Chapter 2

Design Methodology of an Intelligent Learning Environment Applied to the Non Violent Conflict Resolution Education

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ABSTRACT

This chapter describes a learning design methodology for creating an intelligent tutoring system (ITS) to support non-violent conflict resolution education in the school environment. The design method is based on a mathematical formalization in which ITS are defined as automata. The aim is to demonstrate that the automata representation facilitates the integration of the domain contents, the pedagogical strategies and the student models in one computational system. The automata structure guides the system design, managing the variables selection of the teaching-learning process. Variables involve the students' characteristics, the interface resources and the pedagogical strategies. Thus the whole teaching-learning process is modeled as an automaton which fits with the ITS structure. The non violent conflict resolution domain was chosen as the case study due to its relevance and its ill structured contents what makes its modeling difficult. The result is a non violent conflict resolution educational process structured as an ITS.

DOI: 10.4018/978-1-61692-008-1.ch002

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INTRODUCTION

The introduction of new information and communication technologies into education should support more efficient and customized educational situations, reaching a greater number of people. E-learning allows “any time” and “any where” teaching learning processes to occur. The wide representation facilities provided by the multimedia technology, from text to virtual reality, increase the communication channels with the learners. The possibility to interact with the contents that bring the hypermedia technologies supports more customized learning process, where the speeds, the contents, etc. can be managed by the learner. However, despite the great potential of pedagogical software, their efficiency is still controversial. The limitations, both from the cognitive (it is unknown exactly how learning occurs) and technological (difficulty modeling a learner or the teaching-learning strategies) areas have restricted the impact of these systems and have impelled intense research activity with the aim of determining how technology can increase the efficacy of the educational processes (Alsop & Tompsett, 2007; Albirini, 2007).

One of the most important efforts of this research is to develop adaptive systems. The automatic adaptation of the systems to the students seems crucial to construct pedagogical systems that integrate the potentiality of technology with the requirements of pedagogy. But the integration of technology with pedagogy is not trivial and many works propose design methodologies to support it. With the aim of contributing to new alternatives for learning design, Curilem, Barbosa, & de Azevedo (2007) proposed a methodology to develop an ITS, focused mainly on adapting the learning environment to the learning styles of the learner. In this work, the structure of an ITS was used to develop an Intelligent Learning Environment. The main advantage of the proposed methodology compared to others, is that it enables, through a mathematical formalization based on automata, to integrate all the areas into one computational system. This is done by modeling the teaching-learning process as an automaton. Once all the variables of the pedagogical process are modeled, they are integrated into the ITS in a natural way.

This chapter will show how the teaching-learning process from an extremely ill-structured subject matter such as non-violent conflict resolution, was modeled as an automaton. It will also present how the automaton will allow adapting the contents, the teaching strategies, the forms of representation and the degrees of interactivity to the learner characteristics. As the main result, the chapter presents how all these components are integrated into the ITS structure.

The structure of the chapter is as follows: the next section presents a general background of the work. Then, the methodology to model an ITS and a teaching-learning process as automata (Curilem et al., 2007) is presented. Subsequently, the next section outlines the subject matter of non violent conflict resolution and the premises on which the teaching-learning model are based. The next section presents the results of the modeling processes. Finally, the last section presents a discussion and the main conclusions of this study.

BACKGROUND

The great challenge for educational technology is determining how to give the learner autonomy in his/her learning process while at the same time guiding him/her with assertive interventions when support is required (Rose & Strangman, 2007; Mayer, Johnson, Shaw, & Sandhu, 2006). In light of a pedagogical concept focused on learning, the aim of educational technology is to become a learning moderator. One of the most important results of this endeavor are ITS and their evolution, intelligent learning environments, where the system adapts to the learner, fostering a highly customized and interactive learning
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