

Specialized Computer Laboratory Management and Maintainance

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Abstract. In this paper, we have described the flow and feasibility of an application for Computer Laboratories through which supervision and management of the entire laboratory becomes easy for a teacher. This application is platform-independent, thus allowing the teachers to conduct the lectures on any Operating System. The application makes use socket programming for communication between the teacher's computer and all the students' computers. Communication forms the main layer for the application to work independently, regardless of any Operating System being used.

Keywords: Laboratory Supervision, Laboratory Management, Education Improvement, Platform-independence, Remote Control, Socket Programming, URL Tracking

1. Introduction

The university specialized computer laboratories undertake the computer experiment teaching, the extracurricular practice as well as the computer scholar research, the laboratory maintenance work is very frequent and also is arduous. As more and more students are enrolled in universities, the construction of the computer laboratories is getting more and more rapid, and accordingly more modern infrastructure for IT are introduced. Meanwhile, conventional means for laboratory management are still adopted, which lead to the problems in scientific research work and practical tuition. Thus, new execution mechanism based on computer laboratory feature character is desired, so that new business process and technical mode can be built up upon modern IT infrastructure. Specialized computer laboratory management is classroom management software which is designed to make teaching with computers easier and more effective.

2. Research Objective

Our research object is studying a set of novel specialized laboratory supervision and management schema, through technical method, making the laboratory supervision and management to be more reasonable and automation, providing for the teacher as well as the student stably, safe, highly effective practical experiment specifically as follows:

1. The main aim of this software is to make it a platform-independent product, so as to allow the organizations and institutions to conduct their lecture and practical sessions in any Operating System;
2. The student uses individual domain account to login computer which is advantageous for the realization identification authentication and carrying on the control to the user rights;
3. Limit students' Internet surfing activities and prevent them be in touch with not good information;
4. Automatically record student login information and record or monitor the students' experiment procedure in order to improve teaching;
5. Allow the Institutions to carry out Multiple Choice Questions (MCQ) Examinations in laboratories.
6. The students are able to give feedback and comments about the lectures and practical.
7. Minimizes the effect of distraction by blanking the student's desktop screen, disabling the mice and keyboards;
8. The Lecturer can monitor the laboratory sessions easily through the features like screen-sharing and help the student to rectify his mistakes/errors by using the remote control feature.

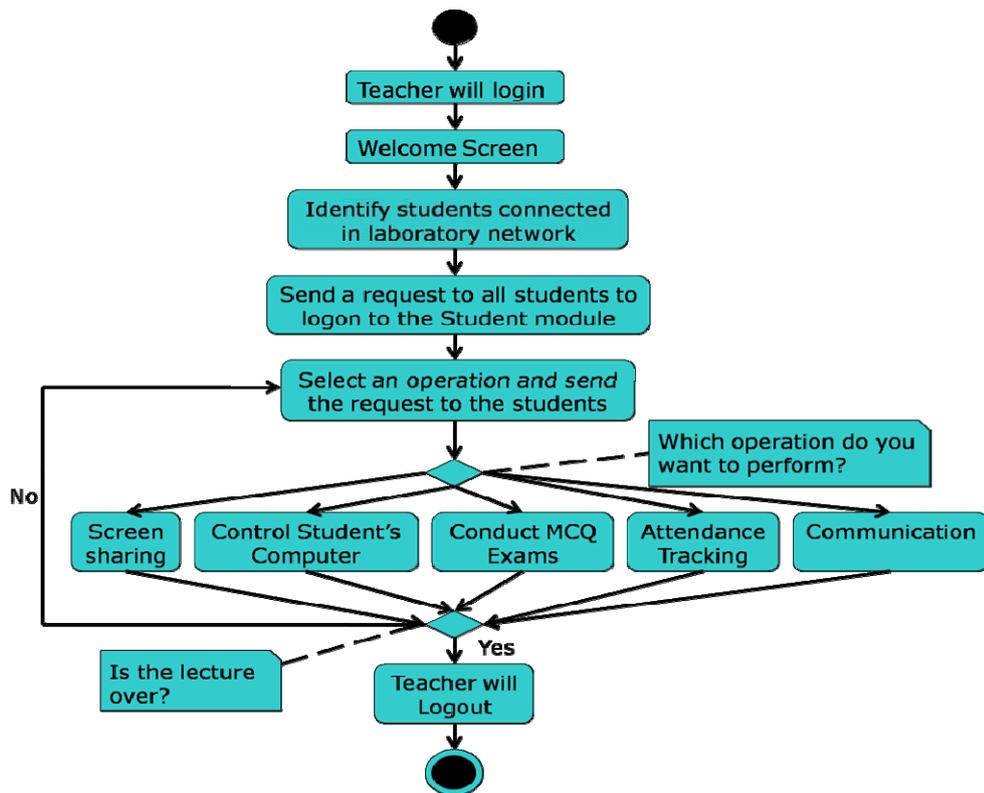


Fig.1 Flow of using this application- Specialized Computer Laboratory Management and Maintenance.

3. Flow of Using the Application

This software has two modules; 1) Teacher Module. 2) Student Module. Both the modules communicate with each other with the help of sockets, for passing any operational commands or data

3.1. Launching the Teacher Module

After launching the Teacher Module, a Login Form would be displayed for the authentication of the laboratory staff. Logging in successfully would display a welcome screen, notifying the teacher's authority and session details, later displaying the Main form, which would allow the teacher to use the supervision and management functions. The Teacher Module will scan all the computers that connected with it, via a Local Area

Network (LAN) Connection or a Virtual Private Network (VPN) Connection. Then, the Teacher Module will give status to the user/laboratory staff. The teacher can then carry out the set of operations on all the students that are connected in the network.

3.2. Performing the Operations

As shown in Figure 2, the teacher can perform all the operations in the figure. Firstly, sending a request for an operation to the student(s) computer, and the Student Module will execute that action locally on all the students' computers. For performing any operation on the student's computer, the software allows the teacher to send a request of that operation to the student(s) computer. On receiving the request from the Teacher module, the Student Module, will perform the specified operation(s) and send a notification to the teacher.

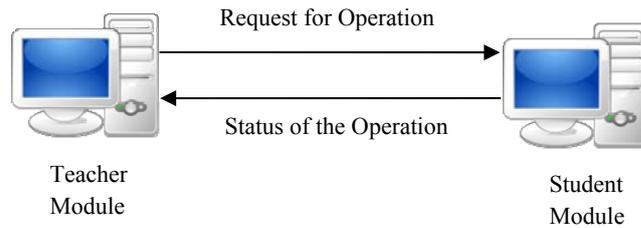


Fig 2: Communication flow

3.3. Flow of the Operations

The Figure1 shows the flow of actions that are carried out by lecturer, for supervising and managing the students in the laboratory.

The Student Module is Server Side of the Socket program and the Teacher Module is the Client Side of the Socket Program. Thus, when the students start their computers, the Server Socket starts running in background within the system tray, and the student is not aware of this background process. The Server Socket is waiting for an operation command from the teacher, who is the Client Socket. After receiving this command from the teacher (Client Socket), the Student Module (Server Socket) starts the requested operation locally on the student machine, thus resulting in the successful execution of the features.

4. Feasibility Study

SYSTEM S = {S1,S2,S3,S4,S5}

Users = {U1,U2....U50}

Messages = {strings, datapackets}

4.1. Screen-sharing:

S1 = {Q, R, q, D, O, P, M, Φ S}

- Q – Request for screen-sharing from teacher to student.
 - R – Taking a screen-shot, attach it to a datapacket and return it to the teacher.
 - q – Store it at the end of the Queue q.
 - D – The teacher will open the datapacket and display it.
 - O – Operations
- 0-NO operation 1-Transition 2-Failure

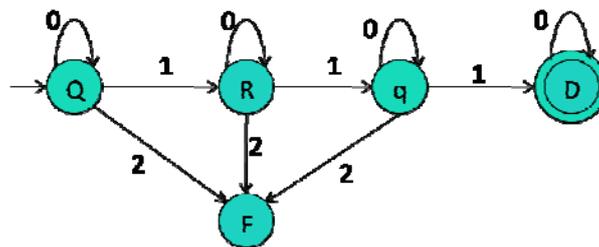


Fig3 Finite Automata for Screen sharing

Φ S – Rules

- ✓ Connectivity between the machine.
- ✓ Program execution environment.
- ✓ Successful transmission of message and data packets.

P – Success State

- Network working correctly, resulting in successful delivery of all the data.
- Resuming the operations after power failure (status file).

4.2. Conducting MCQ Exams:

- A teacher can conduct MCQ exams in laboratories.

S5= {Q,Sd,I1,V,Sb,R,Et,Rs,A}

- Q – The teacher will have to feed the question & answers in DB.
- Sd – The teacher will request the student to start the exam.
- I1 – The Student will start the exam.
- V – The Student will view the Questions.
- Sb – After selecting the answer, he will click the Submit button.
- R – A random number will be generated and the student will get the next question randomly.
- Et – The student can end the test, after he has either attempted or visited all the questions.
- Rs – The results will be evaluated and displayed to the students.
- A – Autometa

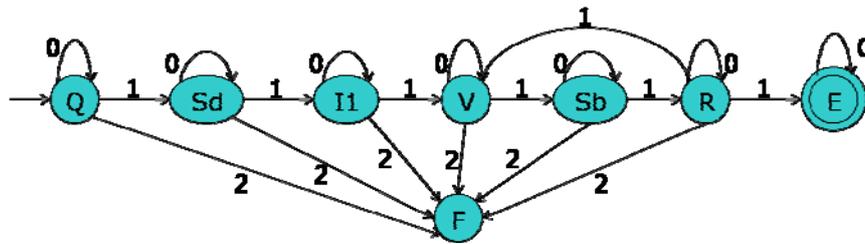


Fig.6 Finite Automata for conducting Multiple Choice Question (MCQ) exams

5. Future Work

The future enhancements in the application would be including some on-screen annotation tools like arrows, pointers highlighters, etc. We would also like to add some tools like zoom and magnifiers, which would help to display the contents of the screen, more clearly. We would also like to add a tool which will give a detailed report of the resources that have been used in the laboratory such as the number of computers being utilized, power consumption, internet usage details, etc.

6. Conclusions

This application through socket programming, Transmission Control Protocol, Uniform Resource Locator (URL) tracking and Remote Control would hence simplify the process of teaching with computers easier of the teachers and professor in schools and colleges.

7. References

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