A Model for an Adaptive e-Learning Hypermedia System

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ABSTRACT
Recent years have shown increasing awareness for the importance of adaptivity in e-learning. Since the learning style of each learner is different. Adaptive e-learning hypermedia system (AEHS) must fit different learner’s needs. A number of 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 knowledge level. On one hand, the developed prototype will assist a learner in accessing and using learning resources which are adapted according to his/her personal characteristics (in this case his/her thinking style and level of knowledge). On the other hand, it will facilitate the learning content teacher in the creation of appropriate learning objects and their application to suitable pedagogical strategies.

Keywords: Adaptive E-Learning Hypermedia System, Adaptive Hypermedia, Architectures for Adaptive e-Learning Hypermedia System (AEHS), Cognitive Tools for Learning, Evaluation of AEHS

INTRODUCTION
In the last decade, the role of information technology for education has changed rapidly and significantly with the occurrence of e-Learning systems. E-Learning systems have increased their value with the growth and popularity of computer networks through the World Wide Web and the Internet (Esichaikul, V., Supaporn, L., & Clemens, B, 2011). Combining the use of the Internet with potential teaching and learning methods offers new challenges and opportunities in distance education and e-Learning. E-Learning plays a major role in delivering educational material to the learners (Goyal, M., Divakar, Y., & Alka, C, 2012).

The advantages of e-learning include classroom and platform independence. 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). The web-based courses are used by a more diversified student population, it could

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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.

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). AEHS is based on the assumption that each learner has different learner-characteristics and that different educational settings can be more suitable for one type of learner than for another. When course content can be provided in a flexible way, adapted to individual learners’ characteristics through the e-Learning system, the system can deliver the course content so that it capitalizes on the learner’s characteristics in order to optimize the learning outcome (Brusilovsky, 1999; Brusilovsky & Peylo, 2003; Shute & Towle, 2003).

The aim of AEHS is to provide appropriate information to the right student at the right time. This means that an adaptive e-Learning system is able to keep track of usage and to accommodate content automatically for each of the users, for the best learning result.

This paper discusses the design of an AEHS based on learner’s thinking styles (AEHS-TS).

**LITERATURE REVIEW**

There were some studies related to AEHS with different focuses and approaches can be found in the literature, one may cite:

- Dall Acqua (Dall, 2009) proposed a multi-dimensional design model, describing the specifications needed for an educational environment and examined the condition that makes a learning environment “adaptive”;
- Dekson and Suresh (2010) 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 and Sharif (2011) presented an approach to integrate learning styles into AEHS and assessed the effect of adapting educational materials individualized to the student’s learning style;
- PERSO (Chorfi, & Jemni, 2004) employs RBC approach (case based reasoning) to determine which courses to suggest to learners based on their knowledge level, and their media preferences;
- TANGOW (Paredes, P., & Rodriguez, P, 2004) is based on two dimensions of FSLSM (Felder-Silverman Learning style Model): deductive/intuitive and sequential/global. Learners are invited to fill ILS (Index of Learning Styles) assessment when they connect to the system for the first time, the learner’s model is initialized accordingly. Afterword, learner’s actions are monitored by the system, and if they controvert the expected behavior for these learning preferences, the model is updated;
- WELSA (Web-based Educational with Learning Style adaptation) (Popescu, Trigano, Badica, Butoi, & Duica, 2008) adopts the unified model of learning style which embeds characteristics of several models proposed in literature, to adapt courses to learners.

From the review presented above we have seen that only few systems (Popescu et al., 2008) can provide certain types of adaptation independently of the learning model style. In the rest, the learning styles are chosen and the corresponding instructional strategies are pre-defined by the systems designers. The proposed
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