An Experiment using Software Agents for Dialogue Analysis in Collaborative Distance Learning

Patricia Augustin Jaques pjaques@inf.ufrgs.br PPGC-UFRGS – Brazil

Flavio Moreira de Oliveira flavio@inf.pucrs.br PPGCC – PUCRS - Brazil

Rosa Maria Vicari rosa@inf.ufrgs.br PPGC-UFRGS - Brazil

ABSTRACT

Trends in distance education show a growing emphasis in collaborative learning, stimulating students to exchange ideas and information. A collaborative environment, however, will demand a higher effort from the teacher, who will supervise all discussions among learners, so that they do not deviate from the intended topic for a lesson. Moreover, the information proceeding from interactions among students will provide to the teacher features that allow an individual evaluation of each student and his course. In this way, this paper describes a first experience using a multi-agent architecture that is able to monitor communication tools in a distance-learning group.

KEYWORDS: CSCL, Educational Dialogue Interaction Analysis, Software Agents.

MOTIVATION

The motivation for the development of the system that we propose here resulted from some interactions with distance learning educators (we had the assistance of some distance learning teachers of Pontifical Catholic University of Rio Grande do Sul - PUCRS). It was observed that there were not tools to aid a teacher to monitor the interactions among students. According to the educators, collaborative classes generate a great number of interactions, which is difficult for the teacher to monitor, and it results in little time to accomplish other important tasks in the class. Therefore, we decided to implement a multi-agent system to monitor and analyze collaboration that provides to the teacher information that will help him/her in the evaluation of the students and of his/her course.

SYSTEM SPECIFICATION

The multi-agent system proposed is composed of four agents. Three of them, witch we call collecting agents, are responsible for gatheringdata on the messages generated by the collaboration tools: discussion list, newsgroup and chat. There is an agent responsible for each tool. The fourth agent, the teacher's agent, when asked by the teacher, requests analysis made by other agents and shows them to the teacher.

Each agent has its own local database, which stores the collecting data. After this process of data collecting, that is periodic, the agent does the analysis. When the teacher decides to see the analysis, he will ask to the teacher's agent. That agent will request to the others agents that will send the name and the address of the file containing the analysis. The teacher's agent will do a local copy of the file and will show the analysis to the teacher. The collecting agents are located in the teacher's local folder, where the e-mail and the newsgroup's messages are stored, and can be installed in any machine chosen by the teacher.

INFORMATION COLLECTING

While reading new messages, the collecting agents look for data that will be used for posterior analysis. This information is stored in a database that has the following fields: ID (message identifier), Sender, Reply (it identifies a news thread), Subjects, Sub-subjects, Date, Time and Tool (chat, news or discussions list).

The subjects and sub-subjects are identified in the messages subject (just in e-mails or news) or by keywords in the message content. The agents consider as keywords all the nouns found in the text. In order to check the syntactic and morphological meaning of these words we are using a lexical-morphological (Lexicon) dictionary of the Lexis project (Lima, 1997) and a thesaurus that is supplied by the system.

DATA ANALYSIS

In the next step, the collecting agents do the analysis, based on data stored in their databases. The period of the analysis can be **default** (which analyzes all messages sent after the last analysis), or teacher can ask interaction analysis that happened in a certain **period** of time. There are three kinds of associations that can be identified by the agent in the analysis:

Student-student: It identifies which students interact more with each other.

Student-subject: The agent gets information about which subjects each student discusses more.

Student-student-subject: The agent identifies which subjects are of greater interest for a specific group of students.

Besides all associations mentioned above, it is possible to have access to some statistical analysis based on data gathered in on the messages. At a first moment, the information originated from the analysis is exhibited as table charts.

More details about the specification of the system can be obtained in (Jaques & Oliveira , 1999).

VALIDATION AND CONCLUSION

For the implementation of the system proposed, we used the Java Agent Template framework (JAT) version 0.3 (http://java.stanford.edu). All functionalities of the agents were implemented using the Java language (http://java.sun.com).

The proposed system was used for the analysis of chat interactions in the virtual discipline of Introduction to Computer Science of the PUCRS (http://www.pucrs.br). For the prototype's validation, the system was used to analyze chat meetings' logs of a virtual group. Messages were in Portuguese.

The analysis of the interactions of the virtual group allowed us to observe that the architecture and the types of analysis showed are appropriate for the desired objective of supplying information to the teacher that is able to aid him/her to monitor its student's interaction. It does not fit to the system to be the only evaluation mechanism of collaboration among students. The teacher's final evaluation and accompaniment are indispensable. The tool, however, can be used as an aid resource to the teacher.

We observed, also, that the analysis would be more precise to the related subjects if some deeper method of semantic analysis, i.e. discourse analysis (Grosz and Sidner, 1986), were used instead of keyword search.

The validation allowed us to observe that new aspects should be considered for larger efficiency of the system:

Expressions: Some subjects are formed for more than one word and they lose the meaning when it is just considered one of the words. For example: programming language.

Orthographic Mistakes: The language used by the students in the interaction tools is quite informal and has many orthographic mistakes and abbreviations that are not considerate by the agents. A possible solution is to create an agent that performs orthographic correction of the messages before they be analyzed.

Improvement of the interface of the Teacher's Agent: The teacher's agent shows the results of the analysis in text, in a simple way. To provide better visualization of the results for the teacher, the interface can be improved inserting hypertext mechanisms that would allow to the teacher to link among the available information.

On-line Prototype: Currently, the agent accomplishes the analysis of the log files of chat meeting. Another way would be the agent to work on-line, where he/she is connected to a virtual conference (chat meeting) and, during the section, it does the analysis and it show the results in the moment in that the conference is happening.

The limitations observed in this work, help us to model a new online system that will analyze the student's messages; and assist and guide the students in communication collaborative tools. This system is modeled as an animated pedagogical agent and it is part of the multi-agent architecture of the project "A Computational Model of Distance Learning Based in the Socio-Cultural Approaches" (Jaques et al., 2002).

REFERENCES

Andrade, A. F.; Jaques, P. A.; Vicari, R. M.; Bordini, R.; Jung, J. (2001) A Computational Model of Distance Learning Based on Vygotsky's Socio-Cultural Approach. *Proceedings of the MABLE Workshop* (San Antonio, Texas, May 19-23). X International Conference on Artificial Intelligence on Education.

Grosz, B.; Sidner, C. (1986) Attention, Intentions, and the Structure of Discourse. *Computational Linguistics,* Cambridge, v.12, n.3, p.175-204.

Jaques, P. A.; Andrade, A. F.; Vicari, R. M.; Bordini, R.; Jung, J. (2001) Pedagogical Agents to Support Collaborative Distance Learning. Proceedings of CSCL 2002. Colorado, EUA.

Jaques, P.; Oliveira, F. (1999) Software Agents for Analysis of Collaboration in a Virtual Classroom. Proceedings of AI-ED99. Le mans: L'Université du Maine.

Lima, V. L. S. de; Abrahão, P. R.; Paraboni, I. (1997) Approaching the dictionary in the implementation of a natural language processing system: toward a distributed structure. In: Workshop on String Processing. Valparaiso.