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Multi-Agent Architecture Approach to Web-Based Teaching System

Nwe Nwe Win

Abstract

An intelligent agent is a set of independent software tools linked with other applications and databases running within one or several computer environments. The primary function of an intelligent agent is to help a client have a better use, manage and interact with a computer application. This paper describes the utilization of multi-agent architecture approach to Web-based teaching system which can result in more interactive and adaptable teaching and learning.

Key words: Multi-agent, web-based teaching system, architecture, teaching and learning.

Introduction

The Web-Based Teaching System (WBTS) has been developed at the Department of Computer Studies, University of Yangon in 2005. The system offers online Master and Diploma courses for Computer Science. In the system, an instructor prepared for a course such as text, PowerPoint slides, exercises and assignments. The instructor also stored the score of assignments and examinations on the database. Students can post any questions or comments on a special web page of the website, which is a class discussion area outside classroom. For each student, the system also stored his/her access history in the database. The system can be easily extended to contain other multimedia such as images, audios, and recorded lectures.

Web-Based Teaching System

The Web-Based Teaching System (WBTS) provides support for online education over the Internet with a high level of interactivity between students and instructors through implementing both Synchronous and Asynchronous modes. The system provides functionalities to create course notes, assignments, and examinations and view the results for the instructor, participate in the discussion groups and post messages by using feedback and also posts the students grades online. The students are allowed to view

the posted course notes and assignments, take the online examinations with exam software, participate in the discussion groups and post message by using feedback. The administrator is granted the privileges of adding a new instructor or a new student to the database, register them for a particular course, query the list of students registered for any particular course, or the list of courses lectured by a particular instructor, etc.

UML Architecture of WBTS

The design begins with the illustration of Use-Case diagrams that represent the WBTS system and one or more outside inter-actors (called *actors*), together with actions performed by the system (Than Than Wai and Nwe Nwe Win, 2007). Figure 1 illustrates the interaction of the instructors and the students with the system. Instructors and students are the external entities to the system who can log into the system and use the functions provided by the system. The interaction between the instructors and the students can take place in two modes: synchronous and asynchronous modes. The synchronous interactivity is provided by functionality offered by the tools like course delivery, feedback tools and discussion sessions. The feedback tool is part of course delivery and is intended to give the instructor immediate feedback on the request of the students during lecture delivery.

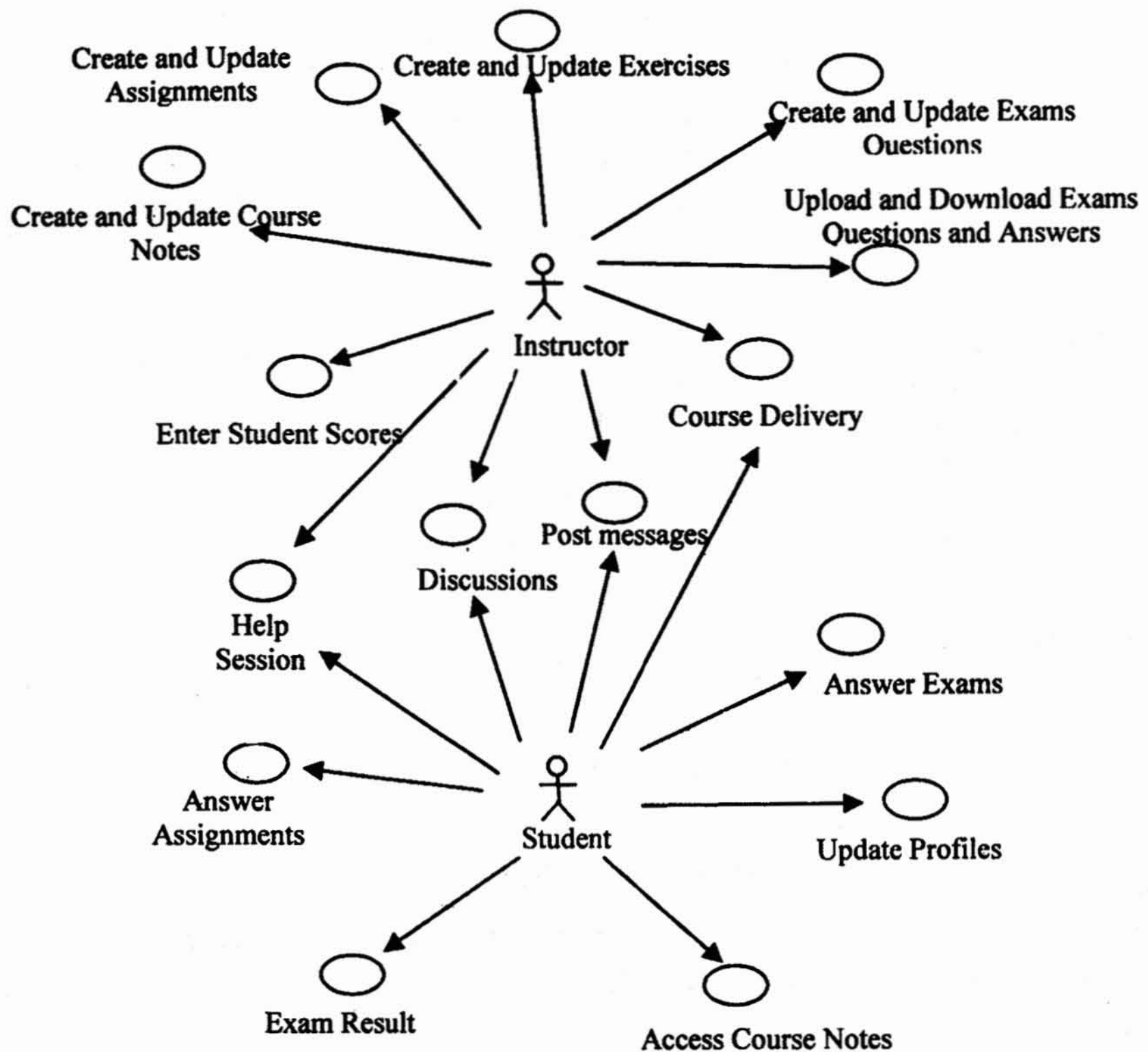


Figure 1. Use case diagram with administrator as the actors

Figure 2 illustrates the interaction of the administrator with the system. The administrator is also an external entity to the system who can log into the System and use the functionality provided by the system. The Use-Case diagrams give an overview of the system functionality and their respective users from a users' perspective. A more detailed documentation of the design issues from a developer and a maintainer's perspective is the illustration of the component diagrams. Component diagrams show the software components that make up a reusable piece of software, their interfaces, and their interrelationships.

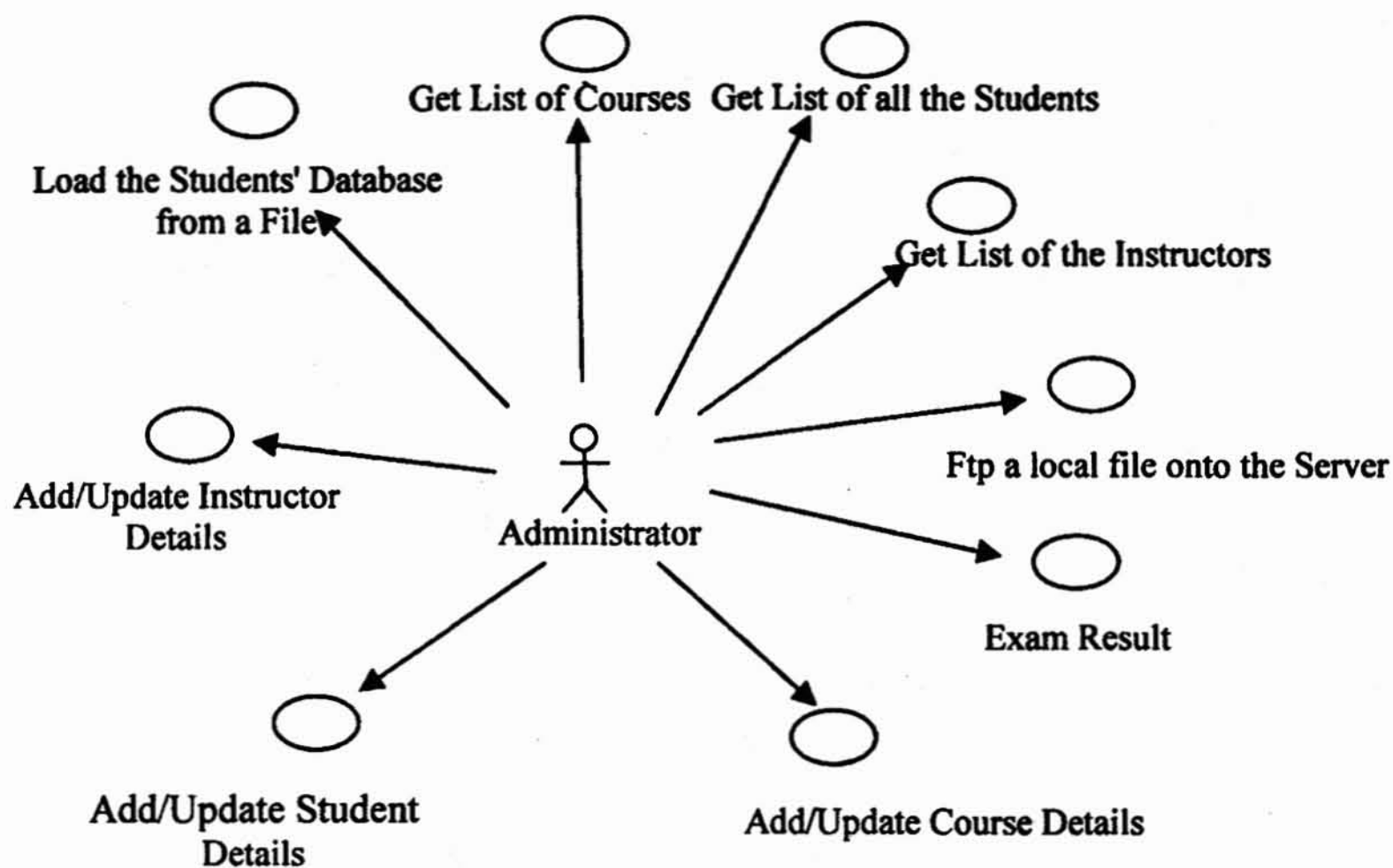


Figure 2. Use case diagram with administrator as the actor

Multi-Agent System

A multi-agent system is a system composed of multiple interacting intelligent agents. Multi-agent systems can be used to solve problems which are difficult or impossible for an individual agent. An intelligent agent is a set of independent software tools linked with other applications and databases running within one or several computer environments. The primary function of an intelligent agent is to help a user use, manage, and interact a computer better. Agent is able to perceive the environment, act in this environment and communicate with other agents. The software agents, like human agents, can be authorized with the autonomy to make decisions and perform certain tasks (Soh, L. K., Xuli, L, Xue Song, Z., Jameela, Al-J., & Hong, J, 2007). Agent-based technology systems are assumed to involve artificial intelligence (AI) and include a degree of autonomous problem solving ability.

The multi-agent system in WBTS includes a variety of agents: student agents, teacher agents and administrator agents. A student agent solicits input from the student, monitors the student activity, updates teacher's instructions at the student's note book, and reports the student's information to the teacher on demand. A teacher agent collects input from

student agents, monitors the teacher activity and corresponds student's behavior, performs a wide range of data analysis on student's input such as sorting, filtering, and pattern recognition and provides decision making support to the teacher. Administrator agent monitors the teachers, students agents administrative works in WBTS.

In order to expand the capabilities of WBTS system into an intelligent teaching and learning environment, using teacher agent, student agent and administrator agent that perform teaching and learning tasks on behalf of teachers, students and administrator. These agents may communicate with their human clients using a combination of texts, graphics, and voice recognition. The multi-agent system architecture for WBTS is illustrated in Figure 3.

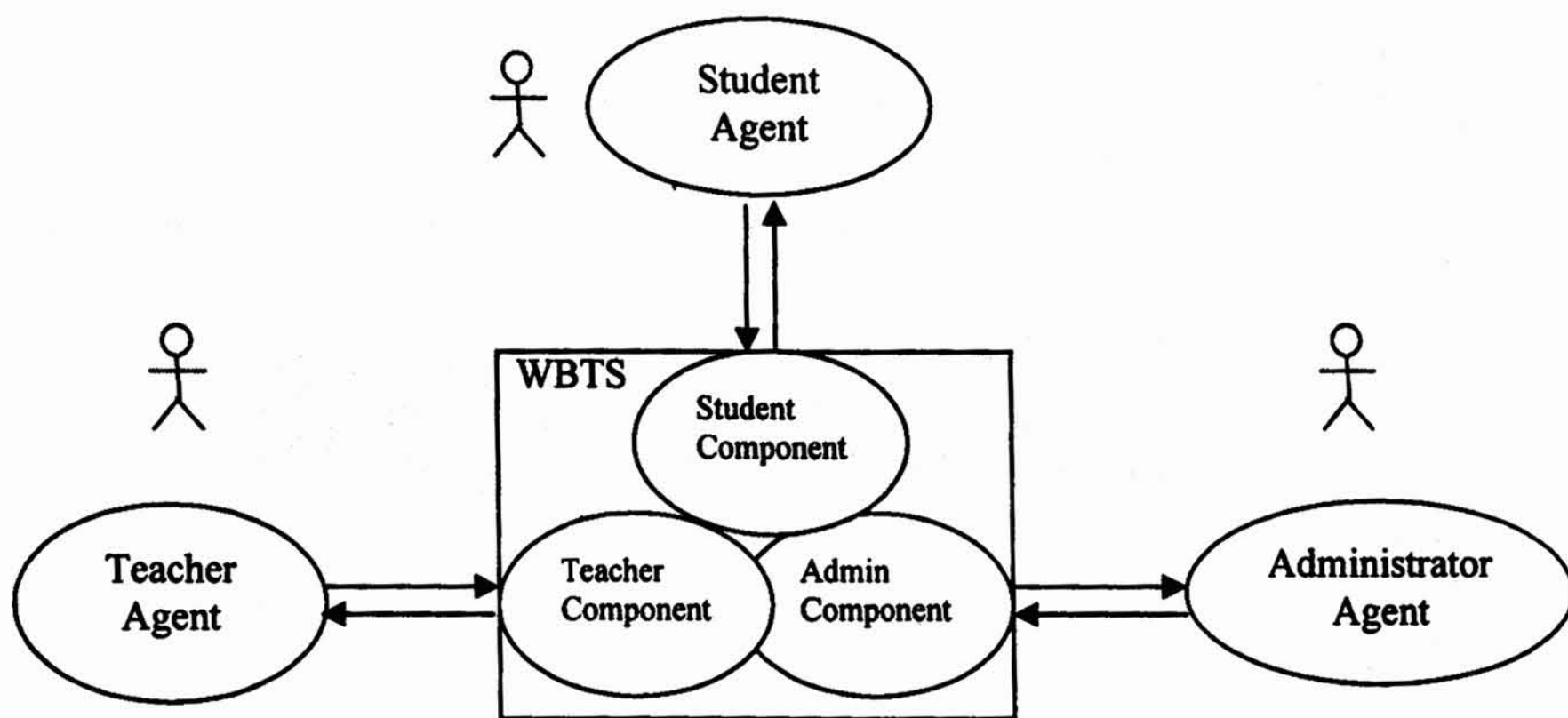


Figure 3. Multi-agent system architecture for WBTS

Teacher Agent

The intelligent agent acting as a Teacher Agent assists the teacher in various teaching functions. Teacher agent is a personal agent that may be configured by its owner and the human teacher. The concept is that the teacher will configure the teacher agent at the beginning of a course (Jafari, A., 2007). This configuration could include, for instance, the agent's level of autonomy to send overdue notices to students on behalf of the teacher, to send lectures, assignments and questions to administrators. The teacher

agent is more useful in WBTS because in the existing system the teacher is isolated from the students, not necessarily knowing if and when students worked on an assignment. The teacher remains mostly unaware of the student's progress until an examination or until the student submits an assignment or drops out of the course. In terms of student retention, the teacher ideally should be constantly and dynamically aware of a student's participation in a course and assist a discouraged student before he or she drops out. Additionally, the teacher agent can assist a teacher with course operation and maintenance.

Figure 4 illustrates a simplified configuration procedure for programming a teacher agent acting as an "inactivity agent" (Figure 5). In this example, the agent is configured to send messages to the teacher, identifying students with more than one week of inactivity. In the existing system, the teacher does not know whether a student is active or not. The active-student agent is configured to send messages to the teacher. The students who submit the assignments in time will send the messages to the teacher to mark them. As mentioned above, the teacher agents could include a series of agents.

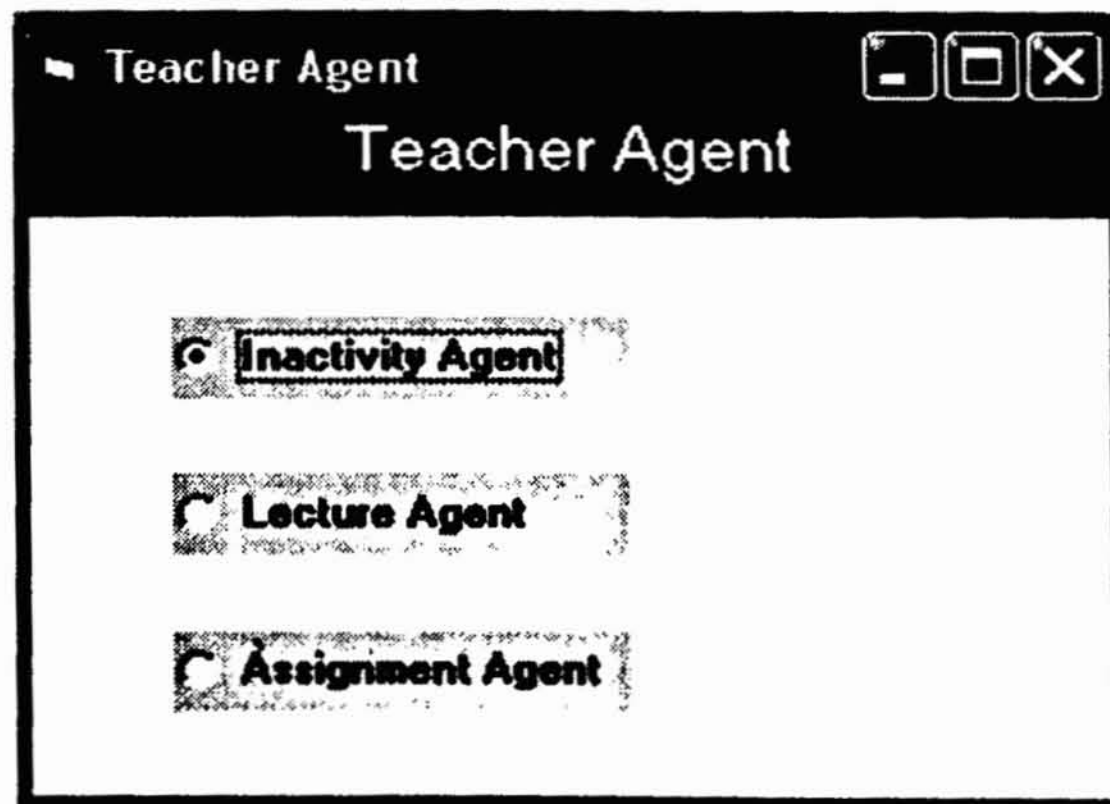


Figure 4. A teacher agent

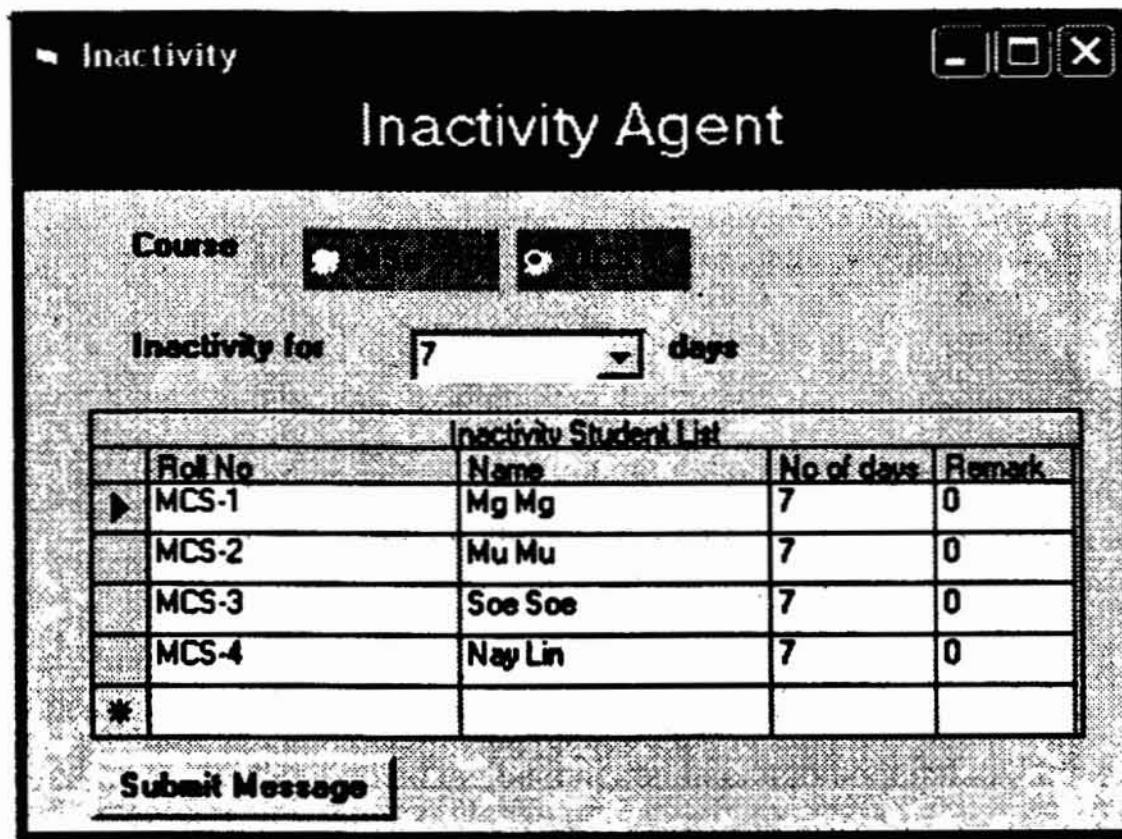


Figure 5. An inactivity agent

Student Agent

The intelligent agent acting as a student agent assists students with specific learning needs. The student agent acts as a smart search engine, finding specific resources to solve learning needs for a student. This agent has an expertise both on content and on understanding a student's learning needs. Accessing the student profiles and knowing student's strengths and weakness on a learning objective empowers the student agent to provide more useful resources. A student agent will act as a communication agent. The communication agent can dynamically show the list of online students within the WBTS environment who are the same course at the same time. Students can use this list to establish a virtual online communication and collaboration session with other online students in the class room. The course chat room, instant messenger, or white board can support this purpose. A student could further program the communication agent to inform him or her when another student in the same class is working on the same assignment signs on to the WBTS environment.

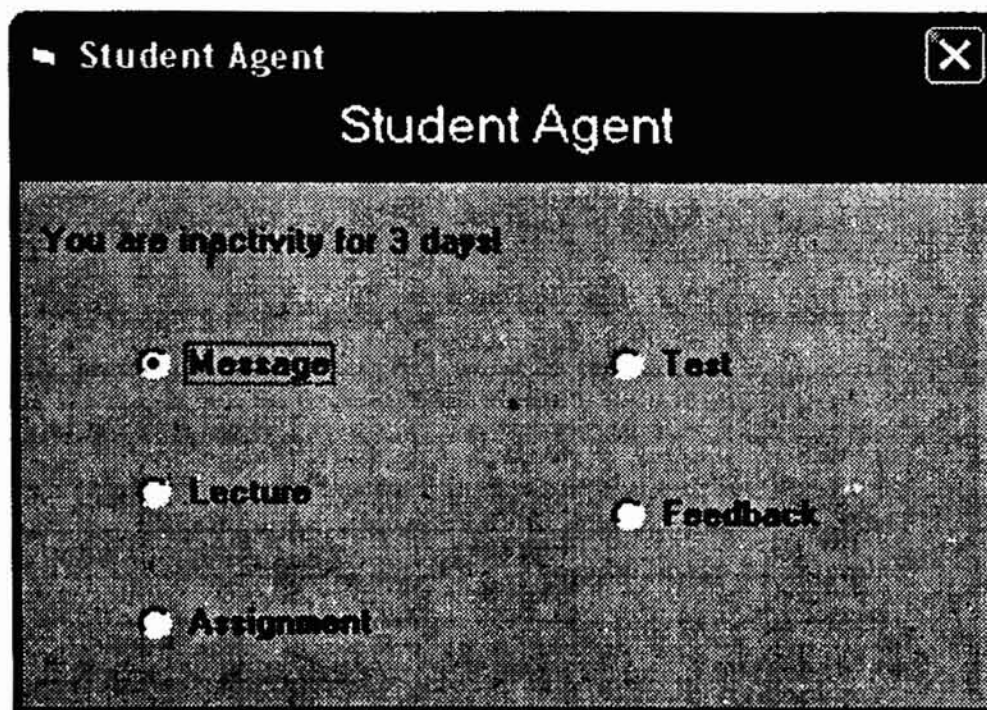


Figure 6. A student agent

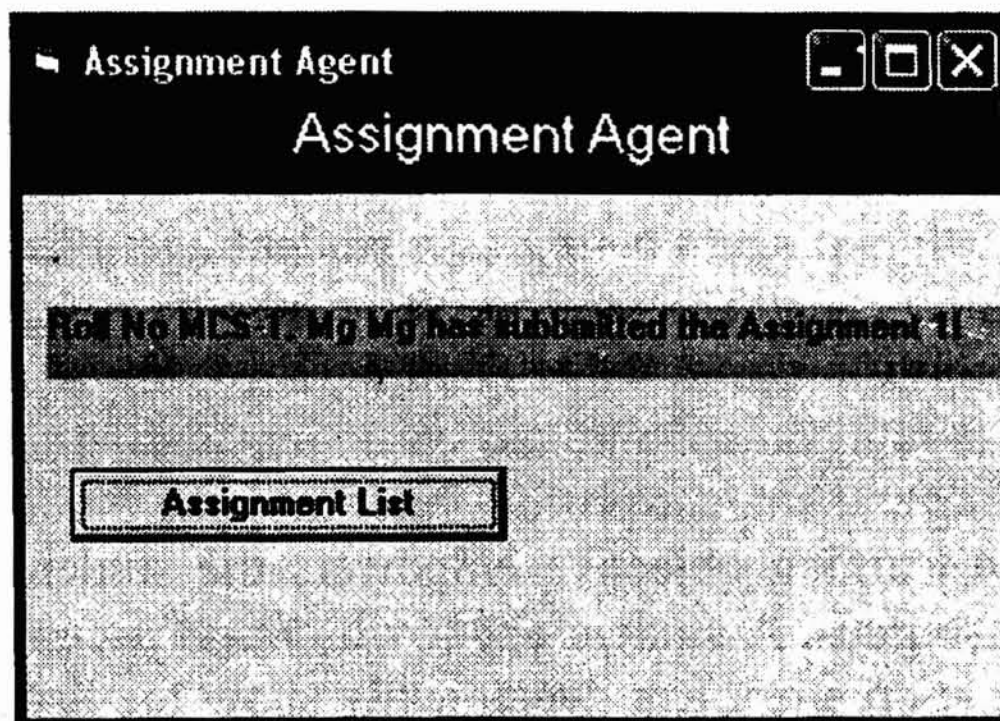


Figure 7. An assignment agent

Administrator Agent

The intelligent agents such as the administrator agents assist the administrator to give messages for teachers and students. The administrator agents (Figure 8) keep track on lectures, student assignments, instructors' details, students' details, and course details. The administrator agents send the reminders to student agents for overdue assignments and also send reminders to teacher agents to check the assignments. It also maintains the exam section and exam results. The administrator agent monitors all the course chat rooms and message board activities.

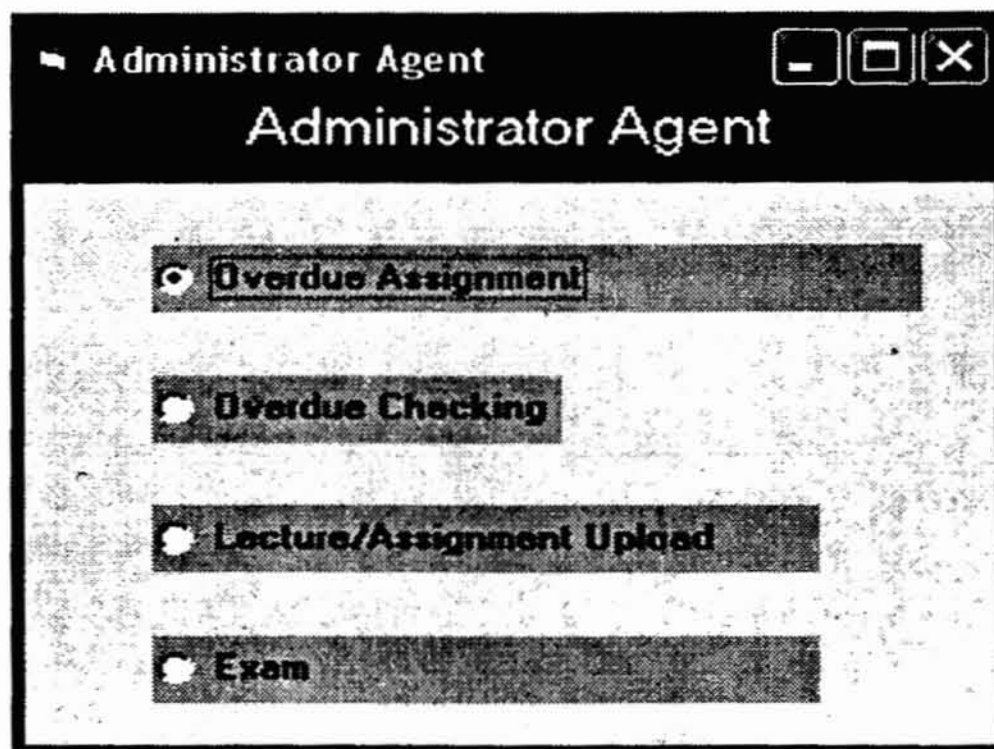


Figure 8. An administrator agent

Conclusion

The multi-agent architecture approach to WBTS applies an agent oriented information system to education. This system enables teachers to teach better and students to learn better. A teacher with the help of a teacher agent is able to address important questions, and survey the profile of each student (that is automatically maintained by the teacher agent). A student, with the help of a student agent, is able to collaborate with other students. An administrator, with the help of an administrator agent, is able to manage and keep track of monitoring. With the agents and a collaborative multi-agent system, WBTS is able to manage, process and share information more intelligently, compared to conventional information systems.

References

- Jafari, A. *Conceptualizing intelligent agents for teaching and learning*. Retrieved October 25, 2007 from net.educause.edu/ir/library/pdf/eqm0235.pdf
- Soh, L. K., Xuli, L, XueSong, Z., Jameela, Al-J., & Hong, J., *I-MINDS: An agent-oriented information system for applications in education*. Retrieved October 25, 2007 from citeseer.ist.psu.edu/648602.html
- Than Than Wai and Nwe Nwe Win, (2007) Architectural design of the student-centric web-based teaching system. *Journal of the Myanmar Academy of Arts and Science*, Vol. (3). Mathematics and Computer Science. 331-340.