Towards Building An Interactive Argumentation System

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Abstract. This research aims to apply agent models and user-adapted interaction techniques to construct a computational model of argumentation that would enable a system to process utterances (even if agents make claims with which the system disagrees), and to generate appropriate responses. The study is expected to cover issues in areas that include natural language processing, argumentation theory, user modeling, knowledge representation, and commonsense and non-monotonic reasoning.

1 Introduction

Dealing with issues involved in argumentation can lead to a better understanding of how a conflict may be resolved. In a human-computer collaborative situation, for example, people will not always agree with what the system tells them; they might need to be convinced. The system must be able to detect whether the user is agreeing or disagreeing with the system and be able to construct a convincing supporting argument or rebuttal when the need arises. Agent models and user-adapted interaction techniques would facilitate the processing of tasks involved in such problems.

2 Proposed Approach and Relevant Issues

The objective of this research is two-fold: (1) to be able to formulate an effective and efficient computational, and well-founded theoretical framework for natural language-based interactive argumentation systems and (2) to be able to demonstrate and validate such framework by building the argumentation system. The approach involves the use of agent models and user-adapted interaction techniques to process utterances and generate appropriate responses.

In structuring the knowledge base, the beliefs of agents participating in a dialog will have separate models. The models are essentially knowledge-bases that contain the system's initial "idea" of the participants. The models are updated dynamically as the dialog progresses. This approach allows the system to reason about, store updated views of the participants, and draw inferences without believing in what the participants believe.

The research will address important issues involving interactive argumentation systems. It will attempt to combine formal techniques in argumentation (Vreeswijk, 1997; Loui and Norman, 1993) and those that focus on generating effective arguments (Grasso, 1998; Zukerman et al., 1998; Reed et al., 1996). Issues involving model acquisition, knowledge representation, and inferencing techniques in a natural language-based argumentation framework using dynamic belief models will be addressed.

A basic issue in argumentation is argument detection. During the course of an ongoing conversation between participating agents, it is important to determine how to detect an argument to be able to effectively handle the interaction. Moreover, in the context of a dialog, utterances may only correspond to portions of an entire argument. Determining what the argument is, which part of the argument to attack, or which argument to use as a basis for rebuttal, are relevant issues.

The underlying principle for detecting arguments will be to find a general case of an argument schema into which the meaning representation of an utterance can be matched. An argument schema corresponds to how an argument maybe structured. Arguments can be detected and generated via these argument schemata. If a matching schema is found, the corresponding variables are instantiated, thereby establishing attack or support relations between propositions (see Restificar et al., 1999). The use of argument schemata for argument detection and rebuttal allows argument relations between propositions to be established dynamically. Moreover, the method is incremental in that it allows processing of each piece of the utterance and uses only a part of the argument to continue.

Rebutting an argument involves choosing an effective strategy. The strategy may be affected by factors that include input from the user model, the strength and soundness of the argument, and the way the corresponding utterance is generated. A user model is envisaged to play an important role in choosing an effective strategy for constructing rebuttals. The information in the model can be utilized in deciding whether an argument to be presented is convincing enough for a particular user. An effective argument must take into consideration the user model which contains the system's model of the user's characteristics, background, and beliefs. In addition, a user's response would allow the system to make inferences about the user. These inferences can then be used to revise and update the user model. Hence, a user model is envisaged to influence how arguments will be constructed and is itself influenced by the information that can be inferred by the system about the user during the course of the interaction.

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