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Student Learning Style Extraction from On-Campus Learning Context Data

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Abstract

Nowadays technological advancement enable technology enhanced classroom learning and systemic data, information and knowledge capturing about the learner and his or her learning preferences. However, at the moment this knowledge is limited and in most scenarios gathered via a learner survey. This situation limits tutoring systems and learning support systems capability on delivering individualized learning experience as the learner sometimes is not able to define his or her learning style, actual preferences and other aspects. Learning session and learner context data enable more advanced adaptation in intelligent tutoring scenarios and deliver new analytical capabilities to the trainer in classroom learning. Learning context data can be captured via various means and from multiple data sources, like education institution on-campus systems and physical sensors. This paper presents the learner context data model attributes that can be filled in automatically, the corresponding identified data sources to fill this model and used techniques to enable this process automation. The paper is concluded with the proposed method application results.

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Keywords: Learner context data model; Context data acquisition; Learning process; Intelligent tutoring system; Context awareness

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1. Introduction

Personalized learning has a potential to improve learning process and overall learning results[1,2,3,4]. Personalization may be achieved via learning content personalization and individualized learning strategy application. Therefore, it is important to gain well applicable and trustful information about the learner, including, its previous experience and knowledge level, learning style, learning preferences and learning habits and create learner model. Contextual information qualifies as one of the sources for learner model creation and could be used for an online and in classroom learning[5].

The Intelligent Tutoring Systems (ITS)[6] in most scenarios operate as a recommender system that gathers appropriate and requested learning material from the learning object/ training material repository and/or provides other recommendations about the learning material application. In more advanced scenarios, ITS assess learner's knowledge and based on the results adapt tutoring material difficulty level[7]. If the context aware system is able to identify learners who are working on a similar learning activities, the system can suggest suitable peer learners to collaborate with[5].

Any learning session happens in defined, describable and observable environment, which might be either physical or virtual, e.g., e-learning system. Such environment could be an educational institution campus, corporate environment, home or any other place that is suitable for education. Learning from process perspective[8] could be a course-steered, self-steered or context-steered. At universities and enterprises, we can find the course-steered learning as the core learning process. This learning process follows strictly defined course structure and there are very limited possibilities to provide individualized learning. Context-steered learning additionally to textual, graphical and multimedia learning objects[9] may use available human resources (problem domain experts, colleagues and trainers) and enable dynamic such resource management and utilization.

To describe learning environment with various contexts Schmidt[8] has identified the following activities that should be performed to enable context aware learning. In other researches these activities are essentially the same, but have different wording[10]:

- Context capturing. This activity collects information about the learner and the learning session conditions. For example, assigned tasks and personal information that is relevant to learning process, like learner's previous experience, individual goals, cognitive style and other aspects. The context can be captured from multiple sources; therefore, it should be managed in a way that several applications can view, modify and update the context in a mutually enriching way
- Development and application of context aware methods. Current online learning platforms (both academic and enterprise) support continuous learning and have a strictly defined learning path. However, context aware systems enable on-demand learning by taking only context relevant learning objects. For example, when learner is performing some task and identifies that there is a need for additional information, the context aware system could assist and assess the situation and look for applicable and suitable learning material that is not necessarily a long-lasting curriculum, but might be a short how-to guide on a particular topic. The context aware systems have great application potential in work/enterprise environment, where companies might have multiple knowledge bases and other information sources. Wiki pages, knowledge management systems are common systems for almost any company and they might contain large number of tagged information that is almost ready for context-aware applications
- Context-aware resource preparation. This activity is responsible for tutoring content preparation for further application in context-aware systems. The objective of this activity is to create context application-ready tutoring material including re-source relationship definitions

After context is captured, it is important to identify context quality level. If context quality is low, it will not be applicable in classroom and/or intelligent tutoring systems. Bellavista et al.[11] have identified, that context quality is measured by the following three parameters: context data level of trust, context data precision and context data age. Consequently, capturing, storing and verification of these parameters should be included in any context and assessed each time when new context is created/captured or existing context is updated. These parameters, additionally to

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