Learner modelling of collaborative concept mapping at a tabletop applying data mining

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Abstract

Interactive tabletops provide an intuitive interface that is natural for collaborative tasks. Our research explores a new way for a small group to externalise their knowledge of a domain, by both sharing the knowledge of each individual and identifying those aspects where they have different understanding. A key goal of this process is to build a *learner model*, which is a representation of the aspects that a group appears to understand as well as their disagreements and misconceptions. In addition, *open learner models* can be used as a basis for reflection, metacognition and conflicts resolution. Our approach builds upon the well established technique of *concept mapping* (Novak & Cañas, 2008) which is widely used in education because it can provide an excellent means for a learner to externalise knowledge of a particular domain and to get meaningful understanding of new information. We take this one step further, by using the concept map as a framework for an open learner model.

Interactive tabletops provide a particularly promising interface for collaborative concept mapping, especially as they can provide many learning benefits from computer supported collaborative learning. In addition, we will explore ways data mining findings can enhance the effectiveness of the group's open learner models for a domain as well as for the group dynamics.

Our application, CMATE, aims to provide a new form of learning environment that helps learners and their teachers gain a clearer understanding of the learner's knowledge and misconceptions. In designing it, we had to carefully review the core principles of concept mapping and then to rethink the user interface to address the limitations of tabletops as well as exploiting their particular advantages, while keeping the computer – learner interactions intuitive and gesture based. We have also to design underlying tools to analyse concept maps as well as logging mechanisms to support *process mining* (van der Aalst & Weijters, 2004). These have two core goals: extracting useful individual's learner models, by identifying the salient features of the map and the process of concept mapping taken by the group. We aim to model each participant's agreement with and confidence in each part of the concept map.

Novak, J., & Cañas, A. (2008). *The Theory Underlying Concept Maps and How to Construct and Use Them* Florida Institute for Human and Machine Cognition.

van der Aalst, W. M. P., & Weijters, A. J. M. M. (2004). Process mining: a research agenda. *Comput. Ind., 53*(3), 231-244.