

REUSABLE ADAPTIVE HYPERMEDIA E-LEARNING CONTENT USING AICC AND SCORM

Miroslav Bures

*Research group Webing, Dept. of Computer Science and Engineering, FEE, Czech Technical University in Prague
Karlovo namesti 13, 121 35 Prague, Czech Republic*

Ivan Jelinek

*Research group Webing, Dept. of Computer Science and Engineering, FEE, Czech Technical University in Prague
Karlovo namesti 13, 121 35 Prague, Czech Republic*

ABSTRACT

Adaptive hypermedia systems can be used in E-learning to improve efficiency and ergonomic quality of producing information. E-learning adaptive hypermedia system stores information about particular user in his profile and adapt its output in correspondence to user's state of knowledge, preferences or specific needs. In contemporary state of area, the most experimental adaptive systems are closed and possibility of e-learning content interchange between systems is not solved satisfactory. For that reason, this paper deals with problem of creating of reusable adaptive hypermedia content using two established e-learning standards, AICC and SCORM. Principles of e-learning standards usage in adaptive hypermedia systems are presented and pilot project implementation introduced.

KEYWORDS

Adaptive Hypermedia, E-learning, AICC, SCORM

1. INTRODUCTION

Adaptive hypermedia system [1] produces its output according to particular user characteristics [2], [3] as knowledge level, state of prerequisite knowledge, subjective preferences etc. Such functionality is very advantageous to use to improve E-learning process [4], [5]. In the area, high ratio of existing adaptive hypermedia systems are experimental educational systems [6], [7]. But, existing systems don't support their content interchange sufficiently. To improve this situation is one of challenges of contemporary Internet.

Adaptive hypermedia system stores user information in structure defined by user model and use it to compile adapted output, which corresponds to user's characteristic. The source adaptive document, which is compiled as output, is often stored in XML format, which allows proceeding by standard means.

Our goal is to propose how to make adaptive e-learning content shareable and reusable by using contemporary E-learning standards, propose an implementation methodology based on a formal description and verify a proposal by implementation of pilot project, which is introduced in this paper.

2. REUSABLE ADAPTIVE E-LEARNING CONTENT

This paper describes two main ideas to create reusable adaptive E-learning content, using established and widespread E-learning standards, AICC and SCORM. The use case of both differs. We deal with the both separately and finding way, how to use them optimal for construction of adaptive e-learning hypermedia. The main principle of AICC is to change e-learning content as whole course between particular LMS (Learning Management Systems) by standard text communication protocol. The main principle of SCORM is to create reusable E-learning content on the level of content by creating reusable learning objects, particular elements

of E-learning hypermedia document. Each standard represent a bit different approach, but we will combine them to gain optimal result.

2.1 Usage of AICC for Communication between Adaptive Content and LMS

The basic motivation for using AICC [8] by adaptive E-learning hypermedia system is to create adaptive courses that can be used in widespread and popular LMS systems. We can use already existing functionality of LMS. The situation differs here from classical E-learning courses. In case of adaptive hypermedia system, there is some adaptation logic and storage of particular user information needed.

In general, we deal with two cooperating systems, adaptive hypermedia system and LMS. In LMS, there will be stored list of users and an adaptive course signature, running the course from the adaptive hypermedia system. In the hypermedia system, there will be source documents and storage of user information.

Certain part of AICC communication can be effectively used, because a topology of adaptive hypermedia can change. Trivial solution is just to send start and end of a course. Of course, there are better solutions. Topology of adaptive hypermedia can be constructed by two ways.

In the first way, adaptive hypermedia has stable core path, which is accessible to a student in adaptive e-learning course. Such core path is relevant to E-learning course structure which is defined in AICC. When we design a topology of adaptive hypermedia, we can use some non-changing elements. By hypermedia topology, user will be "forced" to meet them. In such elements, AICC communication will be sent to LMS.

In the second way, we add elements sending AICC communication artificially. We consider a set of certain adaptive hypermedia elements in various version of behavior as a milestone of student's progress in e-learning course and send proper AICC communication to LMS. A core path in course, which is relevant to AICC course structure, is virtual in this case. This is a difference in comparison to the first way.

2.2 Usage of SCORM to create Reusable Adaptive E-learning Objects

In previous work [9], [10], [11] we have used basic concept of autonomous element, reacting on adaptation signals. Signals are computed by adaptation logic of adaptive hypermedia systems or signals can be some user's profile value itself. This concept corresponds well to SCORM E-learning standard.

Our task is to design a topology of source adaptive document that will allow to use reusable learning objects as static ones in adaptive system and to export autonomous adaptive elements as SCORM reusable objects. The most suitable for implementation of source adaptive document is XML, which is also used for SCORM E-learning objects description. So, the task bounds are set to mapping of tree topologies.

3. PILOT PROJECT IMPLEMENTATION

As we have mentioned in introduction, our goal is to propose an implementation methodology for creating of reusable and shareable E-learning content by using contemporary E-learning standards. This work is in progress and is continually verified by pilot project implementation. We implement an open web collaborative environment for authoring and playing of reusable adaptive E-learning content. Architecture of pilot project system is displayed on Fig.1.

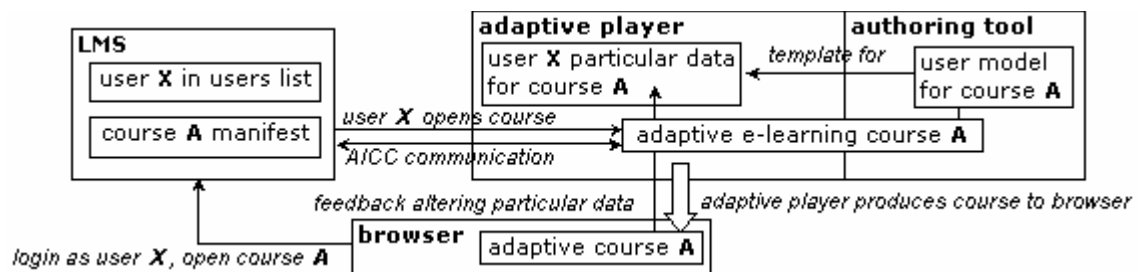


Figure 1. Collaborative adaptive E-learning environment architecture

Collaborative environment consists from authoring and player module. Player module communicates with AICC compatible LMS and sends student's progress information. Adaptive course manifest is stored in LMS. Full course is stored (with particular data of students) in collaborative environment, which open an adaptive course in adaptive player. Student is authorized by ID, which is given by LMS in AICC call.

In this pilot project we use a concept of core path composed from static elements. The mentioned second way, a virtual core path is not intended to implement in contemporary state of pilot project. We intend to implement it prospectively. Proposed system is under implementation work. In parallel, we design a formal description of problem, which will be used in implementation methodology. Next, we are finding a ways of implementation process automation.

4. CONCLUSION

Usage of established E-learning standards AICC and SCORM could make easier to widespread perspective Internet concept of adaptive hypermedia. Both standards can be used in construction of adaptive hypermedia system. We verify the proposal given in this paper by implementation of open web collaboration environment for authoring and playing of reusable adaptive E-learning content, which communicates with LMS that supports AICC communication standard.

A main future work is a development of open implementation methodology, involving principle proposals given in this paper, formal description of problems and particular structure, communication sequences of AICC send from adaptive E-learning course to LMS and experiences from pilot project. Next, we intend to describe a proposed concept of "virtual core path" formally and verify it by involving of such functionality into implemented pilot project.

ACKNOWLEDGEMENT

This research has been supported by CTU Prague IGS grant No. CTU0507113 "Formal description of adaptive web system for E-learning purposes". This proposal is done as part of WEBING research group activity, <http://webing.felk.cvut.cz>

REFERENCES

- [1] De Bra, P. et al, 2002. Adaptive hypermedia and adaptive web-based systems. *In Second Int. Conf. AH2002*. Malaga, Spain.
- [2] Brusilovsky, P., 2001. Adaptive Hypermedia. *In User Modeling and User-Adapted Interaction*. Vol.11, pp. 87-110.
- [3] Brusilovsky, P., A. Corbett, and F. de Rosis, *User Modeling 2003, 9th International Conference UM 2003*, Springer-Verlag, Johnstown, PA, USA, 2003.
- [4] Fong, J. et al, 2002. *Advances in Web-Based Learning*. Springer-Verlag, Hong Kong, China.
- [5] Jones, K., 2004. Sun's Commitment to Education. *Worldwide Education and Research Conference*. Madrid, Spain.
- [6] Brusilovsky, P. et al., 1998. *Adaptive Hypertext and Hypermedia*. Kluwer Academic Publishers, Dordrecht, Netherlands.
- [7] Cerri, S.A. et al, 2002. *Intelligent Tutoring Systems. 6th International Conference ITS 2002*. Springer-Verlag, Biarritz, France.
- [8] W.A. McDonald, J. Hyde, and A. Montgomery, *CMI Guidelines for Interoperability AICC, CMI001 Version 4.0*, 2004.
- [9] Bures, M. and Jelinek I., 2004. Description of the Adaptive Web System for E-learning. *In Proceedings of IADIS International Conference E-Society 2004*. IADIS Press, Avila, Spain, pp 988-991.
- [10] Bures, M. and Jelinek I., 2004. Formal Description of Adaptive Web System. *In The Sixth International Scientific Conference Electronic Computer and Informatics ECI 2004*. Kosice, Slovakia, pp 404-407.
- [11] Bures, M. and I. Jelinek, 2005. Particular Design of Structure for Exact Evaluation of E-learning Hypermedia Documents in Context of Hypermedia Adaptation Process. *In Proceedings of International Conference Virtual University 2005*. Bratislava, Slovakia, pp 206-210.