ABSTRACT

In this paper, we propose an agent-based personalized distance learning system for delivering appropriate studying materials to learners by judging learners’ degree of understanding. The main elements of our proposed system are the agents, which play the role of teacher. Based on the learning history they analyze the understanding degree of learners. To evaluate the proposed distance learning system, we carried out three experiments and a questionnaire investigation. The evaluation results show that by making groupings of learners, the agents can decide what kind of materials should be given to learners. Furthermore, we improved the system by adding new features such as mental action of color and the competition with other learners. The evaluation results show that an improved system can increase learning efficiency.

Keywords: distance learning; agent-based technology; competition of learners; learner volition stimulation

INTRODUCTION

During the last few years, a lot of research has been going on for distance learning systems (Nakabayashi et al., 1997; Katayama, 1999) and many large projects such as CALAT (CALAT Project, 1998), CALsurf (2000), WebCAI (WebCAI, 1999), The University of The Air (UOA, 1984), and WIDE University (WIDE 1997; Ogawa 1999) have been established.

Recently, some distance learning systems, which consider a learner’s capability and understanding have been proposed (Matsumoto at al., 1999; Tamaki at al., 2000). In Matsumoto et al. (1999), an evaluation system of historical data based on learning environment supported by educational software record is proposed, and reappearance and analysis are carried out for historical learning data. The analysis from the history can be performed, but in order to get the learner’s learning condition, the historical data are needed. Thus,
the analysis cannot be done in real time. In Tamaki et al. (2000), a multimedia assisted education system is proposed. The system is able to make the teacher operating cost small and offers fine education by the cooperation of CAI and teacher. The system is able to recognize the learner who needs the assistance, but its main purpose is to support the teacher and not the learner.

In order to offer a suitable and efficient study for learners, in this paper, we propose an adaptive personalized distance learning system using cooperative agents. The purpose of our system is to deliver appropriate studying materials by judging the learner’s degree of understanding. The main elements of the proposed system are the agents, which play the teacher’s role and based on the learning history they analyze the understanding degree of learners. But, it should be noted that only understanding degree is not enough to get the learner’s studying conditions. Therefore, the agent makes a dialog with the learner, and more accurate learner’s condition can be grasped. This information is used to adapt the individual learning.

To evaluate the proposed system, we carried out three experiments and a questionnaire investigation. The evaluation shows that our system can achieve a good delivery of studying materials for different learners. Furthermore, we improved the system by adding new features such as mental action of color and the competition with other learners. The evaluation results show that improved system can further increase learning efficiency.

The paper is organized as follows. In the next section the system design is introduced. Then, we deal with data handling and discuss the experimental results. After that, we treat system improvements. Finally, we give some conclusions and future work.

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**SYSTEM DESIGN**

The learners can access the system in any place where they can be connected to a network. To build the proposed system, we use World Wide Web (WWW) technology which is very suitable for building distance learning systems. However, the present web browsers have different functions and implementation extensions, so the system is subject to restriction on using different functions. But, if we use only text and image, almost all web browsers can meet the requirements of the proposed distance learning system.

In order to have a wide range of applications, we use only standard functions. So, the system can be used easily without depending on computer environment.

**System Structure**

The system is built on WWW and the agents are established on the web server. The learners can access the server to refer to the studying materials from a client as shown in Figure 1.

The agent can grasp the learner’s information and the relevance of the materials to each learner by checking the learner’s network access. The agent also manages the studying materials. The studying materials are prepared on the same server where the agent is established, but they can be distributed in different servers and can be accessed when needed. After the learning session, a confirmation test is performed to check the learner’s degree of understanding. The confirmation test is carried out by using choice-type forms and description-type forms. The collection of learner’s information is necessary to provide appropriate studying materials to each learner. In order to make a right judgment about
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