Chapter 4
A Learner Model Based on Bayesian Networks in Adaptive Educational Hypermedia Systems

ABSTRACT
The work presented in this chapter lies within learner modeling in an adaptive educational system construed as a computational modeling of the learner. All actions of the learner in a learning situation on an adaptive hypermedia system are not limited to valid or invalid actions (true and false), but they are a set of actions that characterize the learning path of formation. Thus, one cannot represent the information from the system of each learner using relative data. It requires putting the work in a probabilistic context due to the changes in the learner model information during formation. In this chapter, the authors propose to use Bayesian networks as a probabilistic framework to resolve the issue of dynamic management and update of the learner model. The experiments and results presented in this work are arguments in favor of the hypothesis and can also promote reusing the modeling obtained through different systems and similar modeling situations.
INTRODUCTION

First of all, to clarify our purpose it seems important to note that the work presented in this chapter lies within Learner modeling in an adaptive educational system construed as a computational modeling of the learner. That is to say, the representation and specification of knowledge (broadly defined) on the learner. Different approaches were made to manage the model of the learner with multiple objectives, from the learner’s knowledge evaluation, to the recognition of the plan followed in problem solving.

Despite these various attempts for modeling the learner which is characterized by a dynamic aspect, we always find difficulties in achieving this goal. The proposed approaches give us just a static view of the learner model, but this model is always in development (the learner knowledge is evolving in the same module), that is why a dynamic view is essential. In order to monitor the behavior of the learner in real time during formation, we must adopt a dynamic modeling approach to the learning model management.

All actions of the learner in a learning situation is not limited to valid or invalid actions (true and false), but it is the actions that characterize his learning path of his formation. From this observation, we cannot represent the information from the system of each learner using relative data. It requires locating our work in a probabilistic context due to changes in the learner model during formation.

The problem of this chapter can be summarized as follows: how to represent the different functions of a model of the learner? What approaches can be used to perform the update of the different characteristics of the learner model?

We propose in this work to use Bayesian networks as a probabilistic formalism to resolve the issue of management and dynamic update of the learner model. To resolve this issue, we must first ask: Why and how we can represent a learning model with Bayesian networks? How can we go from a dynamic representation of the UML model to a probabilistic representation with Bayesian networks? Is this consideration experimentally justified?
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