

IOT BASED LAB AUTOMATION SYSTEM WITH MULTI-MODE AND MULTI-FUNCTION

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Abstract: Lab Automation System is a wireless communication, which give the user with remote control of lights, fans, and appliances within the lab. Internet of Things (IoT) is a promising technology that has wasted no time spreading across the world and connecting the huge number of people with the devices around them. They can communicate with an automation network through a gateway. The technology applied in today's laboratories required to make timely progress. The Internet of Things (IoT) conceptualize the idea of remotely connecting and monitoring real world objects in a network. It focuses on building a smart wireless lab system which sends alerts to the owner for when of any trespass and raises an alarm optionally. This system can make to bring out multiple benefits in a much smarter way using different modules. The "GSM call, DTMF, Serial Monitor modules" override the problem prevailing in the existing process.

Keywords: IOT, connecting and monitoring, modules.

1. INTRODUCTION

The Lab automation system is spreading immensely to provide convenience and comfort to customers or residents to enhance the quality of life. As automation has not been penetrated in most of the labs especially in India. If automated, everyday life would get eased. Lab automation system can control and monitor different interconnected appliances such as lights, temperature and humidity sensors,

power plugs, etc. as it has been designed and developed by using a single controller.

“The Lab Automation System with Multi-Function and Multi-Mode” has been developed to operate appliances in a faster way using different modes. This system is designed to reduce human labour in the production of goods and services and provide ease to the user so that work can be done in a better and effective manner.

One of the greatest advantages of lab automation is that it could be controlled and managed easily from an array of devices such as smart phones, tablet, desktop and laptop. The overall system would be controlled via different mode. A system with a multi-function and multi-mode allows user to wirelessly control lights, fans, security cameras, etc integrated as single portable unit. In this system, the user has different modes to automate the lab and can also check the suspects easily using modules like GSM call, DTMF and serial check.

2. LITERATURE SURVEY

In this paper, Kim Barakat [1], explained Bluetooth based lab automation system. The lab appliances to the Arduino BT board connected at input output ports using relay. The program based on high level interactive C language of microcontroller of Arduino board; the connection made via

Bluetooth. The password protection provided so only authorized user allowed to get access to the appliances. The Bluetooth connection established between Arduino BT board and phone for wireless communication. In this system the python script used and it can install on any of the Symbian OS environment, it is portable. One circuit designed and implemented for receiving the feedback from the phone, which show the status of the device.

The study also showed that a typical lab environment handles a plethora of "Services," so many of these services will have to share the resources of the lab. The wireless communication available nowadays has helped with the "Space Plan" and improved the aesthetics of the modern lab. The work of John J. Gretchen discussed some of the early challenges faced by lab automation systems. These include high manufacturing costs, high development costs, high installation costs, added service and support costs, lack of lab automation standards, consumer unfamiliarity with technology, and complex user interfaces. All these factors contributed to addressing the challenges and concerns of early lab automation systems, which lead to the popularity and wide acceptance of automated labs.

The paper "An Application of Internet of Things with Motion Sensing on Smart House" [2], The system use transducers which goes into microcontroller to convert machine function into electrical signals. The sensors of system convert the physical qualities like sound, temperature and humidity into some other measure like voltage. The microcontroller analyses all signal and convert them into command to understand by GSM module. The SMS based lab automation, GPRS based lab automation and dual tone multi frequency (DTMF) based lab automation, these options we considered mainly for communication in GSM.

In this paper, "Remote control of a domestic equipment from an Android application" [3], Hammamet, Tunisia, December 21-23, 2016, the important goal of lab Automation System is to build a lab automation system using a RF controlled remote. The technology is accelerating and so labs are also getting smarter. Modern labs are also deliberately relocating from current I switches to centralized control system, containing RF controlled switches. RF technology uses implementation by remote to get an easier solution in lab automation. The loads can be turned ON/OFF globally using wireless technology by operating the stated remote switch on the transmitter.

In this paper, "PC Remote Control of Appliances by Using Telephone Lines" [4], Lab Automation system focuses on design and implementation of lab gateway to collect data about data from lab appliances. It is process using map cut and use to carry out a monitoring tasks to remote user presently. This paper presents the design and development of lab automation system that use the cloud computing as service. The hardware interface module is the second part which start the relevant connection to the actuators and sensing devices which give the physical service. This paper focus to build the web services using cloud which need for security and storage and availability of the data. The current system cost efficient, reliable and comfortable which also gives a secured lab automation system for entire family. The system made up of various client modules for various platforms.

In this paper, "Ubiquitous smart lab system using android" [5], This system uses mobiles or computers to control basic lab control and function automatically through internet from anywhere around the world globally, an automated lab is sometimes called a smart lab. It meant to save the

electric power and human energy. The proposed system is a distributed lab automation system, consists of server i.e. Wi-Fi module, sensors. Server controls and monitors the various sensors, and could be easily configured to handle more hardware interface module (sensors).

In this paper, "Design and Implementation of Home Automation System" [6], To watch and control the lab appliances the system designed and implemented using Zigbee. The network SSID and security Wi-Fi value was preconfigured. The message for security purpose first process when it was declared safe it is re-encrypted and forward to the real network device of the lab. The safety and security of all messages that received by the virtual lab algorithm. To cut the price of the system and the intrusiveness of respective installation of the system Zigbee communication is helpful.

In this paper, "Smart Laboratory"[7], Everyday devices made smart and intuitive and by enabling them to share data intelligently they could be used to improve people's lives. It could be used to give better personal safety, monitor health, save time and make better use of our natural resources. IOT has made a huge impact in the way people to live, work and communicate. Main goal of IoT is to manage and control physical objects around us in a more intelligent and meaningful way and improve quality of life by providing cost-effective living including safety, security and entertainment. Smart object-matter useful contextual data autonomously and send to remote application servers for offering context aware place-based services. The word "context" can refer to any place information, surrounding environment, people objects that are nearby etc. so that adaptive and personalized services could be provided to the user.

3. NEED OF PROPOSED SYSTEM

- **Adds Safety Through Appliance and Lighting Control:** Another lab automation advantage is added safety for both your family and lab. You have the ability to control the small appliances and lighting, again with the simple tap of your finger on your favorite technological device.
- **Secures lab Through Automated Door Locks:** This is also a great benefit for you if you have to leave to work before your children leave for school. Often, children run out the door to catch the bus and forgot to lock the door.
- **Increases Awareness Through Security Cameras:** With a lab automation system, you can easily see what is happening. Now you can make sure no unwelcome guests arrive unbeknownst to you or your family. Security cameras increase family safety by recording clips when detecting movement or at specific times of the day or night.
- **Increases Convenience Through Temperature Adjustment:** Often, we leave for work early in the morning and forget to adjust our thermostat. As a result, we come lab to a house that is severely too hot or too cold. This is inconvenient, as it usually takes a good amount of time for the household temperature to increase or decrease after being adjusted.

4. PROPOSED SYSTEM

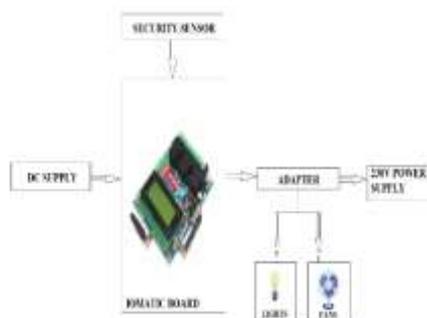


Fig. 4 Architecture of Lab Automation System

The lab automation is for controlling various electrical loads remotely over internet using Internet of Things (IOT). The smart phone android application with user configurable GUI front end could be used for real-time scenario. The commands are given from the different sources and detected on the LCD monitor as they sent to the nearby wireless modem using allotted IP. The WiFi module receives the commands and fed it to 8051 microcontrollers interfaced to it. The relays interfaced to the microcontroller through relay driver operated based on the commands received. Thus, the electrical loads operated (ON & OFF) and the status of loads either ON or OFF could be displayed at sending end over the LCD display.

The proposed system is fully automated. Lab automation is aids efficiency and error reduction. Automation also reduces potential errors through better sample tracking and handling. Lab Automation includes audio and video entertainment, lighting, heating or security as it's about integrating many parts of the lab into one solution. The design of an intelligent lab automation system is to cut the human efforts and save time by overcoming the traditional methods of detecting the faults in lab appliances and fixing it by using sensors.

4.1 CURRENT SYSTEM



Fig. 4.1 Iomatic Board

The lab automation is performed on an automated flow. The current system is fully based on the automated process where user can check and access lab in its own way with the help of multiple mode anytime. This is a faster and easier process as within a second the status of the suspect or any non-user will be shown. Other than this, it also shows the status of the current mode that will be used.

There is now pre-intimated lab automation system with multiple modes to get fully automated system. The system focuses on low-cost, reliable and scalable that could be used to remotely switch on or off the appliances to make hardware simplicity, low-cost short messaging service for feedback and voice dial from any phone to toggle the switch state using a microcontroller. If we look at different lab automation systems over time, they have always tried to give efficient, convenient, and safe ways for lab inhabitants to get access to their labs. Irrespective of the change in user expectations, advancement of technology or change of time, the role of a lab automation system has remained the same.

The wireless communication available today has helped to improve the aesthetics of the modern lab. These include high manufacturing costs, high development costs, high installation costs, added service and support costs, lack of lab automation standards, consumer unfamiliarity with technology, and complex user interfaces. With the time advancement, it has been rapid development in

technology and processing power which leads to a much reduction in device cost and size. All these factors contributed to addressing the challenges and concerns of early lab automation systems, which lead to the popularity and wide acceptance of automated labs.

4.2 FLOW CHART

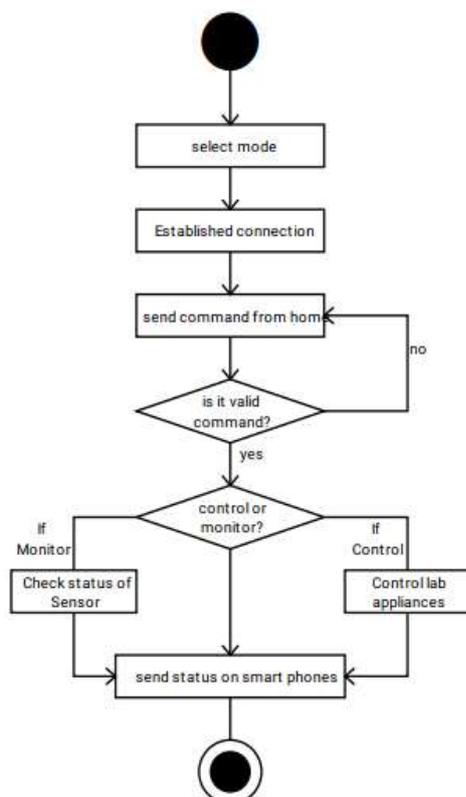


Fig. 4.2 Flow Chart of Lab Automation System

4.3 METHODOLOGY

A simplified technical procedure for monitoring and assessing lab automation handling problems in huge laboratories has developed. This system is used in every customer' houses, laboratories, shops, etc to get ease to the user.

This is a test run project which check the feasibility. We are at the first phase of implementation and we are hoping big success in our project to make the system more convenient and took next step to digital

India initiative by government and we are expecting help and support from every mentor.

4.4 WORKING MODE

There are three modules in the system, GSM call, DTMF, and Serial Monitor. In GSM call module the user has to call from the phone to the sim which is there on the board to automate the lab and the status will show on the LCD screen which is present on the kit. In DTMF module the user has to send message from its phone to the sim to run the lab appliances. In serial monitor module, the user has to work the lab appliances through laptop.

5. CONCLUSION

The main aim of the project is to design and build a lab automation system that can be operated with different modes of any lab applications connected to it. This system will allow the user to remotely control equipment such as air conditioning or door opening, and other appliances.

It grants the end users to manage and handle the electric appliances. Lab of the future is a space for the digital natives. It is used for controlling the indoor and outdoor lights, fans, air conditioning, to control electrical and electronic appliances and so on using various control system using appropriate sensor.

With the invention of lots of automation technologies featuring IOT and AI, lab automation has become a reality. One can

implement several of their tasks with just a single command verbally. It can achieve timely progress and remain competitive.

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