IOT Based Smart Lab

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Abstract- *A smart lab system (Based on a traditional IT laboratory, with additional Internet of Things (IOT)) is based on IOT. Smart lab has great scalability. Based on this proposed architecture many applications can be integrated into the system through uniform Interface. A general problem while conducting lab sessions is inability to correctly assess students' progress of the taught material. The main reason is that generally the lab layout does not provide access to view every student's computer screen. Application of science and technology in the field of education can solve this and numerous other issues. For this specific problem, class and lab monitoring systems provide easy control and monitoring facility to teachers for all students' activities on every computer in the lab. For this purpose a number of classroom management software's are commercially available in the market these days. Research has shown that the use of such management applications can facilitate teachers and can improve students' learning. However, such applications are expensive and cannot be customized as source code is not available due to their commercial nature. We have designed an open source and free of cost educational application called Smart-Lab by using simple Networking concepts. Smart-Lab provides effective means for carrying out interactive and efficient lab sessions and classroom exercises. The design and preliminary testing of this application is discussed in this paper.*

I. INTRODUCTION

Mart- Lab is an IOT based free educational application specially develop for improving the effectiveness of lab sessions. This application can facilitates compatibility sand control of computer labs and other electronic appliances. Smart lab gives an option that with few mouse clicks teacher can have full control over lab computers as well as elec. Appliances. The IOT prototype is subject to smart and self-configuring objects that are connected to each other through a global network infrastructure. IOT is mostly considered as real objects, broadly scattered, with low storage capability and processing capacity, with the target of improving reliability, performance and security of the smart lab and its infrastructures with this knowledge, in this article, a review of the IOT-based smart Lab is carried out. The Internet of things (stylised Internet of Things or IOT) is the internetworking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data

II. IDENTIFY, RESEARCH AND COLLECT IDEA

A general problem or main reason is that generally the lab layout does not provide access to view every lab computers and other appliances. Application of science and technology in the field of education can solve this and numerous other issues

For this specific Problem, Class and lab monitoring system provide easy control and monitoring facility to teachers for all lab computers and Other Appliances.

1) Read already published work in the same field.
2) Attend workshops on IOT and symposiums on the same fields or on related counterparts.

Research has shown that the use of such management applications can facilitate teachers and can improve students' learning. However, such applications are expensive and cannot be customized as source code is not available due to their commercial nature. We have designed an open source and free of cost educational application called Smart-Lab by using simple networking concepts.

III. LITERATURE SURVEY

Smart-Lab application provides a number of features which are individually implemented by a huge number of applications, for example there are hundreds of chatting applications. But we are focused on developing LAN based application for a specific purpose of lab supervision and monitoring which requires a collection of those features which need to work in cooperation.

Keeping this in mind, instead of providing research background of each module of our application, we are only discussing related applications that target this specific problem domain of lab and classroom control and supervision. The search for such applications and systems reveals a number of software which are all commercial products and hence, limited

information about their actual implementation is provided. We are discussing a number of such applications to make the reader appreciate that even though our application is freely available but still provides comparable set of features.

NetOp school software [2] is a commercial classroom management system to be used in labs to control lab activities. The software provides a number of interesting features like; file exchange, audio and text chat, student monitoring by locking mouse or keyboard etc. The software encounters few problems when is used with Internet Explorer 8 (IE8) and on Windows XP platform [1]. Not much information is available on how this software is implemented, as it is a commercial product.

Net support school management system [4] is a commercial management system that provides managing, testing, instructing and monitoring facilities in the classroom for teachers. It has a huge set of management features like; classroom management, device management, printer management, student registration and file collection etc. In terms of monitoring, the features available are; screen monitoring, message/ chat monitoring, keyboard monitoring, application and Internet monitoring.

Lan School classroom management system [5] is a corporate training software which also provides comprehensive classroom management facilities. The salient features of the software are; student assessment, file exchange, chatting, message exchange, student monitoring, screen exchange, device locking etc. The system is a commercial product and not enough information about how those features are implemented is provided.

Another application that is related to our work is Got it System [6]. The system consists of remote controls which can be used to select options when some activity is presented in computer labs. Teacher and students all have these remote controls and teachers can conduct exercises and can take quizzes. Students use their controllers to select one of the available options and system has the ability to identify which student has selected what option. System also provides result generating facility for any activity.

After discussing a number of school management software's we would like to mention that a number of educational institutes are paying for the use of these commercial products. Our application provides most features that these softwares have and still provides; a) access to the source code, b)bilingual support (English and Arabic), and c)free of cost availability.

IV. METHODOLOGY AND IMPLEMENTATION

4.1 PCB DESIGN:

Once you have decided which electronic circuit is to be made on a PCB, you will have to make design for the board on your PC device locking etc. The system is a commercial product and not you can use different PCB designing CAD software like EAGLE. The most important point to note is that everything has to be designed in reverse because you are watching the board from above. If you need the circuit to be designed on a PCB, the layout must have a 360 degree flip. The next step is to print out the layout using a laser printer. You must take special care in the type of paper that you are going to use.

4.2 PCB LAYOUT:

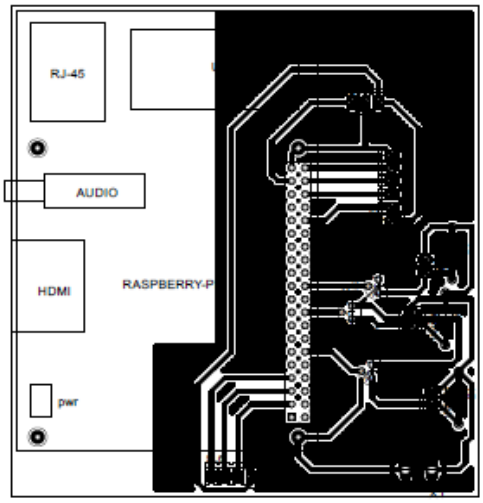


Fig. PCB Layout

4.3 PCB ETCHING PROCESS:

All PCB's are made by bonding a layer of copper over the entire substrate, sometimes on both sides. Etching process has to be done to remove unnecessary copper after applying a temporary mask, leaving only the desired copper traces. Though there are many methods available for etching, the most common method used by electronics hobbyists is etching using ferric chloride hydrochloric acid. Both are abundant and cheap. Dip the PCB inside the solution and keep it moving inside. Take it out at times and stop the process as soon as the copper layer has gone. After etching, rub the PCB with a little acetone to remove the black colour, thus giving the PCB a shining attractive look. The PCB layout is now complete.

4.4 PCB DRILLING:

The components that have to be attached to the multi-layered PCB can be done only by VIAS drilling. That is, a pated-through hole is drilled in the shape of annular rings. Small drill bits that are made out of tungsten carbide is used for the drilling. A dermal drill press is normally used to punch the holes. Usually, a 0.035 inch drill bit is used. For high volume production automated drilling machines are used.

4.5 CONDUCTOR PLATING:

The outer layer of the PCB contains copper connections (the part where the components are placed) which do not allow solder ability of the components. To make it solder able, the surface of the material has to be plated with gold, tin, or nickel.

4.6 SOLDER:

The other areas which are not to be solder able are covered with a solder resist material. It is basically a polymer coating that prevents the solder from bringing traces and possibly creating shortcuts to nearby component leads.

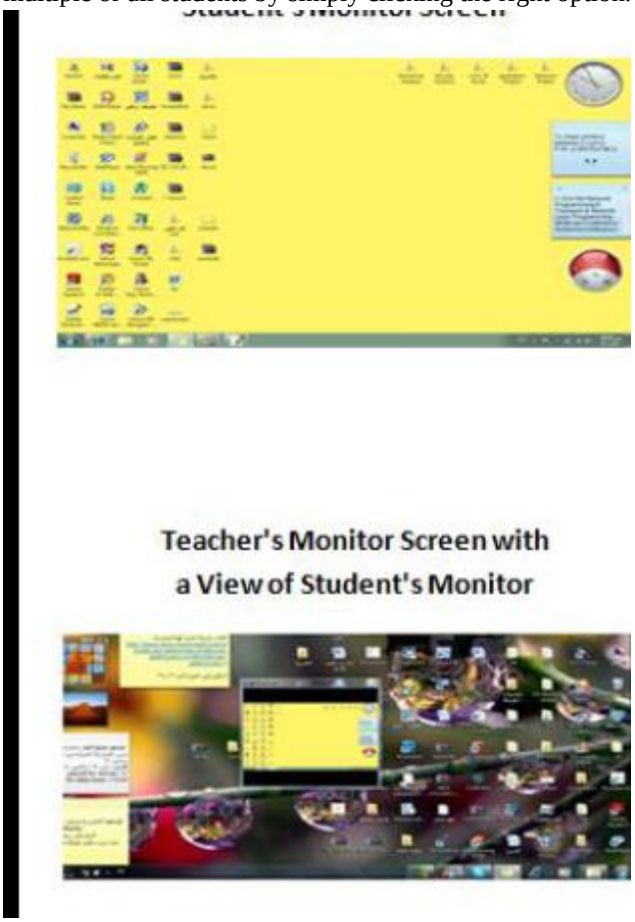
4.7 PCB ASSEMBLING:

PCB assembling includes the assembling of the electronic components on to the respective holes in the PCB. This can be done by through-hole construction or surface-mount construction. In the former method, the component leads are inserted into the holes drilled in the PCB. In the latter method, a pad having the legs similar to the PCB design is inserted and the IC's are placed or fixed on top of them.

V. PRILIMINARY TEST

After careful design of each of the module of the application we have started the implementation in PHP. We have implemented some basic modules of the system like; file exchange, message exchange and screen monitoring. The preliminary testing is performed on a small network consisting of three to four computers connected with a small switch. All three modules are successfully tested at least fifty times in the following manner:

The start-up screen when application starts at the server. This is the part of the application that controls all the operations and hence, icons for all modules can be seen. The second smaller part of the figure shows the drop down menu which comes up when send file option is clicked. The menu is designed in a easy to use manner and file can be sent to single, multiple or all students by simply clicking the right option.



VI. CONCLUSION

Smart lab is an Infrastructure designed for proper supervision and effortless system for computer labs. Smart lab provides a large number of features essential for proper management of classrooms or computer labs. The main problem was that the lab layout does not provide access to view every lab computers and other appliances. That problem is solved by IOT and some Hardware parts. Main advantages are:

- Reduce the work of Human Being.
- Low cost system.
- To control whole appliances and PC's from lab.
- Less time delays, quick response time.
- Fully automated system.

ACKNOWLEDGMENT

I express my sense of gratitude towards my Project guide Prof. G. M. Gaikwad for his valuable guidance at every

step of study of this Project work, also his contribution for the solution of every problem at each stage.

I am thankful to Prof. N. A. Dhawas Head of Department Information Technology, all staff members. I am very thankful to respected Principal Dr. M. S. Gaikwad for his support and providing all facilities to complete the project. Finally I want to thank to all of my friends for their suggestions and support.

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