Chapter 5
The Determination of Learning Styles in a Learner Model Using the Combination of Bayesian Network and the Overlay Model

ABSTRACT

This chapter aims to treat the problem of dynamic modeling in an adaptive educational system construed as computational modeling of the learner. Modeling the learner in adaptive systems involves different information such as knowledge of the domain, the performance of the learning goals, background, learning styles, etc. Although there are several methods to manage the learner model, like the stereotype model or learner profiles, they do not handle the uncertainty in the dynamic modeling of the learner. The main purpose of this chapter is to show the link between the structure of the learner model and the characteristics of a learning profile and the learning style of a learning situation. This chapter shows how the combination of these two approaches to learner modeling can address the dynamic aspect of the problem in the modeling of the learner. 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

Despite the different attempts to model the learning that is characterized by a dynamic aspect, we always find it difficult to achieve this goal. The proposed approaches give us just a static view of the learner model, but on practice this model is in full development (the learner knowledge is evolving in the same module). Thus, a dynamic view is essential. Therefore, in order to monitor the behavior of the learner in real time during a learning situation; we must adopt a model for dynamic management of the learning model.

The overlay model responds to the problem of dynamic management of learner model by showing knowledge of the learner as a subset of the knowledge of the system. We also presented in a previous work (Anouar Tadlaoui et al., 2014) how Bayesian networks are considered an effective tool to manage the problem of uncertainty in the model of the learner.

Our work focuses on identifying learning styles in different learning situations. More generally, it focuses on the initialization of a learner model in an adaptive educational hypermedia system. The main objective of this article is modeling the learner by combining Bayesian networks, and the overlay model. We aim in this chapter to use the combination of these two methods, to determine the learning style of each learner in a probabilistic way during the learning situation. And to achieve the, a dynamic e-assessment of each learner based on the learning styles determined.

First, we present the concepts and definitions of the learner’s model and the learning styles on which we will base our work. Second, we will define Bayesian networks and overlay model. Then, we will focus on the combination rules on which we based our work to incorporate Bayesian networks with the overlay model. Afterwards, we demonstrate with an example of a learning situation the validity of this combination. Finally, we describe a formal structure for the definition of each learning style for a learning situation. The experiments and results presented in this work are arguments in favor of our hypothesis. This combination can promote also reusing the modeling obtained through systems and similar situations.
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