

MOBILE AGENT BASED ONLINE EXAMINATION SYSTEM

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Abstract-This paper presents a case study namely Mobile Agent Based Online Examination System and the roles of mobile agents used in the system. The system provides the infrastructure for conducting computer-based examination which the candidates may be spread over in large areas. The system aims to map the real world examination system and concentrates the full stage of the examination from question setting to answer evaluation. By implementing this system using Mobile Agent gives us several advantages like scalability, flexible structuring, dynamic extensibility, push-pull modes of information dissemination, evaluation of subjective question, and transparency to varying communication channels, application layer multicasting, network latencies and dynamic content delivery.

I. INTRODUCTION

The Internet already plays an essential role in education, research, business, and entertainment today. The advent of Internet and the steady gain in popularity of Distance Education greatly influence our educational environment. Online educational information has been increasing exponentially, and online learning is currently an important research and development area. As online learning environments are strongly driven by information revolution and the Internet, Distance evaluation (DE) of students constitutes a crucial factor for the success of online learning.

Nowadays, most of computer based evaluation mechanisms are Web Based Testing and employ the client-server paradigm [3]. Such mechanisms usually do not scale well and also do not fully support features like: evaluation of subjective solutions, delivery of dynamic content, and network latencies [3]. Mobile Agents technology has been developed quickly and broadly as a useful paradigm for overcoming the above limitations.

The mobile agent is free to travel among the hosts in the network. Created in one execution environment, it can transport its state and code with it to another execution environment in the network, where it resumes execution [9] [10]. A mobile agent will have an itinerary, which is a list of nodes it needs to visit, associated with it. Mobile agent gives several reasons, such as reduce network load, overcome network latency, encapsulate protocols, execute

asynchronously and autonomously, adapt dynamically, naturally heterogeneous in [9] and [10]. Moreover, applications whose components have complex changing relationships and are geographically distributed would most benefits from using mobile agent design [6].

This system aims to solve the problems of examination system in [2] [3] [6] [7] and to replace the existing paper-based examination system like examinations under Ministry of Science and Technology in Myanmar.

II. RELATED WORK

The researchers intended to use a multi-agent platform to design and develop the features (agents) that will provide the added value to legacy e-learning systems in [8]. They implemented a Questioner Assessment Agent in order to manage the student's answers given to the questioner. This agent uses Bayesian Networks in order to determine the sequence of questions that are given to the student according to his/her possible answers. The benefit of their system is that the student does not have to spend time by answering questions that are considered to be far easy for his/her knowledge level. However, the weak point is that their system cannot provide a comprehensive solution to the question.

Mihaela Dinsoreanu, Ioan Salomie, Kalman Pusztai [4][5] have studied the development of a Student Assessment System (SAS), which is a closed, dynamic, distributed agent-based system containing benevolent agents, both stationary and mobile, that cooperate in order to provide an efficient and reliable assessment service in a Web-based Distance Education Environment. There are several issues, related to assessment that should be considered: communication issues, security issues, evaluation types, student answer analysis and grading. They considered two main functional approaches: a pull (Self-Assessment) scenario initiated by the student and a push (Exam) scenario initiated by the teacher. However, their weak point is the structure of Evaluation Engine and lack of student answers as essays.

Virkrum Jamwal and Sridhar Iyer [2][3][6][7] have implemented mobile agent based system for distance evaluation (MADE) of students distributed over large areas by using Voyager ORB framework. They have found that this

approach yields many advantages over other traditional approaches in terms of scalability, flexible structuring, dynamic extensibility, and independence from network disconnections. Other advantages gained were in the form of application layer multicasting, support for dynamic content and provision for both push and pull mode of information dissemination. However, their system still needs suitable techniques for proper control and management of these different mobile agents. Better methods of handling autonomy and improving the overall system reliability need to be formulated and implemented. Besides, they lack the critical requirement, protection of agents (e.g. Answer Agent) from malicious tampering, when they move from closed to open environments.

In the paper [1], the researchers have implemented multi-agent based teacher assistant (MATA) for universities, colleges and schools around the world assisting teachers in student evaluation, grading and enhance student teacher interactions in an intelligent automated way thus reduces burden on faculty members and provides services to the students around the clock. MATA can not only be view as a replacement of the traditional mediator, a human teacher assistance, which bridges between teacher and students but also an accomplishment of a system that could assist teachers in the process of evaluation. The system (MATA) provides several advantages like: dynamic service discovery, delivery, scalability, flexible structuring, dynamically extensibility, transparency, fault tolerance, code as well as data shipping and intelligent end users nevertheless very near with real world scenarios proving to be a sliver bullet for the task of automation and even taking it further to the next level. At present Java Agent Development Environment (JADE) follows the preparation of centralization. They have the problems in remote administration in case of the failure of main nodes which provided the serious set back in MATA.

III. ARCHITECTURE

Existing computer based evaluation mechanisms, usually do not scale well and also do not fully support features like: evaluation of subjective questions, delivery of dynamic content, and off-line examinations. These features are extremely desirable for distance evaluation and there is a need for alternate ways of designing such applications.

Mobile Agents are an effective paradigm for distributed application. Mobile Agents are autonomous software entities that can halt themselves, ship themselves to another agent enabled host on the network, and continue execution, deciding where to go and what to do along the way. They offer many advantages over traditional design methodologies like: reduction in network load, overcoming network latency and disconnected operations.

The session presents the system under development which aims to model an agent-based system, able to replace the existing paper-based examination system under Ministry of Science and Technology in Myanmar. This system aims to

map closely to real world online examination scenarios and to fulfill the lacks of the existing systems. The overview of the system is shown in Fig. 1.

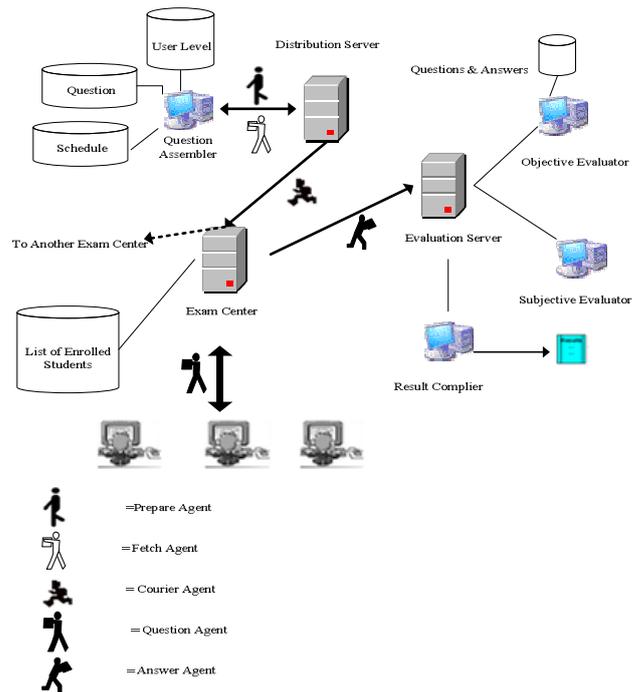


Figure. 1 . Overview of the Online Examination System Using Mobile Agent

The system includes three main stages:

- (1) Question Setting
- (2) Distribution and Testing
- (3) Evaluation and Result Compilation

In the first stage, the comprehensive question is created in time of the due date and time by the help of the agents. Prepare Agent is used to set the needed information to the Question Assembler. The Question Assembler prepares a comprehensive question depending on the Question Database and the data given by the Prepare Agent. Subsequently, the Central Exam Center dispatches the Fetch Agent to the Question Assembler to collect the required question for the related examination. At the appropriate time, the comprehensive question is sent to the examination centers.

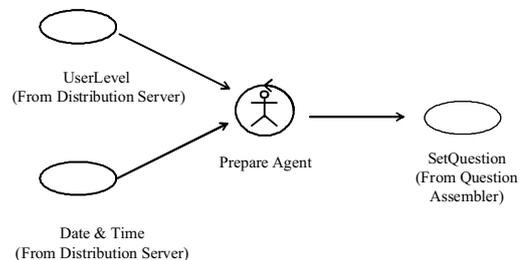


Figure. 2 . Prepare Agent and its Associated Tasks



Figure 3 . Fetch Agent and its Associated Tasks

In the second stage, sending the question to different centers, distribution to each of enrolled students and collection of answers are involved. Courier Agent is used to dispatch the question to the different examination centers that are at remote locations. The Question Agents are created and dispatched by the server node at each centre to distribute the question to each of the enrolled students at that centre. Each Question Agent returns to the server node with the students' answer after the student had submitted his answer or the time is up. The server node creates the Answer Agents for each answer and dispatches them to the Evaluation Server.

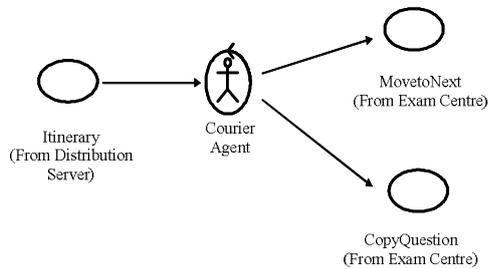


Figure 4 . Courier Agent and its Associated Tasks

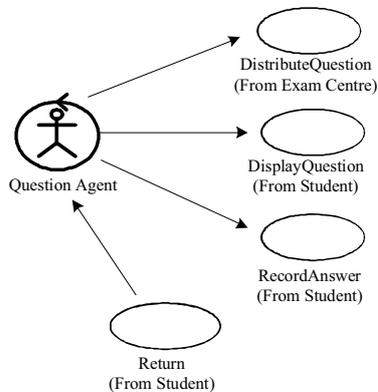


Figure 5 . Question Agent and Its Associated Tasks

In the last stage, evaluation of answers, compilation and publication of results are involved. When the Answer Agent reaches the Evaluation Server, the Evaluation Server examines the type of answers whether they can be objective answers or subjective answers. The Evaluation Server will give the Answer Agent a reference to the evaluators depending on the type of answers. If it is the answer to the objective question, the Answer Agent moves to the Objective

Question Evaluator that is computer-based system. If it is the subjective type question, the Answer Agent visits the Subjective Question Evaluators who are the concerned examiners until the completion of evaluation for all answers. After evaluating the answer, the Answer Agent moves to the Result Compiler and supply the scores. When the Result Compiler has acquired the scores from all the Answer Agents, the comprehensive result will be compiled and published.

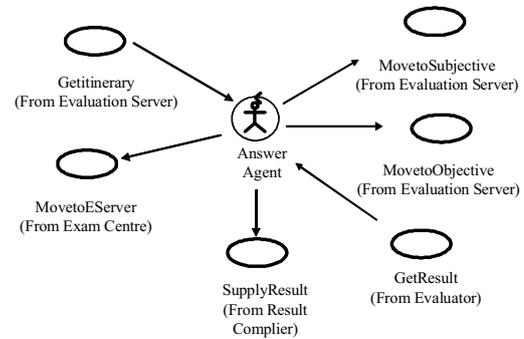


Figure 6 . Answer Agent and Its Associated Tasks

The roles of the different agents used in this system are presented as follows:

The roles of the agents used in the Question Setting are:

- Prepare Agent - Carries the input data, such as user level, date and time, to the Question Assembler, and prepares question on the Question Assembler (Fig. 2).
- Fetch Agent - Collects comprehensive question from the Question Assembler (Fig. 3).

The roles of the agents used in the Distribution and Testing are:

- Courier Agent - Carries only a single copy of the question and moves on to the next center after supplying a copy of the question to the Distribution Server at an examination center (Fig. 4).
- Question Agent - Carries the question to each student, presents the question to each student, record the answer, and carries the answer back to the Distribution Server of Exam Center (Fig. 5).
- Answer Agent - Carries the answer of a student to the Evaluation Server (Fig. 6).

The roles of the agents used in the Distribution and Testing are:

- Answer Agent - Gets the itinerary of the examiners from the Evaluation Server, visits the Evaluators to get itself evaluated, gets the result of the evaluation from the evaluators, and supplies the final result to Publish Server (Fig. 6).

IV. CONCLUSIONS

By implementing such system using Mobile Agent, it can give us clear advantages such as reducing network load,

evaluating the subjective questions, and reducing the dependency on the underlying network. Moreover, the previous implementation [2][3][6][7] lacks of the proper control and management of the different mobile agents, overall system reliability and protection of agent. This system aims to overcome the above limitations. We are in the progress of implementation stage using the IBM Java Aglet framework. Therefore the future research will provide more detailed experiences for implementation of online examination system using Mobile Agent.

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