Decision-theoretic planning for content planning in ITS

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Abstract:
In this paper we focus our work to determinate the mechanisms of decision-making that permit to calculate an objective in working session for one learning particular (dynamic content planning). This work comes within the framework of AMICAL project, which is an informatics environment for teaching and learning to read in French Language, for student at the beginning of learning. our approach is to use Bayesian network for represent tutor’s uncertain beliefs about the student state for each knowledge to be acquire, and decision theoretic planning to select the optimal objective by using dynamic decision network to help children (five years) for learning to read in French Language.

Our aim in this work is to specify a method to manage the matter contents to be taught, within the framework of an intelligent tutor system for the training of the reading of the French language to 5-6 year old schoolchildren.
The choice of the reading is justified on the one hand, by the lack of the adaptive systems in this field of training and on the other hand, by its role for the 5 year old children in the school, and it is regarded as the base of any training, and a failure in this matter will introduce a school failure.

In the literature, the most of research in instructional planning in ITS are focused on aspect of delivery planner and interaction planning. But little are interests of content planning, it (content planning) considered as such as goals organization problem with graph (And/Or/Ipart…) [9], consequently planning content consist in traversing the nodes of the graph. This method remains insufficient to exceed ad-hoc and especially to carry out an individualized training, adapted for each learning profile in the field of the reading. Because, on the one hand the training of the reading is not linear and non sequential: the progression is not made a basic element, the letter, with the most complex element which is the text. The four objects of the language (letter, word, sentence, text) are approached in parallel in their relationships, and on the another hand with uncertainty on the state of knowing of learning. It

1 AMICAL : Architecture Multi-agents Interactive Compagnon pour l’Apprentissage de la lecture
is for that we chose in our research to apply decision-theoretic approach to planning dynamically the contents. This approach was used in other work like DT Tutor[7],CAPIT [6], iTutor [5]for interaction planning.

In this paper, we consider the organization of the contents as a task of planning with decision-making which consists in determining starting from knowledge to make acquire and the student model what to make with him, i.e. to determine the objective in working session, “basic element of learning object LO [4]”, this objective was defined as a set of the units of objectives (UOs)[2] and each UO = (Action, Kow, Context). Action: specify the intention of teaching, Kow determines knowledge to make acquire and Context: a context for specify the level of acquisition of this knowledge K (knowledge, application,… ) within the meaning of Bloom [1].

That says that the calculation of an objective in working session will depend on:

- choice of knowledge to be acquire
- choice of the intention of teaching (Action)
- And the choice of the context in which this knowledge will be treated

For that, the first stage consists to organize knowledge of the reading according to a causality graph. And to present “under uncertainty” the student state for each knowledge to be acquired, by basing on the probabilistic approach. Thus the graph and the probability distribution -obtained starting from the empirical data- for each node, constitute a Bayesian network [8], who presents the tutor beliefs on learning state. Consequently planning content can be treated as a partially observable Markov decision problem (POMDP)[3] , and the action (context) choice can be determined by maximising the expected utilities for sequence of actions (contexts).

This theoretical approach used, we permit to develop a rational agent to determine an objective in working session with three components:

- Component belief that constitute beliefs on the state of knowledge of the learner model is using the network Bayesian
- Component decision: this component is modelled using the approach to decision-theoretic planning
- Component learning for update the agent beliefs
References:


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