Software Agents for Personalized Training of Collaborative E-learning Teachers

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Introduction and Proposal. In Computer Supported Collaborative Learning (CSCL) environments it is not enough to organize students in groups because interactions that originate the collaborative creation of knowledge do not happen spontaneously [9]. Consequently, it is essential that e-tutors (teachers) promote interactions between students and coordinate discussions [9]. To ease the workload (both temporal and cognitive) that supposes for teachers the coordination of discussions, software applications that give information about critical events of the interaction process have been developed so that teachers can intervene when group conflicts take place [9]. Most e-tutors lack of experience with techniques of CSCL [6], but coordination skills of CSCL interactions belong to acquired skills category, it means this kind of skills can be developed through training processes [3].

Software applications that assist CSCL e-teachers have recurred to structured interfaces and free text in order to model interactions. Structured interfaces (such as sentence openers) simplify the process of interactions analysis, yet there are studies that demonstrate this kind of interfaces restrict interaction possibilities and cause slow communication [4].

Considering the need for mechanisms to train e-tutors and the existence of shortcomings in structured interfaces, it is proposed the creation of a multi-agent model for personalized training of e-tutors in CSCL environments where communication is based on a free text interface. In the proposed model there will be some agents who will analyze interactions between students (based on free text) in search of conflict situations whose resolution requires the intervention of e-tutors. In these cases, other agents will suggest e-tutors actions to take so as to solve group conflicts and simultaneously train those skills they have not properly manifested.

Related Work. Software applications related to the proposed model, in the sense they suggest actions according to analysis of recorded interactions, are: ARGUNAUT [9], I-MINDS [8] and SAVER [5]. However, none of the named applications considered skills of e-tutors. The research line of Performance Support Systems [3] should also be taken into account to establish strategies and mechanisms commonly used to promote the acquisition of skills. On the other hand, in the context of CSCL the use of natural language processing (to analyze interactions based on free text) has been limited to tasks such as classification of conversation topics or characterization of discussion patterns [9].

Results and Future Work. The creation of intelligent agents for personalized training began with the application of content analysis on e-tutors interventions from CSCL experiences. This way, psychologists associated each contribution of e-tutors with one or more skills of the classification scheme proposed by Santana *et al.* [6]. Next, text mining techniques were applied to contributions of teachers so as to build classifiers that automatically identify skills manifested by e-tutors. Effectiveness levels of skill recognition achieved with algorithms KNN, SVM, PAUM, C4.5, and Naïve Bayes are described in [7]. The Next activity to be developed for the realization of the multi-agent model is to evaluate the use of IPA [1] and Symlog [2] for the recognition of group conflicts. Then, with help of psychologists, the relation between skills of e-tutors and groups conflicts will be established, and corrective pedagogical-didactical interventions that teachers are expected to perform in each case will be defined. Contributions of students will be taken from interactions stored in previous collaborative sessions in order to, through content analysis and text mining, build classifiers that detect individual behaviors considered by IPA or Symlog. These behaviors will be used to make a diagnosis of the group dynamic and to identify conflicts. Later, the machine learning technique used by agents to personalize the training will be defined. Finally, classifiers and agents will be integrated into Moodle platform for experimental evaluation.

References

1. Tchounikine, P., Rummel, N., McLaren, B.M.: Computer Supported Collaborative Learning and Intelligent Tutoring Systems. En: Advances in Intelligent Tutoring Systems. Springer, pp. 447-463 (2010)
2. Santana Mansilla, P., Costaguta, R., Missio, D.: Habilidades de E-tutores en Grupos Colaborativos. En: Peñaranda, N., Zazarini, S., Bejarano, I. F. (eds.) Experiencias Innovadoras en Investigación Aplicada, pp. 687--704. Ediciones DASS-UCSE, Jujuy (2012)
3. Barker P.: Introduction. En: Barker, P., van Schaik, P. (eds.) Electronic Performance Support Using Digital Technology to Enhance Human Ability, pp. 3-29. Gower (2010)
4. Chen, W.: Supporting teachers' intervention in collaborative Knowledge building. Journal of Network and Computer Applications, 29, 200-215 (2006)
5. Soh L., Khandaker N., Jiang H.: I-MINDS: A Multiagent System for Intelligent Computer-Supported Collaborative Learning and Classroom Management. International Journal of Artificial Intelligence in Education, 28 (2), 119-151 (2008)
6. Costaguta R., Amandi A., Garcia P.: Using Agents for Training Students Collaborative Skills. IEEE Latin America Transactions, 9(7), 118-1124 (2011)
7. Santana Mansilla, P., Costaguta, R., Missio, D.: Aplicación de Algoritmos de Clasificación de Minería de Textos para el Reconocimiento de Habilidades de E-tutores Colaborativos. Inteligencia Artificial, 17(53), 57-67 (2014)
8. Bales, R.: A set of categories for the analysis of small group interaction. American Sociological Review, 15 (2), 257-263 (1950)
9. Bales, R.F., Cohen, S.P., Williamson, S.A.: Symlog: A system for the multiple level observation of groups. The Free Press, (1979)