Domain Ontology and Hermann Brain Dominance Instrument Model for Personalized E-Learning Hypermedia System

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ABSTRACT

A number of adaptive e-learning hypermedia systems (AEHS) have been developed to support learning styles as a source for adaptation. However, these systems suffer from several problems, namely: lack of maintenance adaptation to learning style, less attention was paid to thinking styles and the insertion of specific teaching strategies into learning content. This paper proposes an AEHS model based on thinking styles and domain ontology. The experiment was completed in three phases for both experimental and control groups. In the first phase all the students were informed that they will participate in an experimental process. The students received a short introduction on how to use the system and to create a user account for login purposes into the system. Then, information about thinking styles categories were given to the experimental group and were asked to complete the questionnaire. In the second phase, the students followed regularly the lessons until the completion of the course; meanwhile taking a quiz at the end of each lesson. In the third phase, learners followed a link to do the post-test.

Keywords: Adaptive Hypermedia, Adaptation Model, Learner Model, Ontology, Repeated Measures ANOVA, Thinking Style

INTRODUCTION

The advantages of e-learning include classroom and platform independence (Goyal et al., 2012). Even though currently there are many e-learning systems existing on the web, they commonly present the same materials to all students without considering individual differences (Vassileva, 2012). In most web-based courses, the presented materials are only suitable for students who are homogeneous, highly prepared and motivated. When the web-based courses are used by a more diversified student population, it could reach efficiency limits, as these students may have very different learning aims, backgrounds, knowledge levels, learning styles, thinking...
styles and competencies. A web-based course intended for a certain group of students may not be suitable for others. Therefore a flexible web-based course is urgent to be designed so that different students obtain different learning materials and presentations mode.

An Adaptive E-learning Hypermedia System (AEHS) answer these problems modifying the presentation of materials to adjust each individual student, as well as making an e-learning system more effective by adapting the presentation of information and overall linkage structure to individual users in accordance with their knowledge and behavior (Esichaikul et al., 2011). The aim of AEHS is to provide appropriate information to the right student at the right time (Brusilovsky, 1999; Brusilovsky & Peylo, 2003; Shute & Towle, 2003). This paper discusses the design of an AEHS based on learner’s thinking styles and domain ontology.

The rest of this paper is organized as follows: in the second section, we present a state of the art on related works where we give some studies relates to AEHS with different focuses and approaches. The third section is devoted to the presentation of the some fundamental shortcomings of existing AEHS. In the fourth section, we present appropriate thinking styles which used as a basis for designing adaptation mechanism. Next, our implementation with AEHS-TS to generate adaptive course for each learner’s based on learner’s knowledge level and learner’s thinking styles represents in the fifth section. We present in the sixth section the results of an experiment conducted at the level of the university. Finally, the seventh section contains the conclusion and the future work.

RELATED WORK

Many studies related to AEHS with different focuses and approaches, one may cite: Dall Acqua (Dall, 2009) proposed a multidimensional design model, describing the specifications needed for an educational environment and examined the condition that makes a learning environment “adaptive”. Mustafa et al. (2011) conducted a survey on the various models of adaptive content delivery system and proposed newer methods of delivering adaptive content for adaptive e-portfolio system. Mustafa et al. (2011) presented an approach to integrate learning styles into adaptive e-Learning hypermedia system and assessed the effect of adapting educational materials individualized to the student’s learning style. PERSO (Chorfi et al., 2004) employs RBC approach (case based reasoning) to determine which courses to suggest to learners based on their knowledge level, and their media preferences. WELSA (Web-based Educational with Learning Style adaptation) (Popescu et al., 2008) adopts the unified model of learning style which embeds characteristics of several models proposed in literature, to adapt courses to learners.

DISCUSSION

From the review presented above we have seen that only few systems can provide certain types of adaptation independently of the thinking styles model. In the rest, the thinking styles are chosen and the corresponding instructional strategies are predefined by the systems designers. The proposed system this choice and definition should be done by the teachers of the applications. We think that system developers should provide enough flexibility for the teachers to define their own instructional strategies and to decide which strategies to apply for a particular application. According to the systems discussed above, we can conclude that some problems are related to lack of maintenance of adaptation to thinking style and the insertion of specific teaching strategies into learning content. Specifying a pedagogical strategy in learning content prevents the use of the same teaching strategies for different training materials. Rules are included into the program code, while in contemporary systems they are usually stored together with content; however, this is not an optimal solution. In the proposed system, the pedagogical strategies are stored separately from content. Therefore, it can be concluded