Intelligent Agent Learning System

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Abstract. This article describes the definition of intelligent agent technology and the teaching advantages of intelligent agent applications in the network. A network learning system based on intelligent agent was built. The system was described and studied in this article.

Introduction

With the rapid development of multimedia and Web technology, network learning has been more and more people accepted and recognized, but a good network learning system can be less at present. In the traditional Web-based distance education system, the system according to the teaching strategy which establishes beforehand saves the courseware on the server, waiting for the learners to click on the browsing or downloading. The student can only listen to reason passively, but can’t act according to own feature selection study strategy, dispatch to control study progress. In this single mode, the teacher's guiding position can not be fully reflected, between the teachers and students, the learner interactive and the cooperation is poor. The intelligent agent technology under such background is becoming to realize the intellectualized one kind of mainstream technology gradually in the teaching domain [1].

Intelligent Agent Technology

Intelligent agents are distributed artificial intelligence (DAI) of the product, first developed by the University of Massachusetts. Intelligent agent research began in the 20th century, the mid-80s. Since the 1990s artificial intelligence research has gradually become a hot spot. It represents the cutting edge of information technology development directions. Currently the definition of intelligent agents is very inconsistent for the study and different concerns. The intelligent agent is given two definitions by well-known agent theorist British professor of Wooldridge and Jennings Dr.

Definition 1 (weak definition): Intelligent Agents is most generally described of a hardware and software system, which has such features:

- Autonomy. Agents can operation with no other agent or direct intervention, and also have some control for their own behavior and internal states.
- Social ability. Agents and other agents (and possibly people) exchange information through some sort of proxy language.
- Reactivity. Agents can understand the surrounding environment and make the real-time response to the environment change.
- Activity. Agents are not only simply to respond to their environment, and can show a target behavior by accepting some of the information.

Definition 2 (strong definition): The intelligent agent not only has defines 1 all characteristics, but also has some human’s characteristics such as knowledge, beliefs, obligations, intentions and so on.

That is to say first of all, the intelligent agent works for user and can wrap up other resources, it guides and replaces the user to carry on visit to these resources, becomes a key position and intermediary to understands these resources advantageous; Secondly, intelligent agent can do many high-tech work. For example, it can understand natural language expression of user information.
resources and compute resources on demand; help users to overcome the speech disorder of the information content to a certain extent; capture the user's preferences and interests, etc; The third, an intelligent agent should also be a independent computing entity, can plan complex steps to solve practical problems, independently discovery and meet user’s requirements from the use of resources and services with the user not participating; Fourth, in the network computing environment, an agent can be seen as representative of the user's permanent establishment in the network, it can be flexible on the network to access resources and services.

The Application of the Intelligent Agents in the Network Teaching

The Advantages of the Intelligent Agents in the Teaching of Network

The agent technology is applied to the online education. At this stage, the system can effectively overcome the limitations of the use of agent technology; distance education compared with traditional distance education system has the following advantages:

Personalized Teaching. At present, many distance education system is just simply the teaching content onto the network, which not achieve personal genesis [2]. To use of its intelligence, it can be the object of teaching for each level of learning, learning content, learning difficulties encountered, learning motivation and a series of features to take a different teaching methods after the application proxy, provide different teaching resources, so that each student's teaching resources and teaching process are different to meet individual needs.

To Partly Replace the Teachers to Guide Students in Collaborative Learning. Agents appear in the system which can be used as a virtual teacher, instructor virtual experiments, virtual learning partners, etc [3]. It intelligently solutes the problems encountered in learning, helps students complete the learning task; use the teaching of intelligent agents with analytical functions through the analysis of student learning. Students can ask which feel confused at any time; the agent can use the knowledge base itself to give the correct answer to students. This can effectively improve teaching effectiveness and improve the quality of teaching.

Filter Information Resources. To apply intelligent agent technology, each learner corresponds to an information agent, information agent can quickly and efficiently access network information resources through a set of information conditions, so that learners can be more time and energy into collaborative learning goals to achieve the desired objectives and mandates.

Intelligent Supervision and Intelligent Evaluation. To apply intelligent agent technology, it may monitor and record learner's entire learning process throughout the learning process, can adopt “the event driven” way gathering learning process's each kind of data, you can understand the learner's cognitive status. It can form a description of situations of data by comparing the current cognitive status and expectations of learners cognitive status, to carry the objective appraisal to the learner for making up the defect which evaluated in the past group work, to fully mobilize the collaborative learning group members of the enthusiasm, to complete the task of collaborative learning groups hardly.

Intelligent Agents used in Online Teaching Cases

Web CLTM (Web Based Cooperative Learning) is an online teaching support platform which supports collaborative learning and is developed by the laboratory of Beijing Normal University. In order to better support student collaborative learning, the school designs and developments the intelligent E-Tutor (e-TA). E-Tutor system has a strong interaction; it carries on the massive instructions to student's cooperation learning process by the electronic assistant role, thus ensuring the smooth implementation of collaborative learning. The agency consists of three modules: behavior of capture agents, handling agents and behavioral feedback agent. Using these modules can complete such as guidance on collaborative learning group, expanding the discussion to stimulate students and other functions. Currently, E-Tutor on Web CLTM platform can only
understand some simple students’ behavior, and there is still a real communication gap. E-Tutor system's internal structure and data processing is shown like Figure 1:

Behavior capture agent is responsible for capturing user behavior (teacher or student) and analyzing, preprocessing, to deal with the act into an action which the behavior agents can understand. Then the reaction of these acts, through the role of information feedback to the user agent or system; also through the internal trigger of the system automatically send a request to the feedback processing agent, automated service for students. Different students can study on different computers; the collaboration between them is mainly through the exchange of multi-agent interaction, thus completing the collaborative learning. It is like a computer's central processor (CPU).

![Image](image_url)

Figure 1. WebCL platform e-Tutor system's internal structure.

Feedback agent is responsible for the user (teacher or student), or interact with the system, according to the behavior management agent to send over the instructions, or operate the user interface feedback, or manipulate knowledge to add or update knowledge base. This agent acts as a computer output device (monitor, hard disk, etc.).

**Intelligent Agent's Network System Learning Model**

No single teaching strategy can solve all the problems of the teaching process. Excellent education system must be according to the teaching objectives, teaching content and students' specific situation, in the process of teaching and learning intelligent choice of teaching strategies and dynamically adjust the micro-teaching strategies [4]. Based on this idea, the system designs a student agent for students to assist students to better complete the learning task; for teachers to design a teacher agent to simulate teachers' teaching. And it is responsible for teaching content, teaching resources and teaching strategies for routine maintenance and updates, support teachers and efficiently complete the task of teaching. Assist teachers in efficiently complete the task of teaching. Also it designs management-agent to specially management of student agent and teacher agent; automate some of the teaching work. The system determines the basic teaching strategies in accordance with the process of teaching which used different teaching strategies for different students.

**Logical Structure of the System Model Framework.**

In the intelligent Agent-based learning system, the system uses a Browser / Agent / Server three-tier system architecture, that is browser-based presentation layer, the agent layer and data layer. The middle layer in the system introduces a number of agents, which is responsible for coordination of intelligent browser-side and server-side work. Clients visit the system through the web browser. So for complex distributed systems environment provides a unified operating environment. Figure 2:
The first layer is a browser-based presentation layer. Web browser as a client, provides a graphical user interface, is responsible for interacting with the user. System according to different users comes into different personalized interface, in this layer contains the system's display logic. The layer achieves the input and output of knowledge, user behavior, information, tasks, feedback and other functions.

The second layer is the agent layer. This layer is the key to the design. The agent layer can be divided into four categories: the first is the registered agent; the second class is a user agent: including students, teachers and administrators proxy agent; the third category is the management agent; the fourth category is the task agent: including Q & A agents, the test agent, collaborative learning agents and personalized agent. A user log on to the system server, the system automatically generates a registration agent, and then creates a user agent (students, teachers or managers) help the user interact with the system, guide the learning. And find the right strategy to guide for teacher to guide anyone to the new repository during the learning process based on the actual situation from the repository to the user.

The third layer is the data layer, used to store various types of data resources. Including knowledge base, test bank, teaching strategies library, student information database and Q libraries.

**System Workflow**

Workflow systems are mainly three: learning, teaching and administrator. We work mainly in the learning process introduces an example.

Visit. When learners log network learning this system, the system automatically generates a corresponding to the learner's learner agent. Learner agent with self-test exam related topics in the current study test the level of the learner, learning style, etc. The test results is firstly saved by agents of the memory modules, then upload the module through the transmission of information to students' personal information database. Teaching agent under the guidance of the rule modules, computing and reasoning modules division of collaborative group according to the information and the content which the learners selected.

Courses. In the learning process, learners can make reasonable arrangements according to their own circumstances, self-learning and collaborative learning alternately: You can read it for himself, understand the learning content; through QQ, E-mail and other tools to ask the teacher for help to solve problem; by agent you can discuss with teachers and other members in the agent group collaboration area; agent can also be learners in the system library and learning resources online search, access the necessary counseling information; In addition, according to the rules of the agency's information on a variety of modules to analyze the situation, judge, and give appropriate advice and guidance.

Self-test. After completion of each stage of learning, learners can access through a proxy to test self-test exam, the identification of knowledge points to make up the loopholes, according to test results can be summed up in the last stage of learning experiences, lessons learned, continuous improvement their own learning.

Demonstrate learning outcomes: Task is completed; you are a team to demonstrate learning outcomes. The team under the guidance of personal agency self-assessment, peer assessment team
members and system evaluation combine the ideas of different individuals to solve the problem, methods, and different groups complement each other's ideas and experience to discuss and learn.

Intelligent agent evaluation. After the test results are given by the teacher agent assessment, if this meets the requirements, it will confirm that the objectives for student learning; if not meets, teacher agent will automatically analyze what has been the lack of knowledge points to master, and gives navigation information to guide students to learn pre-course.

Exit. Finally. Students complete this learning or interrupt this learning. The agency will record the student learning situation (Figure 3).

![Diagram](attachment:image.png)

Figure 3. Intelligent Agent-based learning system, student agency work flow chart.

**Summary**

At present, China's online education is at an early stage of development, the introduction of intelligent agents to build an interactive, adaptive, intelligent and personalized online education platform provides effective support, which fully demonstrated the advantage of the remote network education and the modern information communication technology. Agent intelligent applications in the field of education is not only the inevitable future development of online education, and with the development of agent technology it will open up new prospects for online teaching, but also for China's current education reform it provides a good opportunity. But we have a rational understanding that the current immaturity of agent technology has led to the contradiction between technology and demand. Therefore, we must have an objective understanding of intelligence, timely carry out the network teaching practice based on intelligent agent technology.

**Literature References**

The intelligent agent technology under such background is becoming to realize the intellectualized one kind of mainstream technology gradually in the teaching domain [1]. At present, many distance education system is just simply the teaching content onto the network, which not achieve personal genesis [2]. Agents appear in the system which can be used as a virtual teacher, instructor virtual experiments, virtual learning partners, etc [3]. Excellent education system must be according to the teaching objectives, teaching content and students' specific situation, in the process of teaching and learning intelligent choice of teaching strategies and dynamically adjust the micro-teaching strategies [4].

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