# Chapter 3.18
# Automatic Authoring of Adaptive Education Hypermedia

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## ABSTRACT

Adaptive Hypermedia (AH) can be considered the solution to the problems arising from the "one-size-fits-all" approach to information delivery prevalent throughout the WWW today. Adaptive Educational Hypermedia (AEH) aims to deliver educational content appropriate to each learner, adapted to his or her preference and educational background. The development of AEH authoring tools has lagged behind that of delivery systems. Recently, AEH authoring has come to the fore, with the aim of automating the complex task of AEH authoring, not only within a system but also porting material between different AEHs. Advances in intra-system automation are described using the LAOS framework, whereby an author is only required to create a small amount of educational material that then automatically propagates throughout the system. Advances in inter-system conversions are also described; the aim is to move away from a "create once, use once" authoring paradigm currently in force with most AEH systems, towards a "create once, use many" paradigm. The goal is to allow authors to use their content in the AEH delivery system of their choice, irrespective of the original authoring environment. As a step along this road, we describe the usage of a single authoring environment (MOT) to deliver content in three independently-designed Educational Hypermedia systems—AHA!, WHURLE and SCORM-compliant Blackboard. Therefore, this chapter describes advances in automatic authoring and conversion towards a simple and flexible AEH authoring paradigm.

## INTRODUCTION TO AEH AUTHORING

Adaptive hypermedia (AH) (Brusilovsky, 2001a) started as a spin-off of hypermedia and Intelligent Tutoring Systems (ITS) (Murray, 1999). Its goal was to bring the user model capacity of ITS into hypermedia. However, due to technical limitations, such as bandwidth and time constraints, AH only implemented simple user models. This simplicity also gave AH its power as, suddenly, there were many new application fields and also implementation was considerably easier. Early AH research concentrated on variations of simple techniques for adaptive response to changes in user model. No wonder that most of AH development was research oriented, applied only to the limited domain of courses the researchers themselves were giving (e.g., AHA!, De Bra & Calvi, 1998; Interbook, Brusilovsky, Eklund, & Schwarz, 1998; TANGOW, Carro, Pudilo, & Rodriguez, 2001) and with very rare commercial applications (e.g., Firefly, developed at MIT Media Lab and acquired by Microsoft).

Recently there has been a shift in attitudes. The development of the Semantic Web (Berners-Lee, 2003) and the ongoing push to develop Ontologies (Gruber, 1992) for knowledge domains has extended the importance of AH. Indeed, AH now appears to be the tool of choice for collating the static information of these new approaches and bringing then to life.

Moreover, AH is spreading from its traditional application domain—education—to others, especially the commercial realm, which is eager to be able to provide personalization for its customers. Indeed, we often see the phenomenon of other communities re-inventing adaptive hypermedia for their own purposes and applications.

Adaptive Educational Hypermedia (AEH) (Brusilovsky, 2001b) is, in principle, superior to regular Educational Hypermedia (EH) as it allows for personalization of the educational experience. Regular EH, such as that delivered by WebCT and Blackboard, is not adaptive—exactly the same lesson is delivered to each student. Pedagogical research has shown that different learners learn in different ways (Coffield, 2004). This is a truth self-evident to most teachers; if a student is having trouble learning a subject, then the teacher will alter the manner in which he or she is teaching it and try a different approach. Traditional EH systems could be compared to inflexible teachers who base their lesson mainly on drilling and repetition. Educational systems (real or virtual) that adapt their presentation to the needs of each learner aim to improve the efficiency and effectiveness of the learning process (Stach, Cristea, & De Bra, 2004). If each learner has his or her own Learning Style (Coffield, 2004) and is given a set of resources specific to that particular style then that learner will not only learn "better," but will be able to more effectively develop the given information into deeper understanding and knowledge. AEH systems seek to address the inflexibility of current EH methods. Systems such as My Online Teacher (MOT), AHA!, and WHURLE all answer the need for an adaptive and flexible approach to teaching. They allow current online educational systems to break away from the "one-size-fits-all" mentality and move towards having an appropriate lesson for each student.

AEH systems aim to improve upon current static EH systems. This is not to say that AEH is the universal panacea for online education. Education is not undertaken in a vacuum; the social aspect is also vital. It is essential for learners: to be able to build common ground; to ask and answer (negotiate meaning); to argue and debate; to explicate mental models; to share expertise; to collaborate; and to construct novel ideas and understanding. Work on computer-supported cooperative work (CSCW) addresses this side of the educational process, and often AEH systems will fold this research into them (for example, WHURLE can be used in such a social manner). Collaborative work can be encouraged by the use of simple online social tools: e-mail, for

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