THE VIRTUAL LEARNING ENVIRONMENT SYSTEM

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Abstract - The Virtual Learning Environment (VLE) is an integrated university environment where students can apply for admission over the internet, enroll in the classes offered by VLE after admission, access a complete course, take tests, and interact with the professors as well as classmates. The VLE has tools for administrators, professors and students for performing their duties. VLE supports the goals of a virtual university. The VLE implements specific modules for routine administrative functions of a university environment. VLE provides for student admission, course registration, grade management, and administrative report generation among other functions. It implements all the functions for a student to take the course over the VLE. The VLE allows students to view lectures and access the study material for every topic of the course. The students are given tests at specified times, and answers to the questions are transmitted to the professor automatically. The communication hub of the VLE has an e-mail facility, chat facility, and a multimedia teleconferencing system. In addition, it has all the tools and instructions for a professor to develop the material for a course to be offered through the VLE. It also includes all the day-to-day procedures that a professor must follow once the course is ready for delivery to the students.

1. INTRODUCTION

The current computer and communication technologies have been used very successfully in many application areas but are not being utilized to their fullest capability for delivering instruction to a widespread student population [1-4]. The new technologies enable the interaction between students and instructors almost free of time and location constraints. Moreover, the existing technologies have the potential to provide a cost-effective and flexible learning environment. This work is an effort in that direction to provide a cost-effective teaching paradigm the Virtual Learning Environment, hereby referred as VLE.

1.1 Flexible Learning Environment

There are several possibilities for interaction between the student and teacher for providing an effective learning environment. In a regular class room environment, the teacher and student meet at the same place (classroom) and at the same time (schedule). Here, the instructor can use any presentation style, such as on a blackboard or with an overhead projector, to teach the students. One of the limitations of this approach is that students must adjust to the time and location requirements of the course.

The distance learning method in which the course is offered at one location and the students can take the course at geographically different places is also very popular. This method is achieved by using video, fax, phone, and data interaction between the students and teacher [5]. One of the restrictions of this approach is that the student must meet the time requirement for the class. Moreover, the students will have to go to a particular location to take such a class due to the elaborate requirement of audio visual equipment.

To overcome the shortcomings of the regular classroom environment and the distance learning method, it was perceived that the existing Internet and multimedia tools can be used to build a new educational environment called the Virtual Learning Environment (VLE) in which the students and teachers do not have to meet at the same time (schedule) or in a specified classroom (location). However, the students can retrieve the course contents (lectures plus study material) at their own convenience and interact with the professors according to their needs (personally and electronically). This paradigm has great potential but has not yet been fully developed and tested.

1.2 Objectives of the Virtual Learning Environment

The objective of VLE is to make education available to vast population [7,8]. Hence definitely in this project, the Internet will be used as the delivery medium for the virtual learning environment courseware. Now with most part of the world connected to Internet and the remaining part of the world too can not sit in dark for long and sooner or later would join the Internet. The popularity of the Internet is growing at a very fast rate and it is estimated that there are millions of computers connected to the Internet. Based on current projections, most households in the U.S. will be using the Internet for one purpose or other by the end of the next decade. This popularity is due to the user-friendly access to the Internet as well as the availability of useful information such as free software, library access, and weather forecasts. Hence the objective of VLE, education for all, can be achieved only through Internet.

The focus of this project is to design and implement a new and innovative teaching paradigm in order to provide a cost-effective, flexible, and high quality learning environment for education. In VLE, students not only can take the course from remote locations at any time, but also
can provide feedback to the instructor about the course design. Moreover, the VLE will keep track of student's progress through a VLE support software module. The overall objectives of the virtual learning environment are as follows:

1. Provide a learning environment for students so that they can take the courses without the time and location constraints of a traditional teaching environment.
2. Allow students with special needs and restrictions to participate in the courses offered through this learning environment.
3. Provide geographically widespread access to various courses offered through this learning environment.
4. Provide a flexible and cost-effective learning environment for the students through the Internet.
5. Develop a learning environment where students can learn the material at their own pace and provide universities with an environment in which they can improve their enrollment by involving many more students in the learning process [6].
6. Provide a course repository for many universities that do not have the expertise to offer a large number of provider university elective and special courses by signing an agreement with the VLE.

2. VLE DESIGN

This section discusses the logical design of the VLE system. It starts with an overview of the VLE system and its various modules. Then the logical design of each of the module is described.

2.1 VLE System Design Aims

The main aim of the VLE system design is to build a Virtual University that supports the following:

- Applying to the university,
- Registering for the courses,
- Online courses, assignments & tests.

The basic idea of VLE is to provide a good alternative to the traditional classroom teaching environment by presenting the course materials with multimedia tools like audio & video. With this basic aim in mind the VLE system is designed to include the following modules:

i. Admission Module
ii. Admission Status Monitoring Module
iii. Course Registration Module
iv. Course Module
v. Communication Module
vi. Administrative Resources Module

The designed global model for Virtual Learning Environment (VLE). In this model, students will take courses via the VLE system. The VLE system will provide the following functions:

- Student testing and assignments
- Student-teacher and student-student communication

2.1 VLE Admission Module

The main design aim in building this module is to provide an online tool to the prospective VLE student that can be used to apply for admission to the VLE. This module’s activities include the following:

i. Check for application deadline
ii. Validate user data
iii. Update the database

2.2 VLE Admission Status Monitoring Module

The module design aims and functionality can be described as follows:

- Build a tool for the admissions department, using which the admission department should be able to post a question, description, confirmation etc. for a particular student.
- Build a tool for the student, using which the student can view the question posted for him/her by the admissions department. The tool should also allow the student to post the reply to the admissions department.
- Build a tool using which the admission department should be able to view the replies posted by the students.

Since the system saves the questions and replies in the database and this database is accessible by both the admissions department and the student, the information is instantly available i.e. the question posted by admissions is available to the student right on the next instant the admission posts it and similarly the student responses are available to the admission department right away as the student posts his/her reply.

2.3 Course Registration Module Design Algorithms

The Course Registration Module is built by implementing the following algorithms:

- User Authentication Algorithm
- Add Course Algorithm
- Drop Course Algorithm
- Course Report Algorithm

These four algorithms are integrated together to function as the Course Registration Module.

The brief description of how these modules work in the integrated environment is explained in the following steps, for a quick grasp of how the course registration system works.

- Step (1): When a user wishes to register for a course calls the User Authentication Module.
- Step (2): If the User Authentication is successful, present the choice selection screen. This screen consists of the following choices: Add, Drop, Report, and Exit.
- Step (3): Get Choice.
- If Choice = Add, call the Add Course Module
♦ If Choice = Drop, call the Drop Course Module
♦ If Choice = Report, call the Course Report Module
♦ If Choice = Exit, Exit the Course Registration System

2.3.1 Add Course Algorithm
This algorithm is used to implement Add Course Module, which is called whenever the user requests to add a course; this is called by the Course Registration Main Module.

2.3.2 Drop Course Algorithm
This algorithm is used to implement the Drop Course Module, which is called whenever the user requests to drop a course, this is called by the course registration main module.

2.3.3 Course Report Algorithm
This algorithm is used to implement the program to generate a report of courses registered by the student. The Course Registration main module (User Authentication Module) calls this program whenever a student requests for a report of the courses registered by that student.

2.4 VLE Administrative Resource Module
To manage the entire VLE system, several resource modules are built for the administrator. These resources are accessible only to the administrator to aid him/her in administrating the system.
The resource modules developed for the administrator are divided into four groups:
• System Related Administration: Aids in administrating the system related activities.
• Admission Related Administration: Aids in administrating the admission related activities.
• Admission Status Related Administration: Aids in administrating the admission status related activities.
• Course Registration Related Administration: Aids in administrating the course registration related activities.

2.4.1 Admission Related Administrative Resources
These resources aid in administrating the activities related to the VLE admissions. Such resource modules are
• View Application Report Module
• Admit/Reject Application Module

2.4.2 Admission Status Related Administrative Resources
These resources aid in administrating the activities related to the admission status module. Such resource modules are:
♦ Post Question Resource Module
♦ View Answer Resource Module
Please refer to (section 3.3) for the discussion of Admission Status Monitoring Module and refer to (section 3.3.1) for the discussion of the algorithms to implement the Post Question and View Answer resource modules.

2.4.3 Course Registration Related Administrative Resources
These resources aid in administrating the activities related to Course Registration System. Such resource modules are:
♦ Add Course Resource Module
♦ Drop Course Resource Module
It is quite common that courses offered this spring might not be offered next spring and vice-versa. In such a situation tools to add or drop courses from the database are always needed. Add Course and Drop Course resource modules are such tools, which aid the administrator to add and drop courses to and from the VLE Course Database.

2.5 VLE Communication System
As in any learning environment, student teacher interaction is very important in the Virtual Learning Environment. But in VLE educational paradigm, the student and teacher do not necessarily have to be at the same location at the same time. Thus, the VLE provides the flexibility of personal communication as well as remote communication with the instructor. One of the basic design aims of the VLE system is to build a VLE communication system, which provides a student, various resources to communicate with the instructor as well as with other students. The VLE Communication System consist of the following services:
♦ e-mail Service
♦ On-Line Chat Service

2.5.1 E-Mail Service
This service is provided to the VLE students to communicate with the VLE faculty through e-mail. Whenever this module is called a form is generated which consist of the following:
♦ Student Name Input Box
♦ E-mail Address Input Box
♦ Drop-Down Menu Consisting of the Faculty Member Names
♦ Subject Input Box
♦ Message Text Box
♦ Submit & Clear Command Buttons
If a student needs to send a mail to a faculty member, the student needs to do the following:
• Enter name and e-mail address in the corresponding input boxes
• Select the name of the faculty member to whom the user wants to send the mail to by clicking on the drop-down menu and selecting the corresponding name.
• Type in the subject and the message in the corresponding input & text boxes.
• Submit the form
The mail is sent to the corresponding faculty member using the sendmail service of the UNIX system.

2.5.2 On-Line Chat Service
This service is designed to provide a on-line communication between any number of people. It mimics
the different chat services available on the Internet. Here students and the instructor can communicate with each other live as in a conferencing system, but only difference is, in the conference system every key stroke is live, that is as the user types, it is visible to all the participants, whereas in the online chat service, when a participant types the matter, he/she needs to submit it in order to deliver it to the rest of the participants. Using this service one can display images (gif, tif, jpeg etc.) also to rest of the participants. This is essential if a professor needs to explain something with the aid of a image etc.

2.6 VLE Course System

This module is the most essential of all the VLE System Modules. It is the main module through which the VLE system offers courses to the students. The VLE courseware have the following components:

i) Lectures (Text, Audio Clips, Video Clips & Links to Related Topics)
ii) Assignments
iii) Tests.

The lectures include the actual discussions by the teacher and the students would be able to view them on their monitors. The lectures are usually accompanied by audio & video clips. The audio clips generally consist of the audio version of the lectures and Video clips pictorially illustrate course related topics. The lectures are associated with extensive study material. This material will provide more detailed information about the lectures. Thus, the students can directly learn from this courseware. Links are given to the pages, which contain related study materials, hence it is as easy as click and go to the various information rich pages, which aid in better understanding of the lectures. While the student is viewing the lectures he/she can also play the audio files, which contains the verbal description of the lecture. The student can also play the video files while viewing and listening to the lectures. All these put together will stimulate interest towards the course. By providing this kind of learning environment it enhances the people's powerful learning mechanisms.

2.6.1 VLE Course Login

To access a VLE Course, the student needs to login to that course. When a student calls the VLE Course Login Module, it displays a form with User_Id & Password input boxes and the list of courses offered by VLE displayed as radio buttons. To access a particular course the student needs to enter the following:

-db User_Id
-db Password
-db Select the course to login by clicking on the corresponding radio button.

The system authenticates the login information by performing the following checks:

♦ Checks to see if the student by that User_Id exists.
♦ If exists, checks to see if the password entered is the same as that recorded in the database for that User_Id.
♦ If User_Id and Password are correct, then it checks to see if the student had registered for the course.
♦ If registered, it checks for the time deadlines. If that day is less than deadline date then the student is given permission to access that particular course.

3. VLE IMPLEMENTATION

This section focuses on the implementation part of the Virtual Learning Environment (VLE). The detailed algorithms designed to implement the various VLE modules are presented in section 3. Using the logic from these algorithms the various modules are coded. The VLE system module differs from the VLE course module in the way that VLE system module contains W3-MSQL cgi-bin scripts embedded within HTML files which enables logic coding and interacting with the VLE database whereas VLE course module consist of simple HTML files used to format and display text, audio & video. In other words VLE system files are dynamic which are generated on the fly by the W3-MSQL cgi-bin program whereas VLE course files are static files. The details are covered in the rest of the chapter.

The VLE system is built using a n-tier client/server architecture. The graphical user interface (GUI) for VLE is built using HTML. The back-end database is built using the MSQL database package. The interfacing of the front-end world wide web (WWW) with the back-end VLE database is done using the W3-MSQL cgi-bin program. VLE system is an integration of various modules built using HTML and W3-MSQL [9] scripting language.

3.1 Implementation of a Typical VLE System Module

The various VLE forms such as the login form, the application form, course registration form etc. are built using HTML forms, building forms. When a user populates a form and submits it, the HTTP (Hyper Text Transport Protocol) web server reads the HTML file and sends it to the W3-MSQL cgi-bin program. This program parses the HTML file and looks for the following tags "<" and ">". These tags distinguish w3-msql code from the HTML code in the w3-msql embedded HTML files and hence shouldn't be used for the sake of commenting as done otherwise. The W3-MSQL program residing in the cgi-bin directory of the web server after receiving the HTML file from the web server, identifies the embedded code to be processed and processes it. W3-MSQL scripting language also known as "lite" is a "C" like language. If any database manipulation query is encoded in the code, then the W3-MSQL program sends the query to the MSQL server, which executes the query and returns the result to the cgi-bin W3-MSQL program. W3-MSQL program formats the result set according to the specifications in the embedded code. Once W3-MSQL is done processing the embedded code, the result file which is also in HTML is returned to the web server. The web server sends the file to the browser for presenting to the user.

4. CONCLUSIONS

VLE provides the following main features:
1) VLE system is built on the Internet, hence the system does not need any other communication medium to offer the courses. In addition there will not be any major cost for developing a special high performance network to offer these courses.

2) Since any Internet browser supporting HTML forms could be used as frontend, the VLE system is accessible from any computer in the world, having the Internet connection.

3) Courses offered by VLE can be taken anytime during the duration the course is posted on Internet.

   Though VLE is a full fledged virtual university having administration, admission, course registration, communication and course presentation system all under one roof, it needs some modifications and enhancements to be done to make it even more robust and to enhance its functionality.

4.1 Modifications Suggested

   VLE's database is managed by Mini SQL server which is a lightweight database engine designed to provide fast access to stored data with low memory requirements. It also supports only a subset of queries (no views, sub-queries etc.), other limitation is, it does not enforce foreign key constraint. Hence if courses are offered real time to thousands of students it is recommended to move the database to a much powerful database server such as Oracle.

   During design and development of the VLE system, author did not concentrate much on the security related features. It does not mean that VLE System has no security system built, as strict user authentication is done at every stage of VLE. But the fact is due to the growing threat of Internet hackers, a major concern these days, a very good security system using Internet firewall etc. is very much essential. So major work is needed in this direction before it could be used real time.

REFERENCES

Figure 1: VLE System Overview