Improving E-Learning System Using Automated Document Downloading and Announcement Delivery

[1]*Mohd Hilmi Hasan,* [1]*Nazleeni Samiha Haron,* [1]*Mohd Fadzil Hassan,*
[2]*Kamaruzaman Jusoff,* [1]*Fazlina Shahrom and* [1]*Nabila Syanaz Roslan*

[1]Department of Computer and Information Sciences, Universiti Teknologi PETRONAS,
Bandar Seri Iskandar, 31750 Tronoh, Perak, Malaysia
[2]Faculty of Forestry, Universiti Putra Malaysia, 43400 Selangor, Malaysia

Abstract: The rapid advancement of information technology has led to an explosive expansion of web-based learning. Numerous academic institutions have implemented e-learning system for not just supporting distance learning, but also for their conventional mode of teaching delivery namely for discussion, sharing materials and posting announcement. The objective of this paper is to present the improvement of current e-learning systems that require students to manually download teaching materials and check for new announcements posted by instructors. The system is developed in three-tier architecture and tested using functional testing. The system is installed on student's computer and has timer feature which instructs server to perform the checking procedures to look for new documents and announcements for every scheduled period of time. Any new documents and announcements will be automatically downloaded to student's computer. The system is successfully developed and believed can improve the e-learning system. The study implies potential time saving as students do not have to manually check for new course document and announcement posted by instructors in e-learning. For future works, it is proposed that push technology is implemented to initiate the process of checking new document and announcement from server, which can reduce the use of network resources.

Key words: E-learning · Automated document download · Automated announcement delivery · E-learning system

INTRODUCTION

The rapid advancements of information and communication technology have huge impact in many fields, for instance supply chain management [1], education [2] and many others. In this regard, the education field has soundly benefited, as proven by the explosive growth of web-based learning. Web-base learning has proven that it could effectively support the learning and educational processes and will emerge as the most popular medium for delivering instruction in the future [3]. The study done in [4] shows that e-learning has become new tendency in learning and it provides a range of advantages as compared to conventional learning. One of the advantages is its effective way of updating learning contents.

Numerous studies have been done to improvise e-learning system in order to gain the fullest advantage out of it in supporting learning activities. The work done in [5] shows a hybrid recommender system as a tool to support the searching of suitable materials by learners from a huge collection of learning materials available in e-learning. In this study, the developed system is able to provide recommendation of items with different learning contents while reducing the time taken by learners to search for an item. This system is developed based on content based filtering and collaborative filtering techniques. The study in [6] describes the implementation of object-oriented approach in e-learning content development in order to promote content reusability. The three-level information architecture is used to support the implementation. This reusability feature implies cost and time savings.

Corresponding Author: Mohd Hilmi Hasan, Department of Computer and Information Sciences,
Universiti Teknologi PETRONAS, Bandar Seri Iskandar,
31750 Tronoh, Perak, Malaysia, E-mail: mhilmi_hasan@petronas.com.my.

Moreover, instructors who utilize e-learning in their teaching also play important roles to facilitate the learning process. As such, instructors have to be provided with tools which enable them to monitor, understand and evaluate their students' activities in the course. This kind of tools can reduce the rate of dropout amongst students, as well as enable instructors to assess students more closely [7]. These advancements of e-learning has made e-learning from merely a web-based learning portal, to become pervasive [8] and accessible using mobile devices [9]. The research on advancing e-learning is expected to grow for life-long, as it now has gained increasing attention from both industry and academic sectors [10]. This study focused on enhancing e-learning to provide automatic document and announcement download to students' computers. The impetus of this study was based on two issues. Firstly, there was no mechanism to notify students of new announcement posted by instructor in e-learning. As for the second issue, there was no mechanism to notify students about new course documents posted by instructor in e-learning. For both purposes, reading new announcement and downloading new document, student had to log on to e-learning and perform the tasks manually. Students are not always logged on to e-learning, which may result in they are unaware of new important announcement made by their instructor. Moreover, in a case when students want to download course documents from e-learning, they have to log on to e-learning and check whether the document has been posted or not by their instructor. If the wanted document is not there, then students have to repeat the manual checking process frequently. These were believed to give poor effect to e-learning effectiveness and indeed time-consuming. Therefore, this study focused at overcoming these two issues. The motivation of this study was to create active learning environment through e-learning which was believed can enhance learning process. A study shows that communication between online students and instructors should be supported by immediate response and feedback and must be accessible at all times [11]. Furthermore, a study also shows that instructors' teaching performance could be improved while students' satisfaction can be increased should the communication medium between this two user groups is delivered in a timely manner and provide prompt feedback [12]. Studies in [13,14] show the development of agent framework for automatic document and announcement download. These two works consider the processes involved to perform the automatic download. In contrast, this paper presented the development of the system which enables the automatic download.

In a nutshell, the objective of this paper was to present the development of a system that can automatically download new document and announcement posted by instructor in e-learning onto students' computers. This system was named as Automatic Document Downloading and Announcement Delivery System (ADDAS).

METERIALS AND METHODS

The study began with the information gathering and literature study works. The results of these activities had been used for the analysis and system requirements development works. After the system requirements was generated and verified, the system design activity took place. In this phase, the system architecture, system flow, use case diagram and database were designed. Then, the study was preceded with development works. In this phase, the system development works and verification activities based on system requirements were done iteratively until the finished system was delivered. The final activity involved in this study was functional testing, which served the purpose to ensure that the developed system met all the required functionalities.

Development Tools: A personal computer with Microsoft Windows XP Service Pack 2 was used in the system development. The system was developed using Java language, while MySQL was used for its database management system. Throughout the development process, the NetBeans IDE was used for code programming. As for e-learning server, Moodle was chosen in this study.

System Architecture: Fig. 1 shows the system architecture of the developed system that was developed in three-tier architecture. Course instructor uploads new document file or announcement onto e-learning server using Moodle system interface. The document and announcement will be kept in database on e-learning server for students to download later.

On the other part, students have to log on to ADDAS system installed on their computers. This will result in students computers get connected to e-learning server. Once connected, students may perform other works on their computers, while ADDAS system performs task of downloading new documents or announcements. ADDAS contains a scheduling procedure where it instructs PHP scripts on e-learning server to perform checking for new
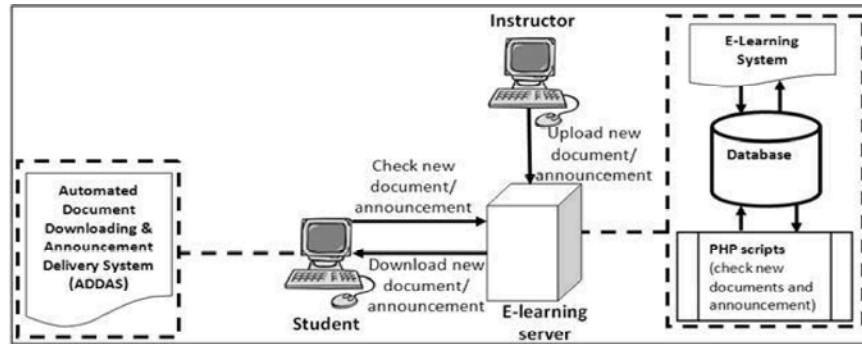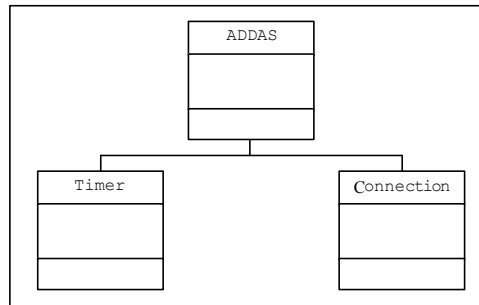
Fig. 1: System architecture
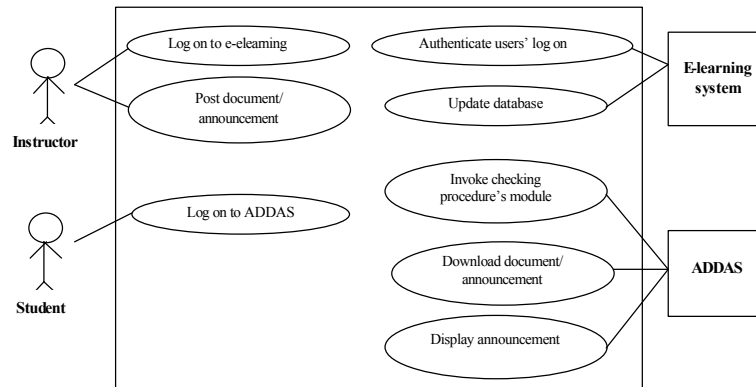

Fig. 2: ADDAS system class diagram

Fig. 3: Use Case diagram

documents and announcements for every certain period of time. In this study, the scheduled time was set to five minutes. This means that for every five minutes, the PHP scripts on e-learning server will perform the checking procedures. The scripts search for new document and announcement in database and if there is any it will push it to students' computer. The new document will automatically be downloaded onto students' computers in the specific location as specified during installation. On the other hand, ADDAS will prompt a message window on students' computers to display the new announcement received from e-learning server.

ADDAS system comprises three classes as shown in Fig. 2. The main class, ADDAS contains system interface and link coordination to other classes. The Timer class does the scheduling procedure where for every certain period of time, the system will send instructive message to e-learning server to invoke the scripts for checking new document and announcement. As mentioned earlier, the scheduled time was set to five minutes in this study. The third class is Connection, which performs the log on operation and connects ADDAS system on client computer to e-learning server. Fig. 3 shows the Use Case diagram to depict the overall structure of the developed system.

Checking Procedure: A PHP module that contains scripts for checking new document and announcement is

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┌──────────────────────┐
│    mdl_received      │
├──────────────────────┤
│ ID                   │
│ username             │
│ course               │
│ labelID              │
│ resourceID           │
└──────────────────────┘
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Fig. 4: mdl_received table design

located on e-learning server. In this study, five Moodle database tables were used namely mdl_user, mdl_course, mdl_course_display, mdl_label and mdl_resource. mdl_user contains students' data such as ID, user name and name. mdl_course, on the other hand, contains courses' data where course ID is used as the primary key. mdl_course_display table contains data of what courses that each student is enrolled in. Finally, mdl_label and mdl_resource tables contain data of announcements and document files respectively. The name label is used to represent announcement since announcement in Moodle e-learning system is made using label format. Each announcement and document file is identified using ID.

The checking procedure implemented in this system was developed with requirements to ensure these two issues were attended to; students can only receive document or announcement of courses that they are enrolled in and no duplicate download of document or announcement onto students' computer. The former issue was accommodated through joining database query amongst the five tables mentioned earlier namely mdl_user, mdl_course, mdl_course_display, mdl_label and mdl_resource. As for the second issue, a new table named as mdl_received was created. Fig. 4 shows the database design of this table. When a request is received from a student, the checking procedure will obtain label (announcement) and resource (document) IDs from mdl_label and mdl_resource tables respectively. These two IDs will then be compared with the student's labelID and resoureID from mdl_received table. Only new document or announcement will be downloaded onto student's computer. This ensures there is no duplicate downloads occur in the system.

Each instructive message received by e-learning server from students' computers contains IP address which is used to push document or announcement to specific computer.

RESULTS AND DISCUSSION

Fig. 5 shows the interface of the developed system, ADDAS. The interface on the left is the log on page where students have to enter their correct username and password. The interface on the right is the page showing that the log on process is successful. This page also states the student's name and the courses that he/she are enrolled in. It does also mean that the student's client system has successfully been connected to e-learning server. At this stage, the system can be minimized and other applications can be run for use.

The timer functionalities of the system will start running once the log on process succeeds. After each five minutes period, the system will send instructive message and IP address of client computer to e-learning server to run the checking procedure. If there are any new documents or announcements posted, then it will be downloaded onto students' computers. Fig. 6 shows the announcement message displayed on students computer. This window will remain on student's computer until he/she click 'OK' button. This is to ensure that student reads the announcement before it disappears.

Testing: In this study, the developed system was tested with functionality test. Table 1 below shows the test cases used for running this test. Table 1 also shows that the developed system had passed all the required test cases in the functionality test.
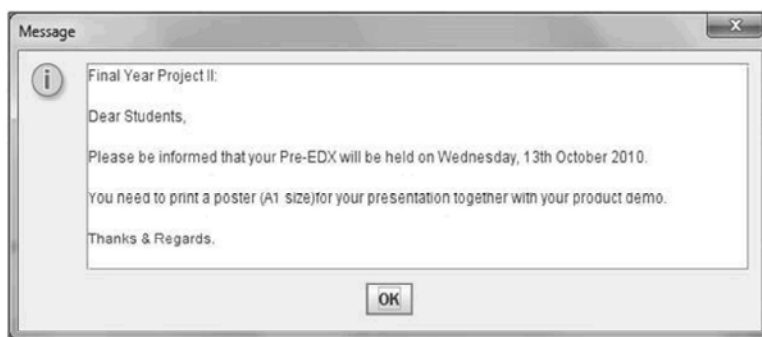

Fig. 5: System interface

Fig. 6: Announcement displayed on computer

Table 1: Test cases used for functionality test

Test Case	Expected Outcome	Result
The system is logged on using INVALID username or password.	The system should not run and prompt failure message to student	PASS
The system is logged on using VALID username and password.	The system should run and display the correct system interface	PASS
The instructor post new document in e-learning while client system is logged on.	The document should be downloaded onto student's computer after 5 minutes	PASS
The instructor post new announcement in e-learning while client system is logged on.	The announcement should be displayed on student's computer after 5 minutes	PASS
The instructor post new document/ announcement in e-learning again while client system is logged on.	The new document/ announcement should be downloaded onto student's computer after 5 minutes	PASS
The system is logged out and logged on again after a while.	The previous document/announcement should not be downloaded again	PASS

CONCLUSION

The developed system allows students to download new course documents and read new announcements posted by instructor in the e-learning automatically. By having this, the system can benefit students in terms of time saving. Students do not need to frequently log on to e-learning system and manually check for new documents or announcements.

The system which is named as ADDAS has to be installed on students' computers. The system contains scheduled timer where it sends instructive message to e-learning server for every five minutes. On the server, a module that contains PHP scripts is installed. This scripts contains procedure to check for new documents and announcements posted by instructors. This checking procedure is invoked only when it receives the instructive message from client system installed on student's computer. If there is any new document or announcement, the script will push it to student's computer.

In this study, the system installed on students' computers initiate the process to invoke the running of checking procedure on server. For future works, it is believed that this study can be extended to make the process of invoking the checking procedure to be initiated by server. This may result in possible benefit of reducing utilization of network resources.

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