

# INVITED EDITOR'S NOTE

## INNOVATIONS IN ADVANCED TECHNOLOGY FOR LEARNING: AUTHORING FOR ADAPTIVE EDUCATIONAL HYPERMEDIA

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### Abstract

*Why should we look at the authoring process in adaptive educational hypermedia design? How does detecting authoring patterns help the process? Why do we need to consider cognitive styles in adaptive hypermedia? What do these seemingly unrelated topics have in common?* These and other questions were posed to the accepted paper presenters of the "First International Workshop on Authoring of Adaptive and Adaptable Educational Hypermedia". The workshop lead discussions and even more questions. As a result, selected authors were asked to extend their papers, and hence the Special Issue on "Innovations in Advanced Technology for Learning: Authoring for Adaptive Educational Hypermedia" was born. This paper will present the issues that we tried to tackle and how these were answered in the selected papers.

### Key Words

Adaptive Educational Hypermedia (AEH), Authoring of Adaptive Educational Hypermedia, Adaptive Patterns, Authoring of adaptive hypermedia, Cognitive styles, user modeling, adaptive educational hypermedia, field dependence/independence, verbalizer/visualizer

### 1. Introduction

Adaptive educational hypermedia (AEH) [1] has been around for more than a decade. The main purpose of AEH is to offer a personalized environment for the learner. As many learning activities are moving to the Web, and as 'pure' hypermedia always bears the risk of the 'lost-in-hyperspace' syndrome, AEH comes with adaptive navigation and presentation [1], thus aiming at alleviating this risk. Instead, AEH offers customization, which is hoped to be the answer to these issues. From an educational point of view, this means adding pedagogic flexibility to an otherwise inflexible environment. Of course, the main issue is not *IF* adaptivity in educational hypermedia is necessary, because everybody seems to agree that the one-size-fits-all approach has little

to do with pedagogy. Opinions start to diverge when the discussion shifts towards the *application* of adaptive hypermedia. The application methodology can determine:

- a) *what kind* of adaptation should be done,
- b) *to what* this adaptation should respond and, to the more technically oriented:
- c) *when* and
- d) *how* this adaptation should be performed [2].

Here, instead of defending one way or another of applying this adaptation, we embrace the solution of authoring [3][4][5]. By shifting the responsibility of answering the above list of crucial questions (about the application methodology of AEH) towards the authors, the decision making power is moved to where it rightfully belongs; i.e. with the creators of the learning material, who can use their pedagogic experience to create the flexibility and personalization they consider necessary. This shift can only effectively be done by creating authoring tools for AEH [5].

The remainder of the paper is structured as follows. We first introduce in section 2 the most important steps in research on authoring of adaptive educational hypermedia, as we see them. Following this, section 3 shows the answers to those issues we have received. Finally, we draw conclusions (section 4).

### 2. The big topics in authoring of AEH

The most important step when researching the design of authoring tools for AEH systems is to define *what functionality* they should at least provide, as a bare minimum, so that there is enough flexibility, and that the decision power is indeed in the hands of the authors. This implies defining what kind of AEH components they should be able to create, as well as the order of their creation (if existent), etc. The desire of obtaining great flexibility might, however, lead to an excess of work and complexity resulting in cognitive overload for the authors. The next step is therefore to search *for ways of reducing the author's load*, without decreasing the flexibility. This can mean that, if it turns out that authors have to (or might want to) do a lot of repetitive steps, these steps can be saved in some way and reproduced automatically. It also

means that, if the authors all use a similar design approach, they should be able to reuse not only each others materials (as in simple hypermedia Learning Object reuse), but also each others adaptive techniques and pedagogical approaches.

Discussions on these issues should lead to a better understanding and formulation of the possible *patterns* to extract from the authoring process in AEH. Here we use the word ‘patterns’ as defined by Christopher Alexander in ’77: “each pattern describes a problem, which occurs over and over again in our environment, and then describes the core of the solution to that problem in such a way that you can use this solution a million times over”.

We hope to make it possible, with this research, for AEHs to become simpler and more effective for use on a larger scale.

In order to answer to the major questions about authoring of AEH, i.e., the functionality necessary for AEH authoring, and the ways of reducing the authoring load, we created a number of topics to be addressed at the workshop. Suggested themes were:

- a) Best practices in AEH
- b) Design patterns for educational adaptive hypermedia
- c) Authoring patterns in adaptive/ adaptable educational hypermedia
- d) Connecting adaptive educational hypermedia with cognitive/learning styles
- e) Authoring of adaptive/ adaptable educational hypermedia
- f) Applying a), b) patterns in Authoring of AEH
- g) Collaborative authoring issues for adaptive/ adaptable educational hypermedia
- h) Extracting from a), b) structural patterns of AEH
- i) Adaptation model transformations between adaptive educational hypermedia systems based on structural patterns in g)
- j) Evaluation of authoring of AEH and of a)-h)

Ideally, the authoring tools should at least be able to reproduce the most successful AEHs built so far (a). The next step, after deciding what kind of end-products are desired, is to propose several types of *authoring methods* (and tools) for AEH, such as prescribed by (e). Following, we can look at different kind of patterns. For authoring, patterns can be patterns of (b) *design* or (c) *authoring*, after the design is done. Another interesting aspect, especially for the education orientation in AEHs, is that patterns can be found at higher level, and thus connected to *learning and cognitive styles*, (d). From an application point of view, patterns (f) can allow (g) *collaboration* between authors, because patterns allow reuse. Similarly, patterns (h) allow *transformations* (i) between AEHs, such as are used in Open Hypermedia [6]. It is to be expected that these two latter applications also set constraints on the way these patterns are extracted. Finally, there is need of research in evaluation (j).

### 3. Some Answers

This Special Issue features six papers with authors from eight countries of both research and pure application orientation, responding to the following topics:

- Design patterns for educational adaptive hypermedia:
  - The paper of Franca Garzotto et al. [6] treats this issue, by looking at hypermedia patterns and extending them for adaptive, personalized hypermedia.
  - The paper of Paris Avgeriou et al. [8] aims at responding to this issue from a user modeling perspective and setting the basis of a pattern language for it.
- Connecting adaptive educational hypermedia with cognitive/learning styles
  - The paper of Pedro Paredes and Pilar Rodriguez [9] analyze current attempts of implementing learning styles in adaptive educational hypermedia and propose their own model.
- Authoring of adaptive/ adaptable educational hypermedia
  - The paper of Milos Kravcik and Marcus Specht [10] presents the authoring process in their system, ALE, that is already used by several universities.
  - The paper of Tim Brailsford et al. [11] looks at authoring from a linking perspective: the automatic or authored generation of links in their system, WHURLE.
- Applying a), b) patterns in Authoring of AEH
  - The paper of Alexandra Cristea [12] looks at using low-level, structural patterns, in order to automatically author part of the material, or assist the author in the process, by suggesting relevant additions.

### 4. Conclusions

As can be seen in the previous section, the papers selected don’t cover all the hot topics enumerated – it would also not be reasonable to expect this, given the limited space and the spread of the topic.

We have given in this issue priority to the *analysis of existing authoring experiences* [10],[11] on one hand, and to the new, emerging topic of *adaptive educational hypermedia patterns*, be they generic patterns [6], [8], or specific ones, such as the ones derived from learning styles [9], and finally, to the application of patterns [12]. For a more general coverage we invite interested colleagues to refer to the papers of the *WBE’04* workshop on *Adaptive and Adaptable Educational Hypermedia*, or to the papers of the follow-up workshop at the Adaptive Hypermedia conference (*AH’04*) in Eindhoven.

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