Autonomous Student Modelling in Learning Management Systems

Brokenshire, D.
School of Interactive Arts and Technology
Simon Fraser University, Canada
dbrokens@sfu.ca

Kumar V.S.
School of Interactive Arts and Technology
Simon Fraser University, Canada
vive@sfu.ca

Abstract: Student modelling refers to representation of students’ goals, capabilities, preferences, and various other personal and social characteristics that are of interest, and reasoning in terms of the student’s knowledge, expectations, personalization, and decisions. The very nature of modelling students necessitates that the model be autonomous. In this research, we explored a generic architecture for student modelling and resolved issues concerning the model being autonomous in the context of Learning Management Systems (LMS).

Introduction

User modelling refers to representation of users’ goals, capabilities, preferences, and various other personal and social characteristics that are of interest, and reasoning in terms of the user’s knowledge, expectations, personalization, and decisions. A student model is a derivative of a user model which represents and reasons about issues related to students. Student models play a particularly critical role in sustaining learning in blended online educational environments, where many of the activities of the students can be autonomously tracked (with their consent) and used as input for the models.

IEEE’s Public and Private Information for Learners (PAPI), in an effort to standardize, capture, and process information related to students, advocates attributes such as personal, relation, security, preference, performance, and portfolio to symbolize student models (IEEE 2000). Information that provides input to these attributes includes learning objectives as concept maps, learning models, pedagogy, students’ workload characterizations, interaction across multiple student assessments, teamwork characterizations, accessibility considerations, structured and unstructured student activities, content modelling, cognitive analysis, and students’ learning styles.

The Architecture

The core data for these inputs are obtained autonomously from diverse data sources, through different application interfaces, at various time frames, and under different representation schemes. Via data to information agents we utilize multiple reasoning mechanisms (Bayesian, constraints, and rules) to translate the core data into granular information. Utilising a blackboard architecture, the data sources make individualized decisions about sharing data that are private, semi-private, and public. This poster presents a summary of our findings of distributed user models (Zapata-Rivera & Greer 2001) (Kumar 2001) and outlines the prototype of a generic autonomous architecture and a prototype system for student models.
Discussion and Conclusions

One of the key aspects of the system is its ability to allow external applications to insert new student model variables, at run time, which could be used by other applications (Kumar 2001). For example, one of our implementations of a distributed Bayesian student model encodes structure and processes evidences from three different applications resulting in a single coherent Bayesian belief network. Interoperability of student models across applications requires a well-defined protocol between the applications to establish a context for the sharing of the student model variables.

In summary, the poster presents a case for autonomous modelling as a means to scalable and interoperable student models, across distributed applications, within the scope of PAPI standards.

References

