USING ANIMATED PEDAGOGICAL AGENT FOR WEB-BASED EDUCATIONAL SYSTEM

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ABSTRACT

Animated pedagogical agent is an animated character that facilitates interactive learning in computer-based learning environments. The primary function is to support human in accordance with the application pedagogical theory within learning environments. This paper describes the concept, agent functionality and the main capabilities of the required computer-generated agents to make them pedagogically effective. The World Wide Web is an interactive communication medium that can be used to encourage active, meaningful and authentic learning. This agent implements key pedagogical functions such as student monitoring and feedback, probing questions, hints and explanation through one-to-one tutoring. Our research concentrates on developing agents that are used to replace “human tutor”. These agents behave like “human tutors” in such a way that interactive teaching and learning process can be facilitated. In addition, the use of animated agents can promote motivation among learners.

Field of Research: Pedagogical agent, web-based educational system and intelligent tutoring system.

1. Introduction

Workplace especially on trainees has not been a common and special interests to managers in the hotel industry. The temporary attachment nature of student workers or trainees at the hotels has been seen to allow the incident to happen unnoticeably. It is a subject that has always been kept quiet by the employers or training managers to avoid scandal and adverse publicity that would later damaged the image of the establishment. The nature of the industry has been portrayed through media as a rough and demanding workplace thus workplace bullying especially on trainees is a norm and is part of the job. Media coverage especially in the reality shows such as “Hell’s Kitchen”, which has glamorized the issue to the international audiences through his rough and advert comments are not really the actual reflection in real commercial kitchen situations (Bloisi & Hoel, 2008).

2. Definition of Animated Pedagogical Agent

Agent is a software programs that are capable of executing a set of operations in accordance with the needs or desires of a user or other software program. Pedagogical agent is an autonomous agent that acts as a guide of instructor for education and training purposes. (Lang, -) and animated pedagogical agents are animated characters that facilitate learning in computer-based learning environments (Shaw, 2009).
3. Pedagogical Agent Functionality

The primary function of pedagogical agent is to support human in accordance with the application pedagogical theory within learning environments. An animated pedagogical agent can teach students using modalities compatible with the full range of interactive learning styles. They are also capable of instructing in collaborative environments, with or without an instructor present. Besides that, the agent could implements several function such as presentation, student monitoring and feedback, probing questions, hint, and explanations. Interaction between the pedagogical agent and student is occurring while learning session in progress.

To make the learning and teaching more effective and efficient, there are several pedagogy objectives that animated pedagogical agent need to follow (Green, -) :

i. To provide instructors of connected education courses a literature base (on and off-line) from which to explore the field.

ii. To explore the instructional possibilities available in example connected education courses.

iii. To explore various philosophies, theories, and pedagogies (e.g., collaborative / cooperative learning teams) as new approaches to teaching and learning in a virtual community space.

iv. To learn how to develop a sense of place in an online environment.

v. To understand the various forms of interaction available and their application within connected education courses.

vi. To understand the various methods of student assessment and course evaluation possible within connected education courses.

vii. To provide exemplars of development and design models for creating connected education courses vis-a-vis an instructional design methodology.

viii. To provide examples of instructor orientations that help instructors learn how to use technological tools (e.g., Web CT).

ix. To explore various methods of assessment and evaluation and how they differ from traditional teaching I learning models.

x. To understand the additional complexities of teaching in a connected education environment (e.g., plagiarism).

4. Why Using An Animated Pedagogical Agent ?

Learning in the classroom or some traditional methods of teaching utilized one-way communication media such as textbooks, lectures and videotapes. These methods promote passive learning (Baker, 2009). Instructors augment or replace the textbook and lecture handouts with list of websites for students to visit and read. The communication process remains one-way and fairly static using this approach. Many merely use the Internet to post their syllabus and handouts for students to access for printing. This may increase instructor preparation time without much added value to instruction.
An efficient learning system should allow students to take a lesson without time and place constraints. The best solution is making the lesson available in the cyber space. It requires to end-users zero cost installation and provides them the maximum time or place flexibility.

Three kinds of Web-Based Tutoring (WBT) methodologies are available on the scene at this moment (Capuano, 2010):

i. Static WBT: teachers arrange learning material in order to cover one or more topics and convert them in interactive linked HTML pages (or different kinds of Web-deliverable objects). Material is then placed on-line in order to make it visible to everybody. Learners can exploit it only by following the path established by teachers.

ii. Personalized WBT: teachers, using a specific kind of software named Course Management System (i.e. Macromedia Attain) are able to perform manually a set of additional tasks. They can monitor student knowledge by testing them, assign recovery material if necessary, define different paths through learning objects for different kind of learning goals, etc.

iii. Adaptive WBT: includes all features of a Personalized WBT but the teacher is supported/simulated in his activity by using Artificial Intelligence techniques.

One example of WBT is Intelligent Tutoring Systems (ITS). ITS are complex systems that involve several different types of expertise (Frasson, -):

i. Knowledge on the subject matter

ii. Knowledge on the learner’s knowledge

iii. Pedagogical expertise, etc.

When building an ITS, collecting this expertise is a time-consuming process that often requires many attempts before reaching a suitable system (Frasson, -). A second problem is managing this knowledge so that they are adapted to the learning process. In other kinds of knowledge-based systems, the classical approach for solving these problems is to separate the knowledge acquisition stage from the real use of the system. The majority of ITS sites consist of static hypertext pages that are not interactive and adaptive to an individual. Students now need an advance web-based educational system that offers adaptability and interactivity using intelligent animated pedagogical agent.

5. The Importance of Using An Animated Pedagogical Agent

Animated pedagogical agent can cause learners feel that on-line educational material is less difficult and also more interactive and adaptive to student. They can increase student motivation and attention (Shaw, 1999). But most fundamentally, animated pedagogical agent makes it possible to more accurately model the kinds of dialogs and interactions that occur during apprenticeship learning and one-on-one tutoring. Factors such as gaze, eye contact, body language, and emotional expression can be modeled and exploited for instructional purposes.

By using an animated pedagogical agent for learning and teaching purpose, student will feel more convenience compared to conventional learning style (Moshinskie, 2008). This is because animated
pedagogical agent offered an interactive and adaptive method for student to gain the knowledge. Beside that, animated pedagogical agent is able to make simulation and record keeping easier. Lecturers also will save their time and cost teaching same content to all students. It’s very useful for distance education and also new way of learning (Moshinskie, 2008).

6. Pedagogical Agent Behavior Category

There are several behavior category of pedagogical agent such as pedagogical agent support, instructional and general goals (Lang, -);

i. Support goals include:

• Optimization of existing resources such as classroom technology and network infrastructure.

• Increasing personal productivity of staff and faculty.

• Reliably automating repetitive office and organizational support tasks.

ii. Instructional goals include:

• Development of methods to teach increasing numbers of students who are geographically dispersed, and require non-standard scheduling.

• Development of methods that retain or improve the effectiveness of instruction. This includes addressing all learning styles and personalizing instruction according to each individual needs.

iii. General goals include:

• Remaining within constrains imposed by budget, staffing, facilities and other fixed resources.

• Ensuring that the initial cost of any new technology support for the organization or for instructional methodology is offset by the benefits as determined in a cost of ownership, return on investment, or cost benefit analysis.

Agent technologies provide methods to achieve all of the organizational goals listed above:

- Applications for network management will optimize existing resources without additional staffing or investments in extra hardware.

- Personal digital assistants increase personal productivity as well as reduce the network load produced by traditional search and retrieval methods.

- Agent applications automate daily tasks such as network and database backups, batch processing, mail sorting and scheduling.
Pedagogical agents can be used in simulations that will provide multimodal instruction for distance and traditional education. These simulations can be used at anytime, by single students or with groups.

- The ability of pedagogical agents to teach autonomously reduces staffing issues.
- The personalized tutoring available with agent applications can increase the overall quality of instruction.
- Since many agent applications run on common platforms, using them does not require major hardware upgrades.
- Overall costs are dependent on the implementation of the technology. The wide range of available applications addresses nearly every need and budget.

7. Benefits Using an Animated Pedagogical Agent

The benefits by using an animated pedagogical agent can be summarized as follows:

i. **Save cost and time**

   Animated pedagogical agent open and non-proprietary concept assists the implementation of education technology without high cost and technology barriers. It also reduces time and cost of traveling to remote training facilities.

ii. **Consistency**

   The ability of the web-based educational system to quickly identify the student deficiencies from the pattern of their responses, would allow the problem to be addressed more quickly than is possible with a human tutor.

iii. **Interactive and Adaptive**

   Animated pedagogical agent uses a browser as a universal client to provide intuitive, friendly, rich and flexible user interface.

iv. **Make revisions easier**

   Students can learn at their own pace and time, and the content can be continually improved and reused in order to meet the changing needs of students.

v. **Distributed and Location Independent**

   With the availability of basic infrastructure or personal computers, existing instructors can deliver the content to a large number of students without significant impact on the quality.
8. Examples of Animated Pedagogical Agent

The web-based educational systems have been developing mostly at artificial intelligence research center in the world. Here are three example of animated pedagogical agent that successfully had been developed:

ADELE, an animated pedagogical agent is used for medical education in the areas of family medicine and graduate level geriatric dentistry. Adele was developed at USC’s Information Sciences Institute’s Center for Advanced Research in Technology for Education (CARTE). In order to expand the agent’s effectiveness, she runs in a student’s Web browser. In this way she integrates Web-based resources with other learning materials and serves a guide through the lesson.

When operating in Advisor mode, Adele will interrupt any student action that is not in accordance with standard practice. She then suggests a different approach or action, or refers the student to a resource, such as a video demonstration, audio clip, or Web-based reference material. Regardless of the mode in which she is operating, Adele makes full use of opportunistic instruction by providing hints or references in all appropriate situations. She will also provide immediate responses when students ask “why” questions. In this way instruction is simultaneous with problem solving, and the student can immediately use the information.

![ADELE](image)

**Figure 1:** Adele explains the importance of abdomen palpation
Adele’s persona includes several behaviors as well as the ability to have new behaviors added. Actions and communications are generated using a behavior state approach. This consists of a library of searchable behavior fragments including visual segments showing her repertoire of movements, audio clips accompanied by a commercial speech synthesizer to serve as utterances, and occasionally segments of other background sounds, such as music. A behavior-sequencing engine dynamically joins selected fragments at run time.

STEVE or Soar Training Expert for Virtual Environments is an agent serves as a teacher, student collaborator and as a team member when the learning situation requires it. Steve teaches everything from how to navigate aboard ship, to how to operate controls in the engine room. His capabilities in this 3-D world allow him to manipulate the environment in order to accommodate different pedagogical and learning styles. There are three major parts to Steve such as:

Figure 2: Steve pressing a button on the HPAC console

i. Virtual environment in which he resides.

This is part of a larger project called VET (Virtual Environments for Training). In this world each object is represented as physical object with all the appropriate attributes. This allows changes to be made in the environment according to the requirements of various simulations.

ii. Sensorimotor component.
iii. **Cognitive processing.**

Steve is able to completely interact with the student. He responds to the individual's actions and can provide any level of feedback, from demonstrations to explanations of what the student did and how it could be improved. Steve is even capable of question and answer sessions after training in which he can explain options and actions that took place during the session. Steve's student monitoring process is designed to allow the student time (when appropriate) to see their mistake, but to intervene and offer advice or correction before the student becomes frustrated.

**PEAGENT** is an intelligent web-based educational system that focused on a few topics of Data Structure and Algorithm Analysis concepts such as pointer, stacks and queues (Zakaria, -). The system used four animated pedagogical agents that communicate with the student in Malay language and performing various pedagogical functions. These four agents are Wira, Pintar, Waja and Tangkas. The main agent is Wira, teach students the basic concepts of Data Structure and Algorithm Analysis. Beside teaching, Wira also provide instruction for using other learning tools such as email, online discussion, internet search and on-line quiz.
Pintar determine the student level of understanding of a topic by asking short question. Pintar provides personalized learning module to each individual student depending upon their level of understanding and performance. Waja monitor student progress by probing short questions during instruction and provides exercises at the end of each chapter. Waja will report student performance to the lecturer. Tangkas will evaluate student answer from the quiz taken and explain why a particular answer is wrong. Tangkas can guide the student to answer correctly by giving hint.

8. Conclusion and Future Recommendation

This paper has described the concept, agent functionality and main capabilities required of computer-generated agents to make them pedagogically effective. Much work remains to be done to evaluate the effectiveness of the pedagogical agent approach.

There are several desirable features in a pedagogical tool such as templates, branching, feedback, providing help to learner, ability to import graphics, ability to distribute education globally, reporting capabilities, animation and testing shell (Moshinskie, 2008).

The application of pedagogical agents is an area that should be explored by all schools and universities. If properly developed and fully utilized, this technology could prove to be not just a solution for existing problems, but the resources could strengthen the institution’s competitive position.

References


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