Affective Adaptivity in Interactive Assistance Planning

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Abstract

Assistance planning is a distinctive type of interactive planning, in which the planner supports a human being while trying to achieve some complex goal. An intelligent assistant capable of assistance planning decreases the work overload, which is characteristic of several activities. On the other hand, it is of great help to humans working towards the solution of some complex problems [Lindner, 1993].
An interactive assistance planner generally has a representation of the task to be executed as a partial ordered plan. This feature allows the user to choose among different paths of execution. Furthermore, it is a hierarchical planner: in this way, the decomposition of the actions enables the system to reduce the task to the actions executable by the user. This set of "human executable actions" depends on the user's competence and familiarity with the task, but it can also change in accordance with the user's affective-cognitive state. Therefore, it is interesting to have a user model in which the relation between the set of executable actions and the affective-cognitive state is realized.
With this demo, we want to show a simplified prototypical tool in which the assistance to the task-oriented activity is characterized by adaptability to the user's mental state. The system consists of an application (in order to provide a task domain) and of an assistant to the user's decision-making [Amant, 1997].

The **TeCLE** application (**Te**xt **C**oncepts **L**earning **E**nvironment) is a simple tool that allows an Italian user to study an English text. By means of this tool, the user can select a set of terms from an English text file, then associate each term with the Italian translation, a definition and the key-terms contained in that definition in order to obtain a concept hierarchy in which leaves are the corresponding primitive concepts.
Thus these functionalities allow the user to build a database with which to represent the conceptual knowledge of the text, in order to use it as an aid for study. That activity is an example of a complex task in which it is useful to have assistance.
The **Texas** assistant (**T**ask **ex**ecution **as**sistant) is an intelligent agent that can make both a model of the actions that the user is capable of executing and a model of his/her cognitive-affective state. Execution starts when the user has selected a task. At any step, Texas indicates to the user one or more executable actions.

The overall execution is simpler because the user can avoid considering actions that are too difficult or not executable or unuseful.
Texas is based on a production system characterized by a knowledge base of objects. The triggering of the rules depends of the changes of the knowledge base (e.g. creation of objects, deletion of objects, modification of values in the slots). The action decomposition continues until it produces a set of operators all contained in the model of actions executable by the user. Starting from those operators, the program generates all the instances compatible with preconditions of each action and with the precedence constraints.
Then, the system enters a planning production system mode that, interacting with the user, plays the role of an assistant planner for the human decision making.

At any stage of the execution, the assistant indicates to the user the *currently executable actions*. Then, the user can select an action and execute it, otherwise can decompose or compose some actions, in order to modify the model of *user executable actions*. This model evolves differently for each cognitive-affective state: if the user indicates a change of his/her mental state, it may have a corresponding change in the user executable actions and consequently in the way in which the task is communicated by the assistant (through the currently executable actions).

The key element which we want to highlight throughout this demo is the correlation between the set of user executable actions (that represents his/her execution capability) and the cognitive-affective state.
For example, if the user communicate to the agent a change of his/her experiential state, the set of the user executable actions may change. In that case, the actions that **Texas** will indicate to the next execution step will also change.
We stress the fact that in this prototype the functionalities for the representation of the cognitive-affective state are very simplified. The assistance for decision making is only a special case of assistance planning. Moreover, the tasks are already represented in the system, but in general we can have a partially ordered planner that can not only build a complete partially ordered plan, but also linearize it.
Nevertheless, the prototype would be sufficiently rich to show the utility and feasibility of an assistance planner adaptable to the user, to his/her execution capability and to the changes of his/her mental state.

For a more detailed description of the system see [Valitutti, 2002].

References

[Amant, 1997]: Amant, Robert St. (1997). *Navigation and Planning in a Mixed Initiative User Interface*. Proceedings of the 14th National Conference on Artificial Intelligence ({AAAI}-97), pp. 64-69. Providence, Rhode Island. AAAI Press / MIT Press.

[Lindner, 1993]: Lindner, M. (1993). *Planning for the assistance of human agents Navigation and Planning in a Mixed Initiative User Interface*. In Forschungsberichte des Graduiertenkollegs Intelligente Systeme fur die Informations- und Automatisierungstechnik.

[Valitutti, 2002]: Valitutti, A. (2002). *Modellizzazione emotiva nell'esecuzione assistita di compiti complessi*. Degree thesis in Phisics, Università Federico II, Napoli. Available on WWW at http://tcc.itc.it/people/valitutti/home/degreethesis/degreethesis.html