Learner Models for Supporting Awareness and Collaboration in a CSCL Environment

AYALA Gerardo and YANO Yoneo
The University of Tokushima, 2 - 1 Minami Josanjima Cho, Tokushima, Japan 770.
{ayalasan,yano}@is.tokushima-u.ac.jp

Abstract. In this paper we present our approach in learner modelling for CSCL environments. Learner models provide the information needed in order to support awareness and promote opportunities of effective collaboration and learning in a networked community of practice. The learner model is proposed as a set of beliefs held by a software agent about the capabilities, commitments and learning goals of the learner. By exchanging their beliefs about the capabilities of their learners the software agents promote the creation of zones of proximal development in the learning group, by proposing tasks based on the group-based knowledge frontier of their learners, which represents the assistance and learning possibilities of the learner in a community of practice.

1 Introduction

GRACILE, a Japanese GRAmmar Collaborative Intelligent Learning Environment, has been developed as part of our research on the structures and procedures needed for the effective collaboration between learners of a networked small community of practice. In GRACILE foreign students in our university collaborate writing a dialogue in Japanese, assisting each other in the application of language patterns and expressions of the Japanese language. The learner interacts with two software agents: a mediator agent and a domain agent [1]. The domain knowledge in the environment consists of a set of Japanese language patterns, expressions and vocabulary distributed among domain agents in the network. The mediator agent supports the communication and collaboration between learners by promoting learning tasks considering the knowledge development of the learner as a member of a learning group.

In this paper we present our approach in learner modelling for CSCL (computer-supported collaborative learning) environments. We propose that learner models in CSCL environments must provide the information needed in order to support awareness and promote opportunities of effective collaboration and learning in a group. We first introduce the need and structure of the learner model in our CSCL environment, then we discuss the use of the learner model, and finally we present the main aspects of the learner modelling process.
2 Learner Models in Collaborative Learning Environments

A learner model has been considered a set of beliefs held by the system about the learner [2]. In CSCL environments the issue of learner modelling has not been discussed in detail. In CLARE, a CSCL environment that facilitates knowledge construction [3], learners work on the construction of a group knowledge base from research papers. While learners derive a representation of an artifact and an evaluation of its content, they are not allowed to see what others are doing or have done. Later they compare, discuss and integrate their individual representations. CLARE includes a representation of the group's knowledge base, but there is not an individual learner model in the framework. A proposal for collaborative intelligent learning systems [4] also implies the representation of a group model, but not an individual one.

In the Learning Web, the multi-agent framework presented by Norrie and Gaines [5] software agents are designed to make intelligent decisions based on the content of their knowledge bases and the messages they receive. In the Learning Web an interface agent learns from the user's actions, working as an intelligent assistant, while a tutor agent provides scaffolding to the learner, progressively removing it as the learner internalizes the knowledge. Those agents require a model of the learner in order to perform their tasks.

We propose that the role of the learner model in CSCL environments should not be to support tutoring or diagnosis, but to enhance awareness and the effective collaboration between learners. Based on the idea that effective and successful collaboration between learners depends on the understanding of their mental states [6] we propose to model the learner as an agent, in terms of her/his mental state, which refers to her/his commitments, learning goals (intentions) and capabilities.

3 Structure of the Learner Model

Since in a CSCL environment the learner is an active agent collaborating with other agents, we propose that the learner model should be based on the basic concepts of agent modelling in distributed AI [7]. In GRACILE the learner model is a set of beliefs the mediator agent holds about its learner. These beliefs are organized as follows:

a) The learner's capabilities (representing her/his actual and potential capabilities).
b) The learner's commitments (the promises to perform tasks for the common problem and to assist other learners).
c) The learning goals or intentions (the tasks s/he would like to perform).
d) The learner's group-based knowledge frontier which represents the opportunities of progress and assistance the learner has by applying the domain knowledge elements together with the other learners in the group.