ITiCSE 2011

June 27-29, 2011, Darmstadt, Germany

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Adaptation of Educational Contents to Mobile Devices

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ABSTRACT
In this paper, we propose a system for adaptation of educational contents to mobile devices, taking into account the skills of the learner, his context and the characteristics of his device.

Categories and Subject Descriptors
K.3.1 [**Computers and Education**]: Computer Uses in Education – Distance learning.

General Terms
Algorithms, Design

Keywords
m-learning, adaptation, mobile devices, skills

1. INTRODUCTION
E-learning has brought a revolution in training methods, as well as support to traditional learning or as new training system. However the main feature of these systems (independence in the student's location) is not completely fulfilled, since the minimum hardware requirement is a personal computer (PC). A true independence in time and place means learning where and when a person wants access to learning materials [1]. Mobile learning (m-learning) is an evolution of e-learning and is based on the use of mobile devices.

Because mobile devices, by their nature, are usually used by one person at the same time, we propose a system capable of adapting educational contents to learners who are performing the training through their mobile device.

2. SYSTEM OF ADAPTATION
The system (Figure 1) aims are to produce educational contents adapted to the needs of the learner (skills), its context and the characteristics of his mobile device. This system has as inputs learning objects (LOs), skills of the learner and features of the mobile device. As output the system will generate an adapted and customized course to the learner. The system is divided in subprocesses that are listed below:

• Selection: It is the process responsible for selecting the components (learning objects, skills and features of mobile device).

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• Sequencing: This is the process that sorts the learning objects so that training is conducted according to the constraints involved in the process of learning [2].

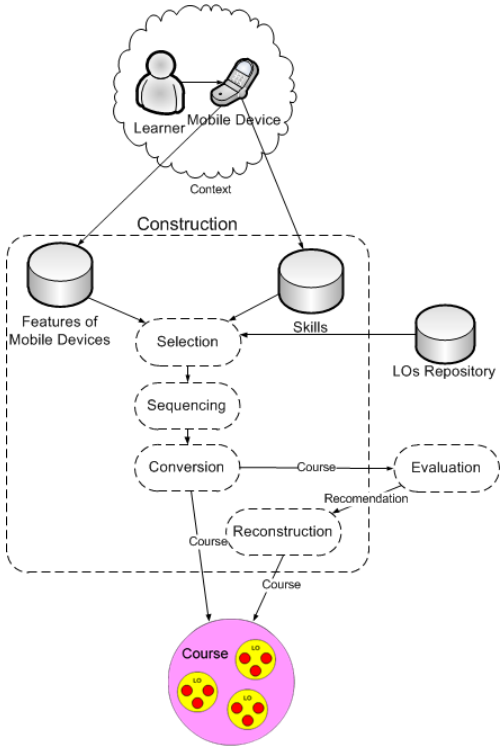

Figure 1. System of adaptation of learning objects.

• Conversion: It is the process that performs the conversion and adaptation of learning contents, taking into account the limitations of the mobile device (screen, operating system, etc.).

• Evaluation: An external expert can make further improvements or suggestions to re-adapt a learning object or course.

• Reconstruction: If the expert has suggested or made changes on any content, this process will rebuild the course.

3. REFERENCES
[1] Motiwalla, L. F. Mobile learning: A framework and evaluation. Computers & Education, 49, 2007), 581–596.

[2] de Marcos, L., Barchino, R., Martínez, J.J., & Gutiérrez, J.A. A New Method for Domain Independent Curriculum Sequencing: A Case Study in a Web Engineering Master Program. International Journal of Engineering Education, 25, 5 (2009 2009), 632-645.