User Modeling in Mixed-Initiative Hypertexts

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Abstract. This thesis proposes an approach to the generation of hypertexts in mixed-initiative situations in which the points of view of both the user and the system are taken into account. The system, besides planning the content of each "hyperdialogue" section at the appropriate level of detail, has the capability of dealing with changes in the interaction context that require reaction, and proactively provides advice to the user accordingly.

1 Thesis Synopsis

The interaction with a mixed-initiative hypertext can been seen as a form of dialogue in which the user asks for information using the links in a hypertext node and the system answers this query by taking into account the user attitudes and feedback, and by ensuring that the global goal of the communication is achieved through the sequence of dialogue sections. In situations in which the system has a strong communicative goal, such as tutoring or instructing, in addition to adapting the information content of each hyperdialogue section, the system can proactively generate context-dependent advice; this is done when the interaction context requires the system to take the initiative in the dialogue. Establishing a hypertext node content, in this case, requires a dynamic approach to planning to: a) consider both the User and the System's points of view; b) plan the discourse at the sufficient and appropriate abstraction level, to achieve the communicative goal of a specific hyperdialogue section; c) react to changes in the context during interaction by updating the user model and planning the subsequent hyperdialogue section. In my Ph.D. thesis, a method for generating mixed-initiative hypertexts, which fulfils these requirements, has been developed. This method combines a deliberative with a reactive approach: a discourse planner plays the role of a mediator between the system's and the user's points of view, and reacting rules are employed to handle changes in the context situations that require revising the system behavior.

To consider the points of view of both the user and the system, several attitudes have to be included in the two models: knowledge and beliefs, pro-attitudes regarding intentions and goals, and ability to "domain actions" (by the user) and "communicative actions" (by the system). These attitudes are scored in relation to the level of detail with which information was presented to the user.

While planning, several methods are employed to adapt the information content of the explanation: i) through the PRECOND field of planning operators, that may contain conditions on the user's and the system's mental states; ii) by using mediation strategies between the system goals and the user interests. In particular, the generator checks the system goals; if the effect to be achieved is part of them, then the generator checks the system's propensity to talk about that topic to that particular category of user. The following situations may hold:

a. ***the system's propensity to talk is high***. The generator checks the intention of the user:

a1) if this is ***high*** too, it plans for that topic at the lowest level of abstraction, by including a great amount of details; a2) if this is ***low***, it plans for that topic at the highest level of abstraction and sets as 'expandible' those steps that admit a further abstraction level, by rendering them as links in the page;

b. ***the system's propensity to talk is low***. The generator checks, again, the user intention: b1) if this is ***high,*** it plans as for the case a2; b2) if this is ***low***, it plans for that topic at the highest level of abstraction without setting as expandible those steps that admit a further abstraction level.

If the effect to be achieved is not part of the system's goals, then the generator plans for the required information according to the user level of interest in knowing about that topic or in doing that action. In addition to this type of adaptivity, Dy-GeNet also considers the user feedback inferred from link selections, to generate context-dependent advice. When the user selects a link in a previously generated page, the planning process is activated to generate and execute a "relevant" plan. This is the reactive part of the system: each subgoal, or link in the hypertext, is associated with a process that allows planning, executing or recovering a portion of the plan. This process is based on a set of reacting rules that set up the most relevant abstract plan for the given interaction context; this plan will then be refined and executed by the Hypertext Generator. The result of this process is to decide whether or not to include the system advice, and if so, to use it in order to suggest or remind the user to view some related topic or some skipped steps (De Carolis, 1999).

2 Conclusions and Future Work

The need to use a reactive approach in the generation of interactive explanations has been raised by other authors (Moore and Swartout, 1992; Andrè and Wahlster, 1998). My dissertation proposes an approach to the generation of mixed-initiative hypertexts that combines reactive planning, dynamic hypertext generation and modeling of the mental state of the two participants to the dialogue. The described work is almost completed and tested on a medical application domain. However, the planner itself needs to be tested in other domains; in addition, more work on the agent's mental state is needed to refine the reasoning mechanism (at the moment, most of the reasoning is left to the planner. Finally, an evaluation study is needed in order to check the user acceptance of the system.

References

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