspond to the different types of constraints that impinge on the process. The term voice emphasizes that the constraints are not innocent bystanders to the process. Instead, they are actively involved, pushing the writer in different directions. Thus, the writer must “negotiate” with these voices to achieve a solution which creates a meaningful text, and (at least partially) satisfies the constraints.

Some of these voices come from the reader. Some of them come from the particular situation in which the writing is carried out. Some of them come from the socio-linguistic context in which the student is writing. The biggest problem with these voices is that the writer is not normally consciously aware of them. She can’t just write something that “sounds good.” This project’s goal is to help the writer convert these ethereal forces into concrete considerations that she is consciously aware of and can then reason about. This is done in two stages. First, the student interacts with a compelling role-playing “game” called Ghostwriter. Then the student writes a related story and receives feedback from the multi-agent advice system called Select-a-Kibitzer.

3 Ghostwriter

Improvisational dramatic role-play activities are used in classrooms to encourage children to explore the feelings of the characters in a story. Role-play exercises can give a story personal significance to each child, and an insight and understanding of the characters which is reflected in stories written afterwards. The second author’s dissertation describes the development of a virtual environment designed for similar dramatic role-play exercises [4]. This environment is called Ghostwriter.

The underlying aim of Ghostwriter is to be used as a preparation activity for writing stories. The role-playing environment is designed to be engaging, thought-provoking, and emotionally loaded. Robertson examined the effects the virtual role-play environment had on the characterisation in children’s imaginative writing [4]. She also investigated the social interactions which children engaged in and the moral decisions they made during the role-play; and the motivational effects of the virtual role-play environment.

The role-play environment was based on a commercial computer game. It provides high quality graphics, sounds, and music which contribute to the user’s feelings of perceptual presence while communication between role-players promotes feelings of social presence. The role-players’ emotional engagement with the other characters and the conflict within the adventure encourages them to experience self-presence.

For the composition instruction system, after the students have interacted with Ghostwriter, they are instructed to compose a story relating to their experiences. The story is then entered in to the Select-a-Kibitzer system for feedback.

4 Select-a-Kibitzer

The first author has created a prototype computer tool called Select-a-Kibitzer (SaK) that uses a variety of computational linguistics techniques to provide feedback on a student's composition [5]. The feedback addresses many different aspects of the student's composition, for example, spelling, grammar, coherence, relevance to assignment, and coverage of topic. This system advances the state of the art in two ways. First, its feedback is based on sophisticated, knowledge-rich, computational linguistics techniques, including on-line lexical resources, parsing, and statistical language understanding. Second, each different type of feedback is presented by a unique character. So instead of an "all-knowing" computer telling the student that something they have done is incorrect, several characters give their "opinions" on the student's composition. Different characters can also disagree with each other. Thus, students can learn that the constraints on composition are not strict. And they can learn the range of different constraints that exist so that they can deliberately address them during the composition process.

One of the major advantages of this tool is that its statistical language understanding mechanism, Latent Semantic Analysis (LSA) [3], allows it to give feedback on meaning-related issues such as topic, coherence, and relevance. LSA uses a vector-based representation which is derived from a large corpus of related texts. LSA can compare the meanings of any two texts that include words from the training corpus, and is much more robust than traditional natural language processing techniques.

The integrated system will allow the testing of the theoretical models of writing researchers like Flower. If the difficulty of the writing stems from the difficulty of recognizing the different constraints on writing, then this system should help students write better.

The system also has scientific ramifications for the use of agents in education. The animated agents in the role-playing environment are expected to stimulate the students' imagination and desire to write. The success of the feedback system relies on the students realizing that the individual agents have different agendas, and inferring that they can take the issues into account in their thinking about writing.

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