

# Smart Lab Automation System

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**Abstract** – There is a rapid increase in usage and dependence on the vibrant features of smart devices, the need for IOT in them is valid. Many existing systems have project into the globe of Lab Automation but have actually failed to provide cost-effective solutions for the same. We illustrate a methodology to provide a low cost Lab Automation System (LAS) using Bluetooth Module. A Bluetooth based Model is designed for the purpose of monitoring and controlling environmental, safety and electrical parameters of a smart organized home. The user can exercise flawless control over the devices in a smart Lab via the Android application based Graphical User Interface (GUI) on a Smart-phone.

**Keywords**- Internet of things, smart governance, smart education, smart agriculture, smart health care, smart homes, Lab Automation System, Wireless Fidelity.

## I. INTRODUCTION

Using this IOT based approach labs will become more and more self-controlled and automated due to the comfort it provides, especially when Faculties or student are in a private lab. Lab automation system is a system that allows users to control electric appliances.

Many existing, well established home automation systems are based on wired communication. In contrast, there are Wireless systems can be of great use for automation systems. With the wireless technologies such as Wi-Fi, cloud networks in the recent past, wireless systems are used every day and everywhere [4].

## II. LITERATURE SURVEY

This section contains detailed description of the methods and approaches known from the literature survey.

[1] paper basically describes about the home automation using mobile device. In this paper, the system basically uses two prototypes. Two prototypes are namely home automation using Bluetooth in an indoor environment and home automation using Ethernet in an outdoor environment are presented.

This paper basically describes about IOT and how IOT can be used for realizing smart home automation using a micro-controller based Arduino board and Android mobile app. This system is depends on IOT. IOT deals with many different objects which would be connected to sense and collect the data and also communicate with surrounding people using mobile, wireless

Technologies. Basically this system have two prototypes i.e. one for indoor environment and second one is for outdoor environment. As range of Bluetooth is less it is used for indoor environment. For outdoor environment it uses Ethernet.

[2] Works on conservation of power consumption of system. the proposed system in this paper basically works on automation, so that the electrical devices can be controlled remotely. because of this proposed system electrical devices can be monitored remotely without any human intervention.

This proposed system basically works in the classroom. it includes surveillance camera and Ethernet connectivity to minimize the cost criteria. This system is basically controlled and monitored using internet. This proposed system have many advantages such as minimizing the electricity bills and also reduces the work of human being..

[3] Paper is basically works on the control of the unnecessary demands of the energy. This paper basically proposes the smart home control system using a coordinator based ZigBee networking. The performance of this proposed smart home is testified through computer simulation. Simulation shows that the proposed smart home system is efficient in reducing the energy consumption of the appliances which are used in the smart home.

[4] Proposes a new home automation system that uses

Wi-Fi as a network infrastructure. Proposed systems have two components. First one is webbing server which controls and monitors user's house. Second part is hardware interface module which provides interface between sensors and actuators of this users home automation system. This proposed system is scalable and flexible than the existing home automation system.

### III. PROBLEM DEFINITION

In this busy life while away from lab we may tend to forget to switch off the AC appliances which cause wastage of energy. Misuse of power energy can be curtailed by automating the devices and appliances. In Home automation household appliances and residential house features like gates, curtains etc are controlled automatically or semi -automatically.

Some of the currently available systems provide a view of the house from a web application. but this can cause trouble to the user. Because user must access the web each time he/she wishes to view the status of the home appliances. Lab automation systems which is referred here, face four main challenges, these are high cost of ownership, inflexibility, poor manageability, and difficulty in achieving security.

The main objectives behind this project is to implement a existing automated system using IOT in a computer lab that is capable of controlling, monitoring and automating most of the lab appliances through an easy manageable Mobile Application. The proposed system has a great flexibility by using Bluetooth technology to interconnect its distributed sensors to lab automation server. This will decrease the deployment cost and will increase the ability of upgrading, and system reconfiguration.

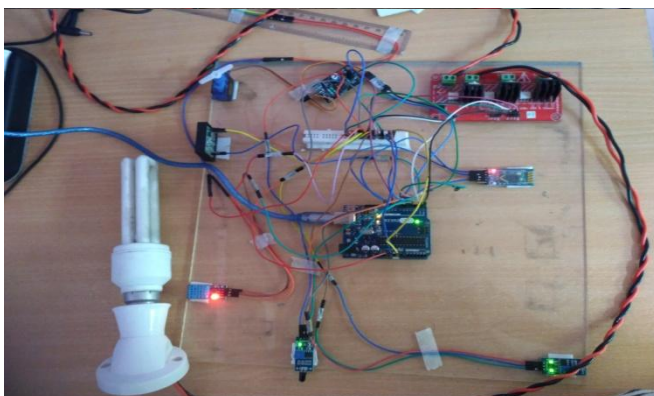


Fig.1. Circuit for Smart Laboratory.

The above Fig.1 shows the block diagram for smart laboratory. Smart Laboratory System means that allow users to control electrical appliances. Many existing lab automation systems are based on wired communication. Here in this

system we used wireless technologies such as Bluetooth. Such systems are used everywhere and every-time. We used different sensors in our system. Such as LDR sensors, DHT11 sensor, IR transceiver, RFID.

LDR sensor is used for checking light intensity. DHT11 is humidity and temperature sensor. In our system we used DHT11 for fire detection.

**RFID** stands for Radio Frequency Identification. RFID is used for door lock system. By using RFID authentication is done.

The Smart Lab will allow users to remotely control electric appliances through Android Application. This software intends to leverage existing technologies and to utilize them in a new way. The proposed System will be multi-user and will exist in a distributed computer environment.

### IV. SYSTEM DESIGN AND IMPLEMENTATION

#### 1. Lab Automation System

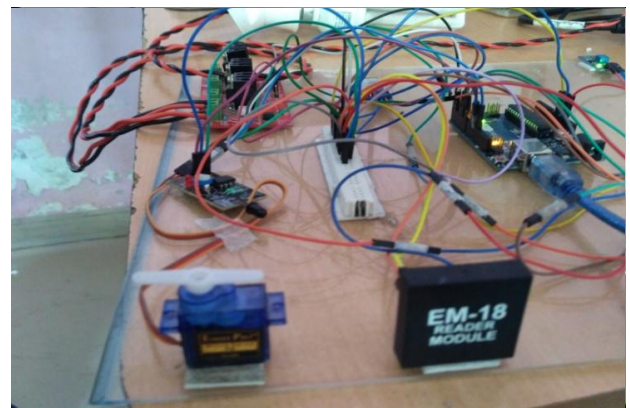


Fig.2. The Lab Automation System.

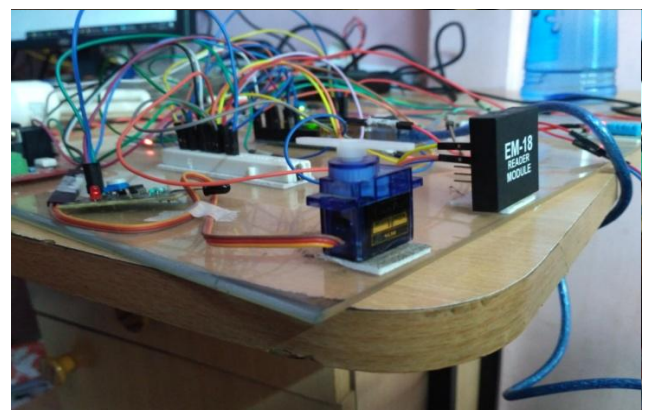


Fig.3. RFID Tag Reader for Access Authentication.

As shown in above Fig.3 we used RFID tag reader for door authentication. If tag is matched with already saved data then user is authenticated. If user is authenticated then door automatically gets open. In this application we used servo

motor to open the door when RFID gets matched. The RFID tags have 13 bit code which needs to be matched. The code is not updateable.



Fig.4 IR Communication to detect chair is not at exact position.

In chair arrangement system we used IR transceiver. As shown in above Fig.4. If chair is at exact position then there are no direct rays from transmitter to receiver. So if there are no direct rays from transmitter to receiver then chair is at exact position.

But if there are direct rays from transmitter to receiver then chair is not at exact position. The red light is glow that means chair is not at its position.

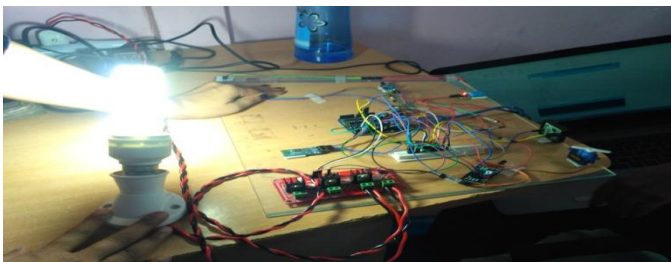


Fig.5.Operating of different devices.

## 2. Mobile Application GUI

GUI helps us to interact with the software or app so our project has different pages which include Login, registration, and Main working page and display the status of output from different sensors. The different pages of GUI are as follows:

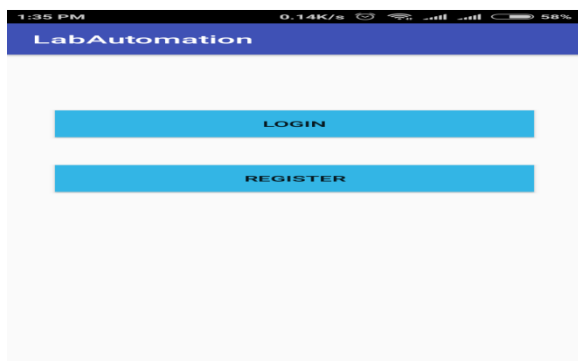


Fig.6.Main Page of app.

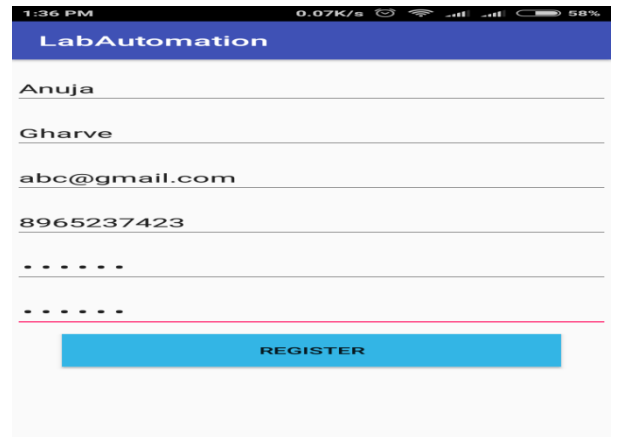


Fig.7. Registration page.



Fig.8. Display of humidity, temperature, detection of intensity, etc.

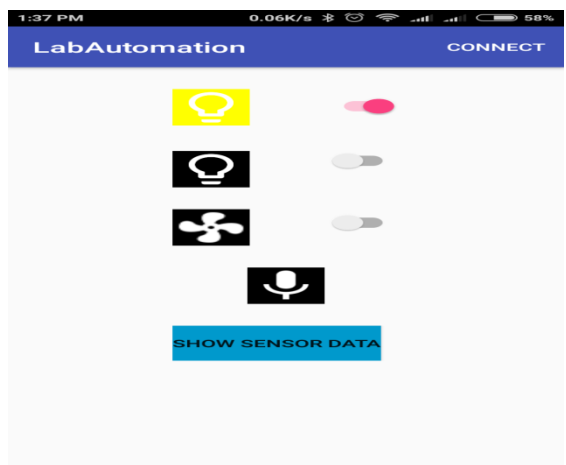


Fig.8. Working of light/fan.

## V. CONCLUSION

The lab automation using Internet of Things has been experimentally proven to work satisfactorily by connecting simple appliances to it and the appliances were successfully controlled remotely through internet. The designed system not only monitors the sensor data, like temperature, light, motion sensors, but also actuates a process according to the requirement, for example switching on the light when it gets dark. This will help the user to analyze the condition of various parameters in the lab anytime anywhere.

## VI. FUTURE WORK

Using this system as framework, the system can be expanded to include various other options which could include lab security feature like capturing the photo of a person moving around the house and storing it onto the cloud. This will reduce the data storage than using the CCTV camera which will record all the time and stores it. The system can be expanded for energy monitoring, or weather stations. This kind of a system with respective changes can be implemented in the hospitals for disable people or in industries where human invasion is impossible or dangerous, and it can also be implemented for environmental monitoring.

## VII. ACKNOWLEDGMENT

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## REFERENCES

- [1]. K. Mandula, R. Parupali, C. A. S. Murty, E. Magesh and R. Lunagariya, "Mobile based home automation using Internet of Things(IoT)," 2015 International Conference on Control, Instrumentation, Communication and Computational Technologies (ICCICCT), Kumaracoil, 2015, pp. 340-343.
- [2]. Anisha Gupta , Punit Gupta and Jasmeet Chhabra, "IOT based Power efficient System Design using Automation for Classrooms" 2015 Third International Conference on Image Information Processing.
- [3]. M. Khan, B. N. Silva and K. Han, "Internet of Things Based Energy Aware Smart Home Control System," in IEEE Access, vol. 4, no. , pp. 7556-7566, 2016.
- [4]. Ahmed ElShafee, Karim Alaa Hamed, " Design and Implementation of a WIFI Based Home Automation System" , World Academy of Science, Engineering and Technology International Journal of Computer, Electrical, Automation, Control and Information Engineering Vol:6, No:8, 2012.
- [5]. Michael A. Mahler, Qinghua Li, Ang Li, " Secure-House: A Home Security System Based on Smartphone Sensors" , 2017 IEEE International Conference on Pervasive Computing and Communications (PerCom).
- [6]. Ravi Kishore Kodali, Vishal Jain, Suvadeep Bose and Lakshmi Boppana, " IoT Based Smart Security and Home Automation System" , International Conference on Computing, Communication and Automation (ICCCA2016).