SEMANTIC AND CONTEXTUAL APPROACH FOR THE RECOMMENDATION OF LEARNING MODULES IN MOBILITY

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Semantic and Contextual Approach for the Recommendation of Learning Modules in Mobility

Many researchers argue that mobile learning is just an adaptation of e-learning on mobile technology, but far from a simple extension of e-learning, m-learning raises original issues in technological and pedagogical terms. M-learning is usually based on the consideration of a context rich on information and interactions. The challenge of m-learning is therefore, not simply to transfer on mobile content designed primarily for e-learning. This concept implies that we must rethink the entire process of the learning experience in mobility to maximize its efficiency.

The influence of learning context in a situation of mobility, gives rise to the concept of contextual awareness which stands for the use of "context to provide relevant information and/or services to the user, where relevancy depends on the user's task" (Dey, 2001). Beyond a simple formatting of education, mobile environment requires an adaptive system that can dynamically combine instructions elements in a learning context.

E-learning refers to training devices, which main objectives are: autonomous learning, distance learning, individualization of training and development of online educational relations. Two major players in the system should be defined: the e-trainer and the e-learner. The e-trainer acts as a pedagogical expert in a given domain. His function is essentially to transfer knowledge into blocks of learning modules or answer questions from learners with chat tools or forums. At the same time, the e-learner becomes an actor of this learning. All the tools at his disposal allow him a more accurate and direct access to information. Nevertheless, the learning situation is not controlled. The distance between the two actors reduces the motivation of the learner and the constantly changing learning context makes sometimes the learning content itself inappropriate.

Mobile learning cannot be reduced to the use of e-learning content on a mobile system. Mobile learning requires both a dynamic adaptation of the learning process to the context and a redefinition of the usual process of creating learning modules.

Three key words can describe m-learning: content, context (defined by environmental constraints and learner's profile) and collaboration. The environment of the mobile learner imposes specific constraints on the learning experience. M-learning requires first a better organization of knowledge, for a better rendering in a mobile situation. In addition, mobile devices inherently encourage learners and educators to communicate and collaborate.

In this new environment, the trainer must find another way to build his training modules, favoring collaborative teaching and considering the situation in which the learner is located. Now, the key point of our approach is whether trainers are culturally ready to face this jump, and if so what tools to provide them?

In partnership with the company "CrossKnowledge", the European leader in the field of e-learning, we are working on a new approach to mobile learning, combining both technologies like the semantic web and recommender systems with socio-technical analysis of the relationship between trainers and learners.

This new approach is based on the recommendation of combinations of teaching units. This recommendation is made in real time; it is scalable and determined according to the learning context defined by the situation of mobility.

To answer to the cultural gap for the trainer and the requirements of m-learning, we propose a new methodology for describing their teaching modules using ontologies.

The term ontology, conceived by Aristote and democratized in the domain of semantic web by (Gruber, 1991) is a model of knowledge representation based on the meaning of things. Ontologies can then be used both for modeling context and for organizing learning materials around small pieces of learning objects (atoms) semantically annotated by the pedagogical expert. To exploit the potential of this type of ontology, we will develop a set of weighted rules that help trainers to design learning modules aiming at situations of mobile learning. This design process will be performed using a monitoring tool that builds rules by combining learning atoms according to the teaching context. The combination of context (geo-location, learning time, parameters of mobile devices, user profile, etc.) to the field of m-learning, make it possible to understand dynamic requirements and real needs of learners to provide adequate resources.

This architecture forms a recommender system that can be attached to the family of content based recommender systems. This choice depends heavily on the quality of content and organization of learning modules, required for the recommendation of atoms to learners. This architecture is based on three layers: the domain model and user model that corresponds to the static part, and the adaptation model that corresponds to the behavioral part (Soualah-Alila & al, 2012).
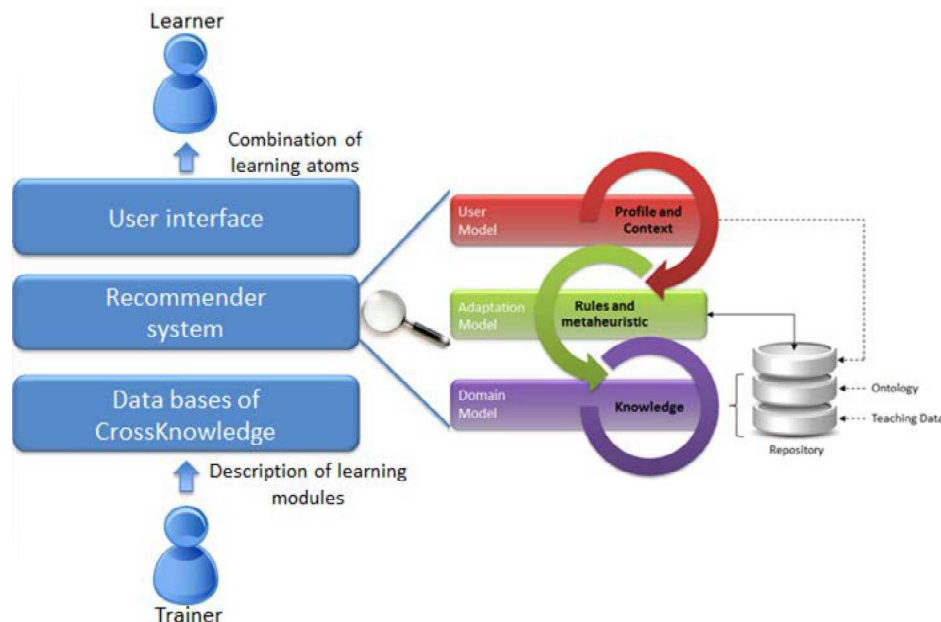

Figure 4. General architecture of our m-learning system

When a learner will use our system, he will have to define his profile. This profile will be completed by context information send by the mobile device. From this profile and contextual constraints, logical rules will be applied to identify and extract pertinent atoms of training course. The association of atoms depending on learning context will be done in real

time by a metaheuristic designed specifically to resolve the combinatorial optimization problem posed by the mobile learning domain.

This metaheuristic will be used to find the best combination of atoms depending on the profile and context. Finally, a proposal of course (made of a combination of elements) will be sent to the learner through the mobile device. If the context changes during the learning, the system can directly switch an element by another, adapting the learning with the new constraints.

Mobile learning presents new technological and pedagogical challenges. Based on the exploitation of semantic and contextual information, our approach aims to adapt learners experience to maximize its efficiency. This project benefits of existing semantic web and recommendation systems technologies, but will provide a new ontological model for learning contents and specific metaheuristical algorithms for real-time adaptation.

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