

Chapter 4.4

Adaptive Learning Organizer for Web-Based Education

Amel Yessad

INRIA Sophia Antipolis, France

Catherine Faron-Zucker

University of Nice, France

Rose Dieng-Kuntz

Edelweiss, INRIA Sophia Antipolis, France

Med Tayeb Laskri

Université Badji Mokhtar, Algeria

ABSTRACT

Adaptive learning support for learners becomes very important in the context of increasing re-use of resources from heterogeneous and distributed learning repositories. This paper presents OrPAF, an Adaptive Educational Hypermedia (AEHS) and web-based System which integrates semantic web models and technologies in order to achieve interoperability with e-learning systems. The key feature of OrPAF is the construction of adaptive hypermedia courses: both the course structure and the course content are dynamically generated and adapted to learners. We experimented the realized prototype on learners in order to evaluate the us-

ability of OrPAF and the conceptual capabilities developed by the learners who used it.

INTRODUCTION

Many researches propose personalized learning supports in order to reuse and share learning resources from distributed repositories (Dolog, Henze, Nejdl, & Sintek, 2004; Miklos, Neumann, Zdun, & Sintek, 2003; Nejdl, Wolf, Qu, Decker, Sintek, Naeve, et al., 2002). The personalization of existing learning resources can be a solution to the problem of developing online courses. However, the personalized learning that uses distributed

metadata of learning resources is still an unsolved problem in the e-learning research area.

Considering the increasing reuse of learning resources from the Web, it becomes almost impossible for the learners, experts, and formations responsible to get an overview of all the available information relevant to their current needs, tasks, roles, and goals. And even if they find some materials, which seem suitable, they are not able to assess completely whether the found content is entirely appropriate for their goals or current knowledge and cognitive state. For that reason, learning resources searched from Web repositories must be first subject to a pedagogy engineering work in order to give them reusability in the context of specific training for specific learners. This engineering work is time and effort consuming in the design step of an e-learning system. To solve this problem, we propose an approach that moves part of this engineering effort from the training responsible/ expert to the software system and delivers an adaptive hypermedia course directly to learners.

In this context, we aim to offer personalized course support which generates dynamically for each learner an individualized course structure and an individualized course content by selecting the most optimal learning concepts (e.g., the concept function in the algorithmic and programming languages domain) and the most relevant learning Web resources (e.g., the definition of the concept function) at any moment. Optimal learning concepts and associated relevant learning resources are selected to bring the learner closest to his ultimate learning goal. This approach is well suited for individual and autonomous learners taking a self-study distance-learning course. They can be employees in an organization who have various experiences and background knowledge and where employees evolve in a competitive economic environment and require lifelong learning.

We propose a learning organizer which generates adaptive hypermedia courses and reuses

learning resources from distant Web repositories, called “*Organisateur de Parcours Adaptatifs de Formation*” (OrPAF). Queried learning resources are already annotated with LOM metadata but stay very difficult to reuse automatically because of the semantic lack of LOM metadata. Our work is based on Semantic Web models, particularly ontologies and semantic annotations, in order to improve the quality of LOM metadata and describe in a standardized way several characteristics of e-learning system (e.g., learning resource, pedagogical strategy, learner model). The Semantic Web for E-Learning (SW-EL) field has shown the greatest activity in this trend with several interesting and recurring practices (Aroyo & Dicheva, 2004; Dolog & Nejd, 2003; Yessad & Laskri, 2006).

Our aim is to improve the learning process efficiency: (1) by providing the learner with adaptive learning paths according to her level of knowledge, learning goal, and time constraints; and (2) by reusing learning resources of different Web repositories. On the one hand, an adaptive learning path is constructed on the base of the conceptual structure of the domain model (e.g., the algorithmic and programming languages domain) and the learner model (e.g., beginner). In the learning organizer, the learner is assisted to construct a “correct” representation of a particular domain of knowledge and the learning is self regulated (Perry, Phillips, & Hutchinson, 2004; Pintrich & Schunk, 2002). For this purpose, we apply filters on the domain model to generate a map of relevant learning concepts. We call this map adaptive cognitive map (ACM). An ACM is automatically generated and displayed to a learner, which takes into account a specific goal, the knowledge and temporal constraints of the learner. An ACM represents an adapted view of the structure of the hypermedia course. On the other hand, learning resources that are queried from distant Web repositories like ARIADNE or created locally by domain experts are annotated by adding a conceptual layer on LOM metadata

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