INTERNATIONAL JOURNAL OF ADVANCE RESEARCH AND DEVELOPMENT

IJARnD

(Volume3, Issue2)

Available online at www.ijarnd.com

Home Control Using Node MCU

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ABSTRACT

This project aims at achieving automation using the widely used mobile operating system Node MCU i.e. android operating system. The electrical and home appliances can be controlled using the android mobile phones even if you are out of your house and you forgot to switch off the appliances. Many electrical and home appliances like light, fan, refrigerators etc., can be controlled using the android operating system. This can also be implemented at workplaces. Home automation is the residential extension of building automation. It is automation of the home, housework or household activity. Home automation may include centralized control of lighting, HVAC (heating, ventilation and air conditioning), appliances, security locks of gates and doors and other systems, to provide improved convenience, comfort, energy efficiency and security. Home automation for the elderly and disabled can provide increased quality of life for persons who might otherwise require caregivers or institutional care.

Keywords: *Node MCU, Android or IOS with Blynk App, Relays, Switches, Arduino IDE software, Protocol.*

1. INTRODUCTION

The main objective of this project is to develop a home control system using Node MCU board with Internet being remotely controlled by any Android or IOS operating system. As technology is advancing so houses are also getting smarter. Modern houses are gradually shifting from conventional switches to centralized control system, involving remote controlled switches. Presently, conventional wall switches located in different parts of the house makes it difficult for the user to go near them to operate. Even more it becomes more difficult for the elderly or physically handicapped people to do so. Remote controlled home automation system provides a most modern solution with smart phones.

A. Automatic Control

In order to achieve this, a relay module is interfaced to the Node MCU board at the receiver end while on the transmitter end, a GUI application on the cell phone sends ON/OFF commands to the receiver where loads are connected. By touching the specified location on the widgets, the AC loads can be switched ON/OFF remotely through this technology.

B. Manual Control

It can be achieved by connecting the switches in between the Node MCU and the relay board. So that the output load will be HIGH for any HIGH signal coming either from Node MCU or from manual switches. It will be more advantageous in case of damage to the Node MCU.

2. BLOCK DIAGRAM

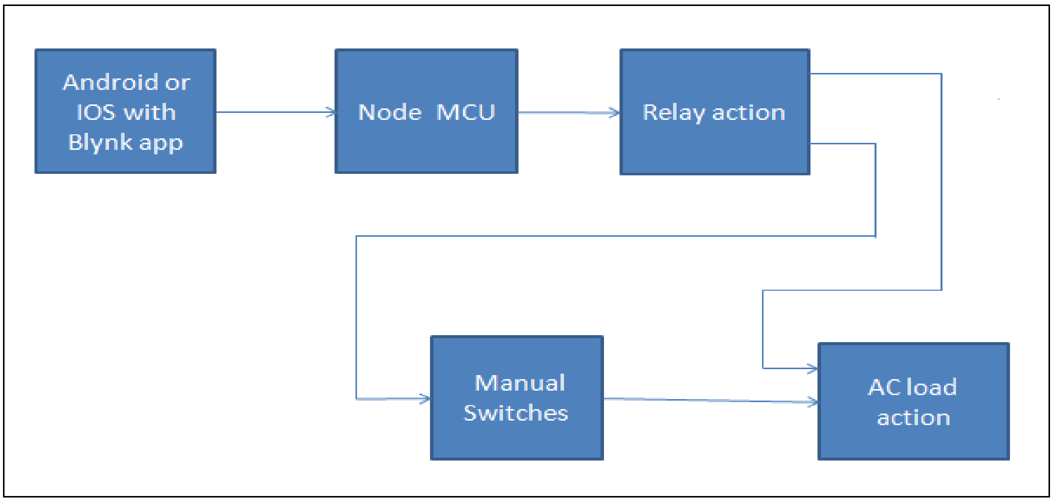

Fig. 1 Block Diagram of Home Control

To achieve the home control using smart phone, initially the mobile unit should be connected to any network and the WiFi module ESP8266 which is on Node MCU should be connected to local network. By touching the specified location of widgets in the blynk app, this blynk app sends ON/OFF commands to ESP8266 on Node MCU via Blynk server. Then the relays connected to Node MCU performs switching operation corresponding to the input. So that the loads connected to relays will be switched ON/OFF. Similarly, we can also control our home appliances using manual switches. This can be obtained by connecting the relays outputs to manual switches and manual switches to the AC loads. Whenever the relay corresponding to manual ON or OFF is switched ON then the AC loads corresponding to that switches will perform switching operation.

A. Hardware Components Used

1) Node MCU

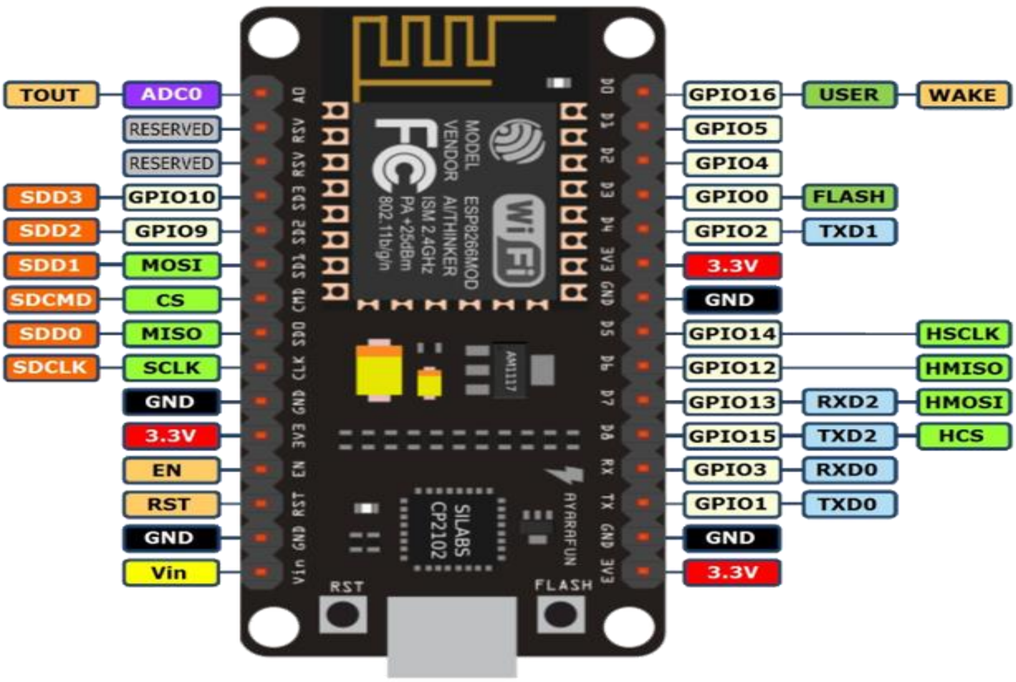

Fig. 2 Pin Diagram of Node MCU

The Node MCU (Node Micro Controller Unit) is an open source software and hardware development environment that is built around a very inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Espress if Systems, contains all crucial elements of the modern computer: CPU, RAM, networking (wifi), and even a modern operating system and SDK. When purchased at bulk, the ESP8266 chip costs only $2 USD a piece. That makes it an excellent choice for IoT projects of all kinds.

2) Relay

Fig. 3 Top View of 8-Channel Relay

A relay is an electrically operated switch. Many relays use an electromagnet to mechanically operate a switch, but other operating principles are also used, such as solid-state relays. Relays are used where it is necessary to control a circuit by a separate low-power signal, or where several circuits must be controlled by one signal. Here we are using SPDT (Single Pole Double Throw) relay. The Single Pole Double Throw SPDT relay is quite useful in certain applications because of its internal configuration. It has one common terminal and 2 contacts in 2 different configurations: one can be Normally Closed and the other one is opened or it can be Normally Open and the other one closed. So basically you can see the SPDT relay as a way of switching between 2 circuits: when there is no voltage applied to the coil one circuit "receives" current, the other one doesn't and when the coil gets energized the opposite is happening. We are using it in Normally Open mode.

3) SMPS (Switch Mode Power Supply)

Switch-mode power supply is nothing but the electronic power supply integrated with the switching regulator for converting the electrical power efficiently from one form to another form with desired characteristics. It is used to convert unregulated AC or DC input voltage to regulated DC output voltage. Here we used 5v/5amps SMPS. So it converts 230V AC voltage to 5V DC voltage.

4) Smart Phone with Blynk App

Here we are using smart phone with blynk app.
i) Blynk App

Blynk is a Platform with iOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet.It's a digital dashboard where we can build a graphic interface for our project by simply dragging and dropping widgets. Blynk is not tied to some specific board or shield. Instead, it's supporting hardware of our choice. Whether our Arduino or Raspberry Pi is linked to the Internet over Wi-Fi, Ethernet or this new ESP8266 chip, Blynk will get you online and ready for the Internet Of Your Things.

5) Manual Switches

By using manual switches we can ON or OFF the bulbs manually.

B. Software Used

1) Arduine IDE Software

Arduino is an open-source platform used for building electronics projects consists of both a physical programmable circuit board(often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

3. Experimental Set Up with Results

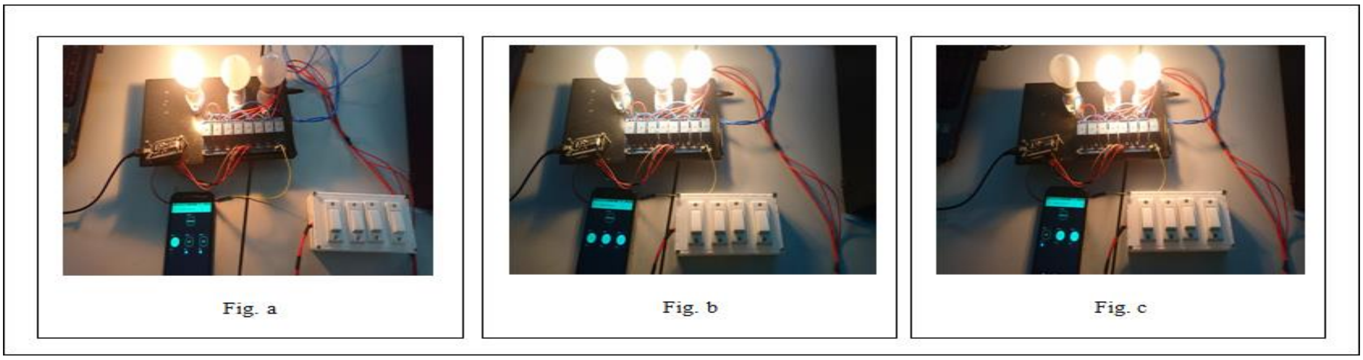

Fig. 3 Home Control Using Blynk App

As shown in Fig. 3(a), the bulb1 gets turned ON automatically by turning ON the button1 of Blynk app in smart phone irrespective of manual switches. As shown in Fig. 3(b), the three bulbs gets turned ON automatically by turning ON the three buttons of Blynk app. As shown in Fig. 3(c), the bulb1 gets switched OFF automatically by turning OFF the button1 in Blynk app.

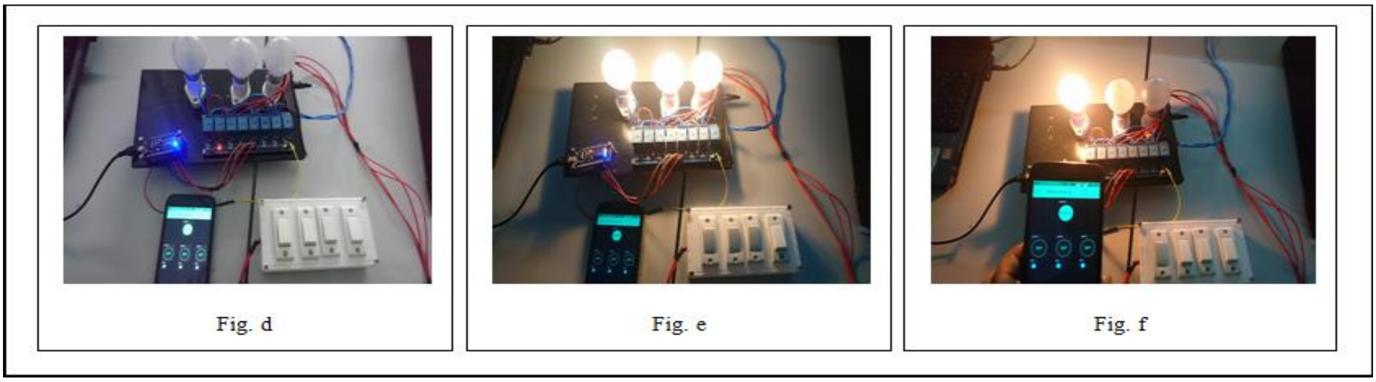

Fig.4 Home Control Using Manual Switches

From Fig. 4, we can say that the manual switches get controlled by using the manual button in the blynk app. By turning ON the manual button in the blynk app the manual switches operates normally. If the manual button is in OFF position then the manual switches are in inactive state. As shown in Fig. 4(e), the bulbs gets controlled using manual switches.

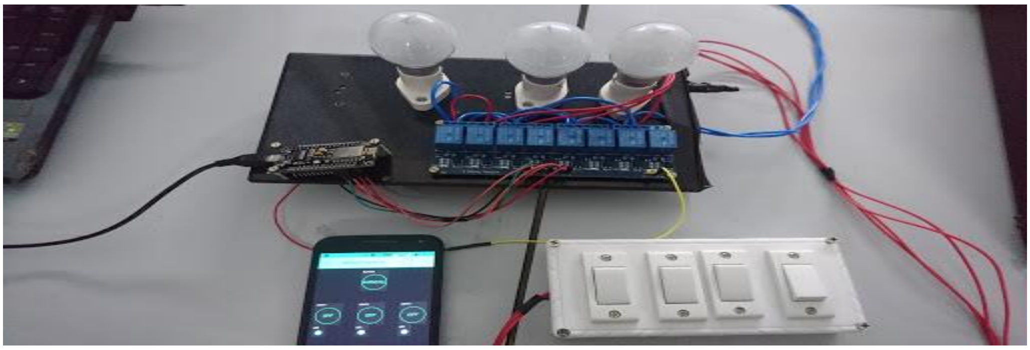

Fig.5 turning OFF all bulbs using single button in Blynk app

All the bulbs in Fig. 4(e) gets turned OFF by turning OFF the manual button in Blynk app even though the manual switches are in ON condition.

From the above result, we say that we can control our home appliances from anywhere by using a smart phone with Blynk app.

4. Conclusion

The paper has been experimentally proven to work successfully. We can control the AC loads using the Blynk app or manually using the normal switches. The designed system can be controlled from anywhere throughout the world. This will help the user by saving the power by switching off the home appliances in case of forgot to switch off. This will also help for physically disabled people who might otherwise require care givers.

5. FUTURE SCOPE

Additional improvement to this project can be done by implementing the same project in the industries.

6. ACKNOWLEDGEMENT

We would like to express our sincere thanks to Ms. T. Shalini, Assistant professor, Department of Electronics and Communication Engineering, Vasireddy Venkatadri Institute of Technology, for her kind support to us.

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