The Friend: Socially-Intelligent Tutoring and Collaboration

Jozef TVAROŽEK and Mária BIELIKOVÁ

Faculty of Informatics and Information Technologies, Slovak University of Technology, Ilkovičova 3, 842 16 Bratislava, Slovakia

Abstract. Motivation as key factor for maintaining effective learning must be maintained during computer-supported learning. For this, we attempt to investigate the benefits of a socially intelligent tutoring agent that goes beyond attending to aspects of an individual student, the tutoring friend. In a computer-supported learning system, a tutoring friend is an artificial agent that manages relationships with learners, monitors their social behavior, and is able to assemble socially-aware groups for peer collaboration. We hypothesize that intelligent tutoring friends can motivate students to long-term participation by the virtue of social affordances they provide.

Keywords. Intelligent tutoring, social intelligence, long-term motivation

Concept Overview

Motivation is not easy to maintain in computer-supported learning systems. One way to motivate students and improve learning is by attending to their emotional and affective states [3]. Another way is to augment learning with collaborative experience. In collaboration, however, just placing students into a group does not guarantee success [7]. Friends are more supportive and critical than non-friends, and were found to provide a better collaborative learning experience [6]. In this project, we are interested in how computer "being friends" with student can improve motivation and learning, and devise computational models and methods to realize this concept.

Language is the primary mode for managing relationships [4], and thus the student working with a natural language tutor inherently engages into constructing a relationship with the tutor. Friends typically provide various provisions for each other [4] such as emotional stability, opportunities to talk, reassurance of worth, and introductions to others. The computational model of social dialogue [2] represents the system-user relationship by a dimensional model (familiarity depth / width, solidarity), and an activation network-based dialogue planner is able to hold small talk during task conversation to deepen the relationship before more intrusive topics are discussed.

We, instead, use an instance-based model with two types of instances recorded: (1) *external to the system* that demonstrate student's social behavior such as past events the student attended in real life, future plans and opinions on interesting topics; (2) *internal to the system* such as peer evaluations and group outcomes of collaborative activities performed by the student in the system. The internal instances are collected straightforwardly. The challenge is to gather descriptions of student's events, plans and opinions

during the off-task (socializing) dialogues with the tutor. Accounting for all conceivable topics is currently intractable, and we limit ourselves to topics likely to be discussed by the target population, middle and high school adolescents. For each topic a slot-filling dialogue manager attempts to extract (from student's utterances) attributes relevant for the instance type such as duration, location, participants and topicality. Additionally, user actions within the learning environment are analyzed into higher-level indicators [1]. The intelligent tutoring friend provides support on the basis of this instance-based model of social behavior. In a way, opportunities to talk, self-expression and self-disclosure are already present during the extraction process of the particular instances.

The provision of introduction to others, the chief motivating factor of this approach we believe, involves a selection of group members for collaborative group. After each collaborative session, performance and peer feedback are evaluated facilitating the exploration of the social graph of users. Users being nodes of the social graph are connected by edges representing the activities. Various users might prefer to pair up with different types of users, and after several rounds of collaboration (and feedback), social structure allowing to identify suitable collaboration peers emerges.

To test our hypotheses, we build a prototype system that adds socially intelligent tutoring to our previous work [8] which is a pseudo-tutor assessment system comparable to Assistments project [5] enhanced with free-text answering, question generation and adaptive selection. In evaluation, we are interested in how does the addition of an intelligent tutoring friend affect students' on-class motivation and off-class system use. Additionally, we want to investigate the effect of an earlier anonymous collaboration between students that, in case of mutually positive evaluations, is transformed into an acquaintance by the tutoring friend, thus allowing the particular students a possible future encounter.

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References

[1] M. Barla, M. Tvarožek, M. Bieliková, Rule-based user characteristics acquisition from logs with semantics for personalized web-based systems. *Computing and Informatics*, 28(4), 2009.

[2] J. Cassell, T. Bickmore, Negotiated Collusion: Modeling Social Language and its Relationship Effects in Intelligent Agents, *User Modeling and User-Adapted Interfaces*, 13(1), (2003), 89–132.

[3] S.D. Craig, A.C. Graesser, J. Sullins, B. Gholson, Affect and learning: An exploratory look into the role of affect in learning. *Journal of Educational Media*, 29, (2004), 241–250.

[4] S. Duck, Human Relationships. SAGE Publications, London, 2007.

[5] M. Feng, N. Heffernan, K.R. Koedinger, Addressing the Testing Challenge with a Web-based E-Assessment System that Tutors as it Assesses. *World Wide Web Conference 2006*, (2006), 307–316.

[6] W. Hartup: Cooperation, close relationships, and cognitive development. *The company they keep: Friendship in childhood and adolescence*, Cambridge University Press, (1996), 213–237.

[7] A. Soller, B. Goodman, F. Linton, R. Gaimari, Promoting effective peer interaction in an intelligent collaborative learning environment. *Intelligent Tutoring Systems 1998*, LNCS 1452, (1998), 186–195.

[8] J. Tvarožek, M. Kravčík, M. Bieliková, Towards Computerized Adaptive Assessment Based on Structured Tasks. *Adaptive Hypermedia 2008*, LNCS 5149, (2008), 224–234.