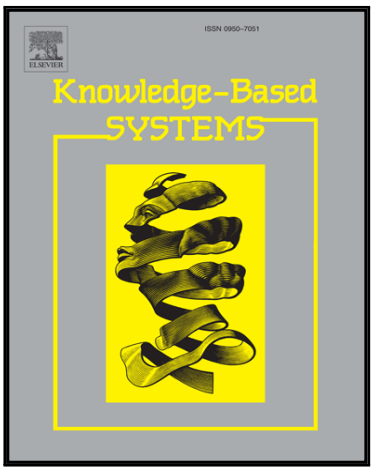

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Ontology-based approach for the validation and conformance testing of xAPI events

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Abstract

Learning analytics (LA) looks for a better understanding of learning and ways to optimize both the learning and the environments in which it occurs. One of its key research areas is focused on data interoperability, specifically on how to collect and store learning data. Proprietary systems usually store data in their own unique format and thus make difficult to reuse LA solutions. Some approaches have appeared in the last years to overcome this issue and the Experience API (xAPI) has been the most successful in this area, primarily because of its transversal approach not tied to any Learning Management System (LMS). However, the xAPI specification is informal, with some loose definitions, that may lead to unexpected mistakes. In order to avoid ambiguity, in this paper we present an xAPI ontology that captures the concepts and semantics of the specification, and has been validated with two datasets of the xAPI community. In addition, a web client has been developed to provide a validation tool that can check the correctness and conformance of individual xAPI files as well as complete xAPI datasets.

Keywords: Experience API, Ontologies, Ontology validation, Conformance testing.

1. Introduction

Since the Advanced Distributed Learning initiative (ADL) created the Experience API (xAPI) [1], many Learning Management Systems (LMS) have adopted this specification as a new way to structure and store events of a learning environment. The xAPI is an open source specification designed to collect data about the learning experiences of a person. It describes these experiences as statements, where each statement is comprised of an actor, an action, and an object. For instance, "John read this post", "John wrote an essay about Ancient Egypt", or "John answered Madrid is the Capital of Spain" represent three examples of learning experiences that could be recorded by an xAPI-enabled application. The xAPI is considered the successor to SCORM (Sharable Content Object Reference Model) [2], the de facto e-learning standard for describing learning contents of LMSs. It supports recording any kind of learning experience, giving thus a much richer picture of an individual's learning path. In fact, and contrary to SCORM, xAPI can handle tracking offline events. This feature is indispensable nowadays, since many online learning do not happen in the LMS.

However, xAPI only provides the structural interoperability, i.e., syntax and data interchange mechanisms, but not the semantics nor a specific vocabulary. The use of xAPI in a specific domain implies defining the vocabulary, activities, documents, and extensions. Taking this into account, further xAPI formalization would improve its interoperability since it would provide a machine-readable semantics. This would facilitate the definition of semantic-based learning analytics and so provide the means to better understand users' behaviours. The most obvious way to achieve these goals is to formalize xAPI as an ontology. The use of ontology technology would also provide a set of mechanisms to improve xAPI interoperability with other languages that have a similar objective, such as IMS Caliper [3] (for instance, the concepts of xAPI and IMS Caliper can be aligned, and thus make it possible to uniformly query datasets represented in different languages). Moreover, an ontol-

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