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# Smart Lab Automated control system using IOT

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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].

**Advantages of lab automation systems:**

- **Less installation costs:**
  The project requires less installation costs since there is no cabling is necessary. Wired solutions require cabling, where material used as well as the skilled for cables (e.g. into walls) is expensive.
- **System scalability and easy extension:**
  Deploying a wireless network is especially advantageous when, due to new or changed requirements, addition of the network is necessary. In contrast to wired installations, in which cabling addition is tedious. This makes wireless installations a influential investment.
- **Integration of mobile devices:**
  Easy Integration of devices can be made using the devices like smart phones and PDA's and as it uses wireless devices there is easy location access.(as long as the device is in reach of the network). Because of these advantages, wireless technology is an smart choice in renovation and refurbishment, but also for new installations.

## II. ANALYSIS OF SYSTEM

**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.

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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.

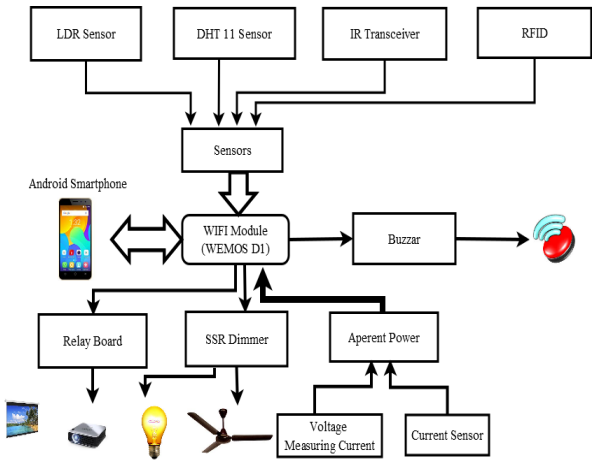


Fig.1. Block Diagram for Smart Laboratory.

Here in this system we used wireless technologies such as Bluetooth. Such systems are used everywhere and every-time.As shown in Fig.1 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. If user's RFID tag matched with stored data then user is authenticated. We used WEMOS D1 as Wi-Fi module. All sensed data is sent to the Wi-Fi module And from Wi-Fi module it sends data to Android application.

Through Android application we can control different devices in lab such as light, fan, etc**.**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 such as the Internet but will also be accessible from within an intranet such as an office or in the home itself.

## III.SYSTEMDESIGN AND IMPLEMENTATION

### 1. Lab automation system

The referred model (Fig.1) of the lab automation system is as shown in the figure1.

As shown in above Fig.2 we used RFID tag reader for door authentication. If tag is matched with already saved data then user is authenticated

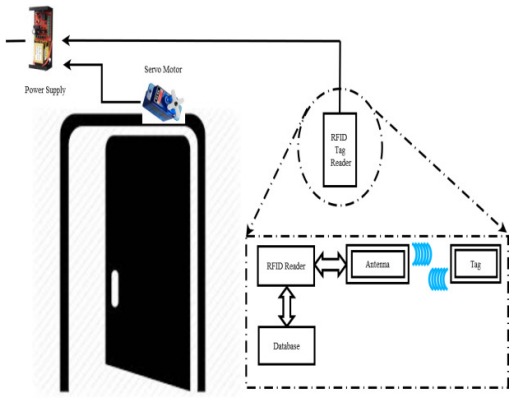


Fig.2 RFID Tag Reader for Access Authentication.

As shown in above Fig.2 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.

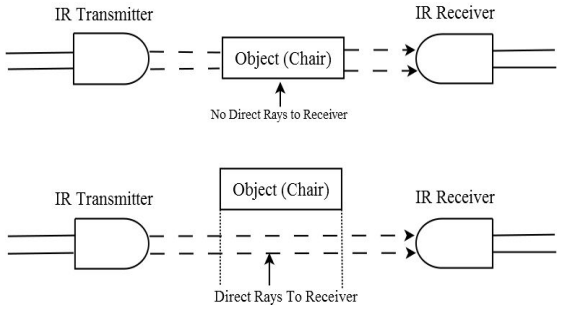


Fig.3. IR Communication to detect chair is not at exact position.

In chair arrangement system we used IR transceiver. As shown in above Fig.3 if chair is at exact position then there is 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.

### 2. Functions of Automation System

The proposed lab automation system can control the following appliance

- Lights on/off/dim .
- Fan on/off .
- On/off different appliance.
- Check whether chairs are at exact position or not.

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## IV.CONCLUSION

The lab automation system has experimentally proven satisfactorily using Internet of Things by connecting lab appliances to it and the appliances were successfully controlled through mobile application. The designed system allows to 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.

## V. FUTURE WORK

Using this system, sub-system it can be able to expand with different other options which could include lab security feature like capturing the photo of a person moving around the Lab and storing it onto the cloud. This will reduce the data storage than using the CCTV camera which will record all the time and display it on mobile app. The system can be expanded for different applications as 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.

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