MODEL FOR ADAPTIVE E-LEARNING IN BIH ENVIRONMENT

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ABSTRACT
Adaptive e learning systems are expensive and their development is consuming both in the sense of time and human resources. Therefore, it is not realistic to expect that such systems can be developed in BiH environment in the very near future. On the other hand, even in BiH institutions involved in e learning, there exist elements of adaptive systems in the form of e content and independent applications that support e learning, such as forums, testing modules, e learning content management modules, and applications for testing the learning styles. In this paper, we present a model that uses the existing solutions combined with one additional module which is collecting data from the individual applications in order to use them for achieving certain level of adaptivity. The suggested solution is possible to implement in the BiH environment is as step in a fully adaptive system development.
Key words: adaptive, e-learning, adaptivity module

1. INTRODUCTION
E-learning is instructional content or learning experiences delivered or enabled by electronic technology [1]. On the other hand, the Adaptive Hypermedia Systems (AHS) make it possible to deliver "personalized" views or versions of a hypermedia document without requiring any kind of programming by the author(s) [2].
Due to it's definition, AHS are ideal for implementation of education, in particular for e-learning. Accordingly, AHS serve to adapt hypertext to student's (user) model, and increase usability of created Learning Objects (LO) [3]. Classical web server is offering the same web content and the same set of links to all students, while active web server is personalizing web content to each student, depending on student's pre-knowledge, goals, and interests.
Adequate basic storage units for AHS are reusability learning objects (RLO), but in order to use adaptive functions, it is necessary to store their semantic annotation (metadata). Classical e-learning AHS have the following adaptive functionalities: suggesting adequate contents to student (based on student's knowledge model), adaptive navigation support, and adaptive presentation [4].

2. BACKGROUND
The Faculty of Information Technologies in Mostar, Bosnia and Herzegovina (FIT) is developing own e-learning platform for several years now, used for in-situ teaching support, distance learning and blended learning. E-learning platform (DLWMS2) consists of two modules: learning management system and content learning management system. The users of learning management system are

lecturers and students. Lecturers are managing the teaching process, accessing student's personal data, grades, status, etc., while students are only checking their own data. Learning content management system contains the learning content developed and maintained by teachers in the teaching process, and used by students in the learning process. In addition, there is an autonomously developed testing module. For teacher-student and student-student interaction, apart from standard methods of synchronous and asynchronous communication, there is a community server (FITCS), which is a knowledge sharing community [5]. The actual reforms in higher education and adaptation to Bologna process demand that e-learning platform, especially for realization of distance learning, enables adequate cooperation of student and educators. In the previous researches, we identified the disadvantages of the existing e-learning system in the frame of the actual reforms:

- lack of continuous monitoring of student's learning process and progress in student's model development,
- inability of identification of internal and external student's motivation factors needed for adaptation to learning style and personalization of learning process,
- content is not adapted to usability due to non-modular structure and non-standardized aggregation, and
- inability of sharing learning content among different systems.

Consequently, it is necessary to use AHS in order to organize distance and life-long learning teaching process.

In this paper, we present the first stage of AHS model development based on the existing solutions.

3. MODEL DEVELOPMENT

The existing modules of FIT DLWMS are: DL platform (including LMS and LCMS), learning style identification module, testing module and FITCS online community. LMS contains basic student data, and AHS predicts data storage on student's learning process, current knowledge, progress and motivation factors. Taking into account that the actual reforms all learning resources (people, knowledge, technology, media, organization) orient towards student (Learner–centered paradigm), the focus of this research is the student model as the centre of e-learning AHS model (Figure 1).
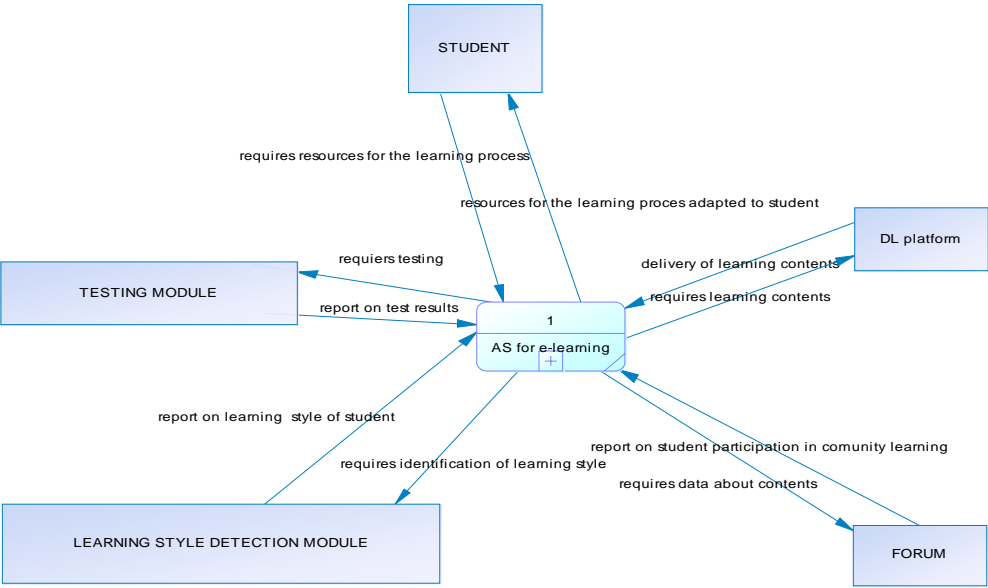

Figure 1. AHS model for e-learning at FIT using the existing resources. Power Designer 12.5.

Data storage "Student" stores the data on student relevant for implementation and realization of adaptive functions. The stored data are the teaching content student accessed, testing results, learning style, the role in the online knowledge sharing community, etc.

The process "Learning resources adaptation" is using the student data in order to ensure adequate teaching content.

Students take part in the following use cases (Figure 2): log on to system, choose knowledge area, start or continue learning and teaching, access student record, test progress, activate the evaluation procedure. The student model registers all of the above-mentioned student's activities, and, based on that data, offers the personalized content set to the student. The base for this personalization is adaptive presentation and adaptive navigation.

Lecturers create four sets of content for each learning module, based on the learning style of student. Accordingly, the system is offering personalized material using sorting of links and their presentation from more to less relevant. This technique is common in goal orientated education systems [6].

For classification of nodes (learning objects) into groups, according the knowledge values from student model, the system uses the user model. The AHS than manipulates the nodes so to navigate the user towards relevant and interesting information, which Brusilovsky calls the adaptive navigation support [4].

In order for AHS to ensure adequate learning content at adequate level of complexity to student, the system will mark, exclude or dim some fragments, based on the value of READ attribute. In this way, system ensures that content is personalized to the given student in the given moment. Brusilovsky calls this process the adaptive presentation [6]. The adaptive presentation is also used for the adaptation of teaching content to the learning style. Reordering of information in the learning content presentation is dependent on the value of LEARNING STYLE attribute of student model.

The adaptive presentation and navigation enable guiding, monitoring and advising of students, and directly affect rising of student's motivation.
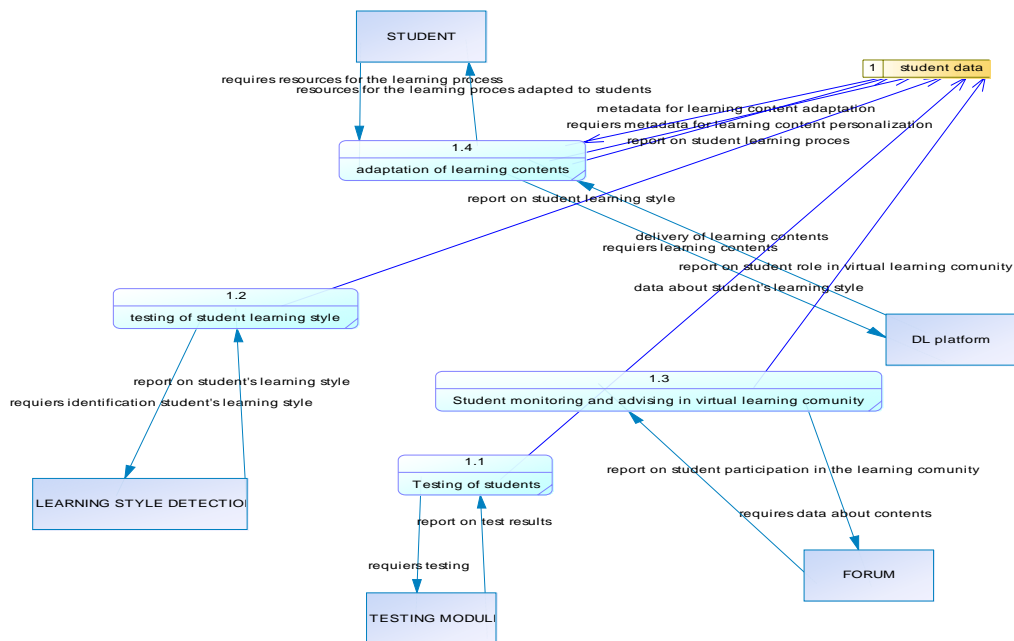

Figure 2: Sub-processes AHS-a for e-learning and interaction with student data repository. Power Designer 12.5.

4. CONCLUSIONS AND RECCOMENDATIONS

Users of e-learning system are students who acquire knowledge, experts on topics who contribute to knowledge base, educators who teach and add didactics to content, and system administrators who manage data of all users and content. Authors are aware of importance of all of these acters in the realization of teaching process, but in this paper, we focus on student as the central point of the education process. The next research stages assume development of models for other acters.

The suggested student model in the AHS e-learning model enables the distance learning process according the requirements of the Bologna declaration. Furthermore, the AHS model is adapted to actual goals and trends of higher education development, as well as the limiting factors of higher education in BiH. It also bypasses the disadvantages of open source platforms (especially concerning the data security), and enables upgrades towards the fully personalized AHS. In that sense, this research is not only the continuation of the theoretical and practical results presented in scientific and expert papers of the authors, but also the foundation of further development of personalized e-learning in BiH.

The application of the suggested model will fulfil the basic goals of it's development, better system-student interaction, more efficient learning process, improved continuous monitoring of learning process, improved advising in one-to-one student-educator interaction, and improvement of student's motivation. All of these goals are in the line with the goals of the requirements that Bologna declaration imposes to higher education.

On the other hand, adaptive functionalities enable personalized learning as well as student progress monitoring in the learning process, while the hypermedia enable availability and usability of content to all students and other acters in the life-long learning process.

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