User context and personalized learning: a federation of Contextualized Attention Metadata

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Abstract:

Nowadays, personalized education is a very hot topic in technology enhanced learning (TEL) research. Learners are different in age, sex and social role, culture, education background, way of learning, attention and interests. It is of vital importance to provide them with learning contents and teaching tactics according to their individual needs. To support students during their learning process, we need to capture the context in which they operate. Current Learning Management Systems (LMS) like Moodle [MDL02] and Blackboard [BKBRD97] support the user in specific tasks (e.g. acquiring a skill) in specific environments. These LMSs are a good source of users' contextual information in specific learning environments (e.g. which learning material a learner is reading and which learning resources remain to be read). However, the user typically operates in a much larger environment while learning, using non-learning tools and services like e-mail, instant messaging, web pages, locally stored files and folders, etc. Capturing such information significantly extends the users' operating context. Enhancing this information with data about the attention that users spend on learning resources (e.g. time spent to read a document, movement of the eyes, mouse clicks, scrolls) in a specific context will provide valuable additional information. The users' attention in a given context defines the Contextualized Attention Metadata (CAM).

In our previous work [BUT09], we proposed a framework able to gather CAMs data produced by any non-learning or learning tool. The framework builds on the Web-Based Enterprise Management (WBEM) standard [WBEM99] dedicated to system, network and application management. Attention information specific to heterogeneous tools are represented as a unified and extensible structure, and stored into a central repository compliant with the above-mentioned standard. To facilitate access to this attention repository, we introduce two dynamic services: the first service allows users to define attention data they want to collect. The second service is dedicated to receive and retrieve traces produced by learning systems. These services are self-adapting to the evolutions of the model. Thus, even if new CAMs to be traced are defined into the model, the services do not need to be modified.

There are various different approaches allowing to capture CAM in a knowledge workers' environment not only in the TEL area (CAM [SCH09], Aposdle [LIN06], Lip [SCH07]), but also in others domains like Knowledge Work Support (SWISH [OLI06], TaskTracer [DRA05]), Personal Information Management (DYONIPOS [RAT09], GNOWSIS [SAU06], NEPOMUK [GRO08]) and Information Retrieval. These approaches differs in matter of: (1) tools and add-ons used to collect CAMs (DragonTalk [DRTK], ALOCOM [VER08], Slogger [SLOG], Inotify [INOT], etc), (2) operating

systems where this tools run on (Windows Xp, Vista, Linux), (3) applications that are traced (Mozilla Firefox, Microsoft Office, Mozilla Thunderbird, Skype, etc), (4) which data elements are tracked, (5) the way that CAMs are represented (XML Schema, ontologies), (6) the extensible character of the model, (7) the CAMs storage infrastructure (RDF files, XML files, etc) or (8) CAMs sharing.

Based on these differences, in this paper we'll review some of the approaches enumerated earlier and compare them with our approach in order to identify their advantages and inconveniences and draw some comparative tables. Furthermore we will determine which tools and add-ons we can reuse in our framework to track more CAMs to better describe the context of the user.

To validate our earlier work, we implemented two agents which collect CAMs from within Moodle and the ARIADNE search tool [SILO]. In order to improve the services provided by the Ariadne Search Tool, the Ariadne Foundation created a lighter version of this search tool, called AriadneFinder [FNDR]. The finder supports faceted federation searching through its connection with the ARIADNE federated search engine and provides access to learning resources worldwide [GLOBE]. In this work, we'll integrate an agent into the new AriadneFinder and will show how it interacts with our existing tracking framework.

After collecting a rich number of CAMs, we will exploit them by defining a dashboard which provides useful statistical information for teachers and learners. For a given class, each student can visualize his and his colleagues' progress during the learning process, thus growing his motivation level. For a specific learner, the dashboard interface provides him with information concerning his progress in acquiring a competence or a skill, his gaps and weaknesses, thus, to improve his knowledge level, the interface recommends him tools, persons, resources adapted to his profile, difficulties and context. Using techniques of the Information Retrieval area, the user interface is able to indentify learners with the same preferences as the current learner, thus encouraging the social learning or E-learning 2.0, where users share the same interest domain, learn together, and develop a shared repertoire of resources [DOW05].

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