IOT BASED LAB AUTOMATION USING ANDROID APPLICATION

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ABSTRACT

Nowadays, automation is playing a crucial role in our life. Automation let the user to control the home from one's computer and assign actions that should happen depending on time or other sensor readings such as light, temperature or sound from any device in the Automation network. It reduces the human intervention thereby using the energy efficiently and saves the time. The aim of this technology is to automate the appliance around us which enables us to control them and helps in warning us during critical situations. It facilitates the communication between many real worlds objects by collaborating with various technologies. Here in this project, Blynk is used to control electrical appliances of a laboratory, using certain number of relays connected to ESP32 wi-fi module which then connected to electrical appliances. By using method of automation we are able to reduce the energy bill and consumption of electricity.

Keywords: Automation, Blynk, ESP32, IoT, Relay.

I.   INTRODUCTION

In current era, technology brings people and things towards adoption of internet. Life dependability on internet is massively increasing. The Internet of Things (IoT) became a domain of high potential, impact and learning [1]. Living cost is increasing day by day. The concentration of researchers is to implicate machinery to reduce this cost of living[2]. In order save energy and make electrical loads monitored easily, this paper suggests smart automation project based on IoT technology. Internet of things is a growing network of everyday object-from industrial machine to consumer goods that can share information and complete tasks while you are busy with other activities[3]. A particular electrical appliance or a load controlled by a computer system or from a portable device has many advantages over manual control. Microcontroller is used as a support tool for controlling the electric current, as example, the control system with SMS (Short Message Service) on the mobile phone as a remote control system automatically[4]. IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. Keen Home is ordinarily alluded to a home where the gadgets are associated with cloud. It can be viewed as a framework which utilizes advanced mobile phones, PCs to control, screen, educate or communicate with the apparatuses of home. It facilitates the human work[6]. Many countries are making attempts to make their cities smart and more efficient to combat the problem of increasing population and depleting resources through home automation[5]. IoT allows us to control many devices simultaneously and reduces human efforts. This process is done in low cost and controlling of many devices in a simple circuit is possible.

II.   DESIGN AND METHODOLOGY

The design and implementation is kind of tough and one must be done with great care. At first one must check that which appliance or load is going to control with the relay, according to that load or appliance one must choose the appropriate relay. In this paper, we have taken 8 tube lights, 4 fans, 4 down lights (also called as office lights) under consideration. Hence, we've used 16 relays for 16 loads. Next, connect relay input to ESP32 microcontroller and connect to the power supply through buck converter. Since, the relay and microcontroller require 5V DC supply, we've used 230V to 12V DC Switch Mode Power Supply (SMPS) and buck converter to convert 12V DC to 5V DC. Then a smart phone connected to internet with Blynk application as a control panel, and ESP32 microcontroller kit in other side as a controller that receives control commands via Wi-fi signal. The microcontroller acts as a signal receiver which receives signal sent from android device or computer which acts as a signal transmitter.

Proposed System Feature

The proposed system allows the user to control the appliances connected in laboratory remotely anytime within the wifi range by using smart mobile phones with the help Blynk application. Certain number of relays are connected to electrical appliances available in this case it is 16 electrical appliances or loads. Those relays are further connected to wifi module.
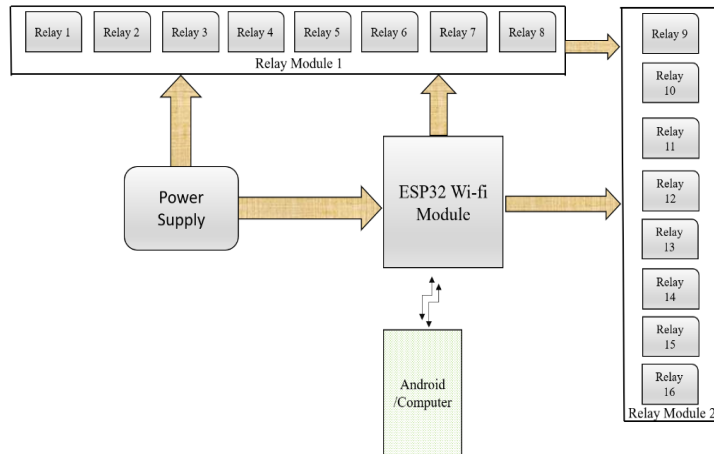

Figure 1: Block Diagram

To communicate between wifi module and android smart phone a signal transmitter is needed. Here Blynk app acts as a signal transmitter and sends signal through smart phone to wifi module which acts as a signal receiver and it performs respective action according to signal. All these components are connected 230V AC supply though a switch mode power supply (SMPS). Figure 1 shows the block diagram of the system and gives idea of architecture of the system.

III.   SYSTEM FLOW
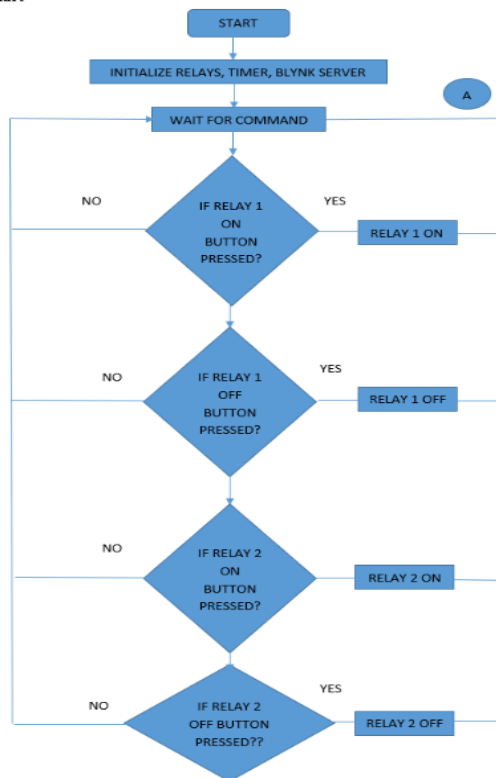
IV.   WORKING METHODOLOGY AND MODELING

ESP32 Wi-fi Module :-

ESP32 Development board is based on the ESP WROOM32 WIFI + BLE Module. This is the latest generation of ESP32 IoT development module. At the core of this module is the ESP32 chip, which is designed to be scalable

and adaptive. ESP32 integrates a rich set of peripherals, ranging from capacitive touch sensors, Hall sensors, low-noise sense amplifiers, SD card interface, Ethernet, high-speed SDIO/SPI, UART, and I^2C.

8 Channel Relay Module (Active Low) :-

This is a LOW Level 5V 8-channel relay interface board, and each channel needs a 15-20mA driver current. It can be used to control various appliances and equipment with large current. It is equipped with high-current relays that work under AC250V 10A or DC30V 10A.

T- Type Relay Module :-

Adam Tech RPL relays are high power, modern relays, available in industry standard packages and can switch loads up to 30 amps. Available in both a PCB package and a combination PCB/Quick Connect terminal package, these relays are designed for applications such as Spa/Pool controls, HVAC, and large appliances. These relays are used for inductive loads(in this paper for fans).

Switch Mode Power Supply :-

This is a 12V 10A SMPS - 120W - DC metal power supply. It works efficiently and is only low heat. It's output of constant voltage ensures the stability of power supply. The switching power supply is provided with protection against over voltage, short circuit and overload.


Buck Converter :-

DC-DC Buck Converter Step Down Module LM2596 Power Supply is a step-down(buck) switching regulator, capable of driving a 3-A load with excellent line and load regulation. These devices are available in fixed output voltages of 3.3 V, 5 V, 12 V, and an adjustable output version. The LM2596 series operates at a switching

frequency of 150kHz, thus allowing smaller sized filter components than what would be required with lower frequency switching regulators.
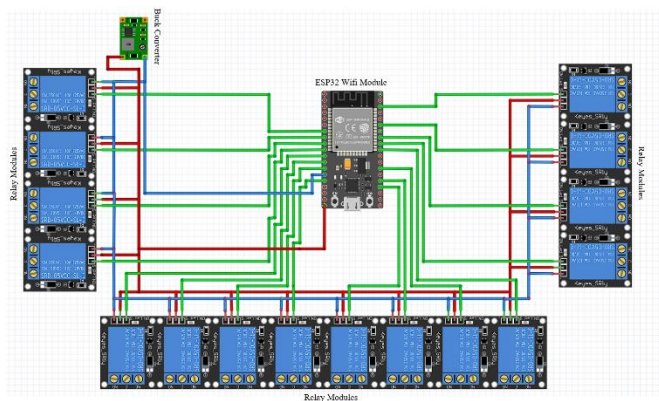

Two Pin Terminal Block :-

To connect two or more wires securely.
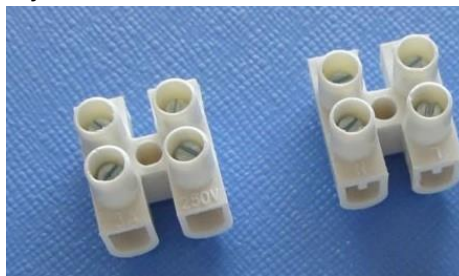
Wiring Connection :-

V.   RESULTS AND DISCUSSION

The Light Control Test is done by pressing the ON / OFF button widget on the Blynk application on the respective Android smart phone for lights and fans. This is done after the system is turned on and connected to a Wi-Fi internet connection. If at any time the internet connection is lost or bad signal, then it also affects system performance. As button widget is pressed the light connected to respective relay turns ON and turns OFF when button is pressed again. When all buttons are in ON state then to OFF all electrical appliances on single tap Master Switch is provided on Blynk application. When master switch button widget is pressed, all electrical appliances goes OFF state with time delay of 1 sec to 2 sec. Timer is provided on the app to automatic turning ON and OFF relays at convenient time. To turn OFF whole automation system, one have to perform this action manually and similarly for turning ON or otherwise it will stay ON leading to energy waste.
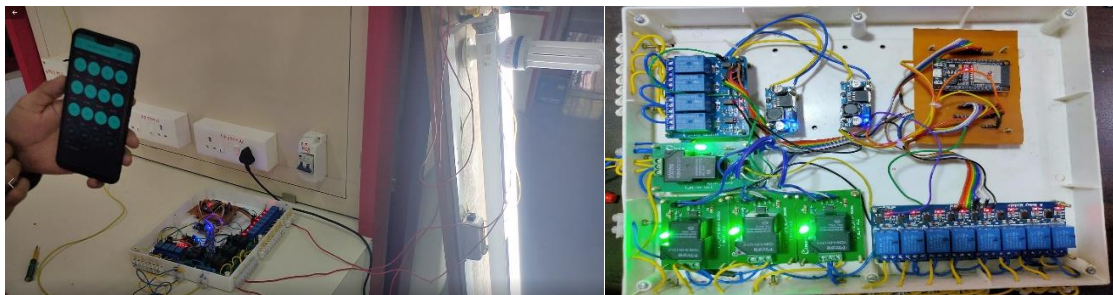
VI.   CONCLUSION

Using single microcontroller one can control sixteen different appliances from mobile provided that mobile phone and the microcontroller is connected to stable internet. Additional sensors or voice recognition modules

can be install in this system. If for some reason internet is no available then one can control the appliances manually too. Microcontroller is limited to control sixteen appliances hence, to connect more appliances, I/O pin expander or another similar microcontroller can be used. This system also include timer, that means after certain period all appliances can be turned off automatically. With this system energy bill can be reduced and it is very helpful for physically handicapped people to handle the appliances on their own

ACKNOWLEDGEMENTS

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