A

Real-Time Research Project Report

on

CONTROLLING ELECTRIC BULB USING SMART PHONE

(Submitted in partial fulfilment of the requirements for the award of Degree)

Bachelor of Technology

in

COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

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DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING (DATA SCIENCE)

CERTIFICATE

This is to certify that the project entitled **"CONTROLLING ELECTRIC BULB USING SMART PHONE "** being submitted by **PENTA SRINIKA (227R1A67B0), P.VARSHITHA (227R1A67A9), MANI VENKAT (227R1A67B4)** in partial fulfillment of the requirements for the award of the degree of B.Tech in Computer Science and Engineering (Data Science) to the Jawaharlal Nehru Technological University Hyderabad, is a record of bonafide work carried out by them under our guidance and supervision during the year 2023-24.

The results embodied in this thesis have not been submitted to any other University or Institute for the award of any degree or diploma.

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ABSTRACT

Internet of Things is composed of things that have unique identities and are connected to each other over internet. It is simply connecting and monitoring various devices and sensors through Internet. This paved the way for home automation and monitoring which makes human life more comfortable and secured.The proposed prototype uses Node MCU board with internet being remotely controlled by Android/iOS OS smart phone. Node MCU is the heart of this system and it can perform as a micro web server and it acts as an interface for the wide range of hardware modules. 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. With advancement of Automation technology, life is getting simpler and easier in all aspects. In today's world Automatic systems are being preferred over manual system. With the rapid increase in the number of users of internet over the past decades as made Internet a part and parcel of life, and loT is the latest and emerging internet technology.. wireless Home Automation system (HAS) using loT is a system that uses computers or mobile devices to control basic home functions and features automatically through internet. The aim of this project is to develop a system that enables users to control an electric bulb remotely using a mobile device. By integrating wireless communication technologies and a user-friendly mobile application, the project seeks to enhance convenience, energy efficiency, and home automation. This system will allow users to turn the bulb on or off through mobile.

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1. INTRODUCTION

1.1 Background

Internet of Things depicts a general concept for the power of network devices to sense and collect data from the planet around us, then share that data across the Internet where it can be processed and applicable for various interesting purposes. Internet of Things is extremely quickly becoming a reality. We can see the results of it around us.

Controlling an electric bulb with your mobile phone is like having a superpower in your pocket. It's a modern marvel that brings convenience to your fingertips. With a simple app or device, you can command your light bulb from anywhere, whether you're snuggled up in bed or miles away from home. Just imagine the ease of turning off forgotten lights without getting out of bed or creating the perfect ambiance for movie night with a few taps on your phone screen.

This innovation blends the power of electricity with the convenience of mobile technology, revolutionizing how we interact with our surroundings. No more fumbling for switches or worrying about leaving lights on; everything is under your control, effortlessly. Moreover, it's not just about convenience; it's also about efficiency. With the ability to schedule when your lights turn on or off, you can save energy and reduce electricity bills. It's a win-win situation for both comfort and sustainability.

In essence, controlling your electric bulb with your mobile phone is more than just a modern convenience—it's a glimpse into the future where technology seamlessly integrates with our daily lives to make things simpler, smarter, and more efficient.

1.2 EMBEDDED SYSTEMS

In these present scenario, the world is becoming more and more digital and using advanced technologies as like connected and automated. Embedded system is one of the advanced technology. This system is the one which has computer hardware with software embedded in it. The embedded system is designed to perform a specific task/function. But the task assigned has to be completed in a given time interval and it is an arrangement in which all its units, assembled work together according to set of info provided. When the system performs the given tasks at high speed, then it is used for real-time applications. A set of information or code embedded into the micro controller.

The characteristics of the Embedded Systems are:-

- Specific-Functioned
- Tightly constrained
- Reactive and Real time
- Microprocessors based
- Memory
- HW-SW systems
- Accuracy, reliability and adaptability.

Adavantages

- Easily Customizable
- Less power consumption
- Cheap
- Enhanced performan

1.3 Project Scope

In the coming years, fully automated smart homes will surely become a reality because the home automation is growing rapidly in this tech world. Due to good user convenience and accessibility, smart homes are appealing for a wide range of people all over the world. The User can check for the electricity usage, the condition of their devices and receive notifications accordingly.

1.4 Project Objective

The objective of this project is to implement a very low cost, reliable and scalable home automation system which will be used for remotely switching on or off any home appliance, using a microcontroller to achieve hardware simplicity low cost built-in wifi module at the receiver end while on the transmitter end, a GUI application on the cell phone sends ON/OFF commands at the receiver end where loads are connected. As technology is advancing so houses also are getting smarter. Modern houses are gradually shifting from conventional switches to centralized system, involving remote controlled switches. Presently, conventional wall switches located in several parts of the house makes it difficult for the user to travel near them to work. Even more it becomes harder for the elderly or physically handicapped people to try to do so. Remote controlled home automation system provides a latest solution with smart phones.

2.LITERATURE SURVEY

2.1 Literature review

The expeditiously growing internet has opened new horizons for development in various fields. The home automation industry has seen a rapid growth in the previous years. It has become a topic of interest for many people around the world. Vishwateja Mudiam Reddy & Naresh Vinay in their paper “Internet of Things Enabled Smart Switch” designed a system which integrates the cloud and web app. With the assistance of flip-flops, logic gates and a processor, the switches might be controlled. The proposed model was intended for reducing the value of those systems which was the most barrier within the wide adaptation of this technology. Khusvinder Gill & Shuang-Hua Yang created a common home gateway for ZigBee and Wi-Fi. This enables a remote control using a simple graphical user interface. The system was cost effective and had a good security inside the house. Salma and Dr. Radcliffe with a goal of increasing the popularity and reach of home automation designed a system that used the Novel Network Protocol. It gave the choice of controlling the commercial devices through a mobile phone or laptop. An additional network device had been used for remote access in place of a microcontroller. A reliable and simple system with a power to integrate with very lesser efforts for off the shelf products was created by Carelin and I. Jacob Raglend. The system uses ZigBee for home automation and GSM for remote access. It didn’t provide any GUI and also it had been susceptible to security threats as anyone could access the system. Rozita Teymourzadeh, Salah Addin Ahmed designed a GSM based system for home automation. Using the GSM protocol, it became possible to access the system by using the Short Message System (SMS). The system also gave feedback to the user about the present state of any desired object

2.2 Literature survey

2.1 Literature survey table

S.NO	NAME OF THE AUTHOR	TITLE OF THE PAPER	INTERNATIONAL JOURNAL	ISSUED
1	Ahmed et al	mobile technology can enhance the control of electric devices in a smart home environment	International Journal of Electronics Engineering Research.(IRJET)	2017
2	Sharma and Singh	research emphasized the reliability and low power consumption of Bluetooth communication.	IEEE access	2018
3	Lee et al	Explored the integration of Internet of Things (IoT) technology in home automation systems	International Journal of Electronics Engineering Research.(IRJET)	2018
4	Zhang et al	energy-efficient lighting control strategies in smart homes.	International Journal of Electronics Engineering Research.(IRJET)	2018
5	Kim et al	Explored remote monitoring capabilities in home automation systems	International Journal of Electronics Engineering Research.(IRJET)	2020

2.3 Existing system

The existing system for controlling electric bulbs relies on manual wall switches. This method necessitates physical presence, making it inconvenient when users are not near the switch. There is no capability for automation, meaning lights must be turned on and off manually, which can lead to inefficiencies. Energy wastage is common, as lights are often left on unintentionally. For individuals with mobility issues, reaching and operating these switches can be difficult. Furthermore, traditional systems do not offer remote control, which limits flexibility and convenience. There is no integration with smart technologies, missing opportunities for improved energy management and user experience. Overall, the existing system is simple but lacks the advanced features that modern smart lighting solutions offer. The existing system of home automation leverages advanced technologies to provide enhanced convenience, security, and energy efficiency in modern homes. Central to this system is the use of a home automation hub or controller, which can communicate with various smart devices through wireless protocols such as Wi-Fi, Zigbee, Z-Wave, or Bluetooth. These hubs, often powered by platforms like Amazon Alexa, Google Home, or Apple HomeKit, serve as the brain of the smart home ecosystem, enabling seamless interaction between different devices.

WHAT THEY HAVE FOLLOWED IN EXSTING SYSTEMS

In this existing system, home automation is done by using the Blynk app which sends the command by it's Blynk Server. Home Automation mean controlling lighting, climate, entertainment systems, and appliances without a manual switch. Blynk is a mobile application which has its own server to process user requests. It is an open source application and anybody can use it in their Home Automation to control devices, monitor sensor data and get a notification by some trigger actions. Blynk app has been used to read data from

sensors located in home environment and user controls home appliances based on these data. Being busy in hectic schedule of daily life user may not be able to read sensor data continuously to take some action through app. Blynk has a nice GUI but one may sometimes face a problem due to it's busy server and get a late response or zero response.

Figure : 2.1 existing system

Despite the many advantages, the existing home automation systems face challenges such as interoperability issues between different brands and potential security vulnerabilities. Nevertheless, continuous advancements in technology and increasing adoption rates are driving the growth and evolution of home automation systems, making them an integral part of modern living.

2.4 Disadvantages Of Existing System

- **Limited Control:** Users need to be physically present to switch the bulb on or off.
- **Inconvenience:** Manual operation is needed, especially for individuals with mobility issues.
- **Energy Inefficiency**: Lights may be left on unintentionally, leading to higher energy consumption.
- **Lack of Automation:** Traditional systems do not support automation, scheduling, or remote control.
- **High Initial Cost**: The installation and setup of home automation systems can be expensive. This includes the cost of smart devices, hubs, and sometimes professional installation.
- **Compatibility Issues**: Different devices and systems may not be compatible with each other. This can lead to difficulties in integrating new devices with existing setups and may require additional hubs or software.
- **Complexity:** Setting up and managing a home automation system can be complicated for users who are not tech-savvy. This can lead to frustration and underutilization of the system's capabilities.
- **Security Vulnerabilities**: Home automation systems can be vulnerable to hacking and other security breaches. Poorly secured devices can become entry points for cybercriminals, risking personal data and privacy.
- **Privacy Concerns:** The data collected by smart home devices can be extensive, raising concerns about privacy. Users might be uncomfortable with the level of surveillance and data collection involved.

2.5 Proposed System

The proposed system uses the Blynk application to control electric bulbs via smartphones, offering significant enhancements over traditional methods. Users can remotely control lights from anywhere, providing convenience and increased security. It integrates a microcontroller (e.g., ESP8266), a relay module, and Wi-Fi connectivity to facilitate remote control and automation. The Blynk app features an intuitive interface for easy management of multiple lights. This setup enhances accessibility for individuals with mobility issues, eliminating the need to physically reach switches.

Integration with IoT technologies enables advanced functionalities, such as voice control and smart home integration. The proposed system provides a flexible, efficient, and user-friendly lighting solution. The proposed home automation system using NodeMCU and the Blynk app offers an innovative and accessible solution for modern smart home management. NodeMCU, an open-source IoT platform based on the ESP8266 microcontroller, acts as the central hub of this system, connecting to various sensors and actuators to control and monitor home appliances and environmental conditions. This versatile platform supports multiple input/output interfaces, making it ideal for integrating a wide range of smart devices, such as lights, thermostats, door locks, and security cameras.

The Blynk app enhances this setup by providing a user-friendly and highly customizable mobile interface. Users can create personalized dashboards with widgets that correspond to different devices and functions within their smart home. Through the app, homeowners can remotely control and monitor their devices in real time, receiving instant notifications and updates on their smartphones. This real-time interaction is facilitated by Wi-Fi connectivity, ensuring seamless communication between the NodeMCU and the Blynk app.

One of the standout features of this system is its cost-effectiveness. NodeMCU is a low-cost microcontroller, and the Blynk app offers a free tier with extensive functionality, making it an affordable option for a wide audience. Additionally, the system's ease of installation and configuration, coupled with comprehensive online resources and community support, allows users of all skill levels to implement and expand their home automation setups.

The open-source nature of NodeMCU allows for significant customization and scalability. Users can tailor the system to their specific needs, adding new devices and features as required. This flexibility makes the system future-proof, capable of evolving with technological advancements and user requirements. By leveraging the powerful combination of NodeMCU and Blynk, this proposed home automation system promises to deliver a robust, flexible, and user-centric solution, transforming any home into a smart home with minimal investment and effort.

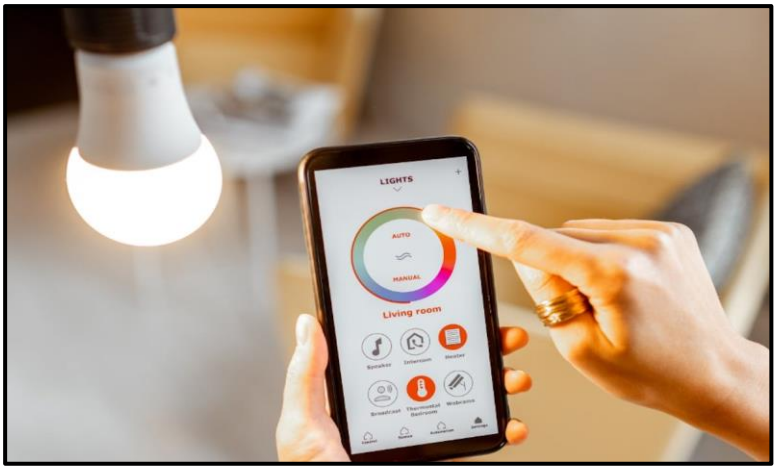

Figure:2.2 proposed system

2.6 Advantages Of Proposed System:

Convenience:

You can turn lights on or off using your mobile device, without needing to physically interact with the switch.

Energy Efficiency:

Smart bulbs can be programmed to turn off when not in use or scheduled according to your daily routine, reducing energy consumption and lowering electricity bills.

Remote Access:

Control your home lighting even when you're not at home, which can be useful for security purposes or to create a welcoming environment upon your return.

Cost Savings:

Although smart bulbs are more expensive upfront, their energy efficiency and the ability to fine-tune usage can result in long term savings.

Affordability:

NodeMCU is a cost-effective microcontroller, and the Blynk app offers a free tier, making the proposed system budget-friendly.

Versatility:

NodeMCU supports various input/output interfaces, allowing for the integration of a wide range of smart devices, including lights, thermostats, door locks, and security cameras.

User-Friendly Interface:

The Blynk app provides a customizable and intuitive mobile interface, enabling users to control and monitor their smart home devices with ea

3. REQUIREMENT ANALYSIS

3.1 Hardware Requirements

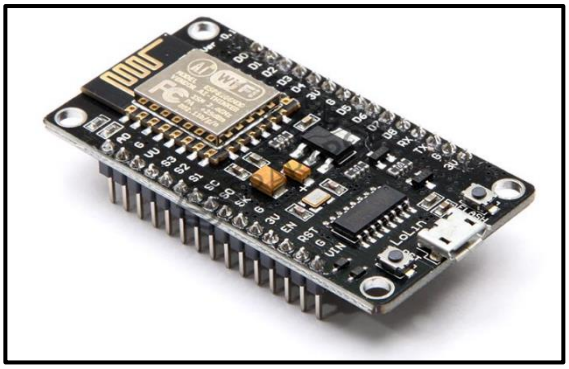

Fig:3.1 node MCU

Node MCU ESP8266 MICROCONTROLLER

The heart of project is the WiFi enabled board that needs no introduction; the ESP8266 based Node MCU development board. Node MCU is an open-source Lua based software and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is predicated on the ESP-12 module. Node MCU was born out of the desire to overcome the limitations associated with the first versions of the ESP8266 module which was not compatible with the breadboards, it was difficult to power and had more difficulty in programming. The Node MCU board is easy to use at a very low cost and that quickly endeared it to the heart of makers and it is one of the most popular boards today. Both the firmware and prototyping board designs are open source. The firmware uses the Lua scripting language. The firmwareis predicated on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, like lua-cjson and SPIFFS. Thanks to resource constraints, users got to select the modules relevant for their project and build a firmware tailored to their needs. Support for the 32-bit ESP32 has also been implemented.

Applications of Node MCU

- Prototyping of IoT devices
- Low power battery operated applications
- Network projects
- Projects requiring multiple I/O interfaces with Wi-Fi and Bluetooth functionalitie
    - **Wi-Fi Capability:** The ESP8266 is known for its built-in Wi-Fi module, allowing it to connect to the internet or local network.
    - **Processing Power:** It features a 32-bit RISC CPU running at 80 MHz (or up to 160 MHz in some configurations).
    - **Memory:** Typically includes 64 KB of instruction RAM, 96 KB of data RAM, and an external flash memory that can vary in size.

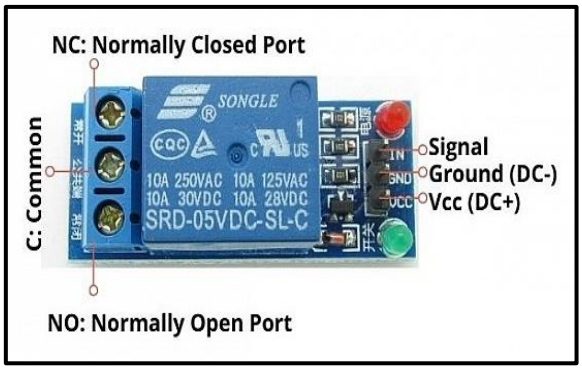

Fig:3.2 relay

A relay is an electrically operated switch used to control a circuit by a separate low-power signal or multiple signals. Relays are fundamental components in many electrical and electronic applications, enabling the control of high-voltage circuits with low-voltage signals.

The relay is that device that open or closes the contacts to cause the operation of the opposite electric control. It detects the intolerable or unwanted condition with an assigned area and gives the commands to the circuit breaker to disconnect the affected area. Thus isolates the system from damage. The 4 Channel Relay Module may be a convenient board which may be used to control high voltage, high current load like motor, solenoid valves, lamps and AC load. It is designed to transmit and receive data with microcontroller such as Arduino, PIC and etc. The relay's terminals (COM, NO and NC) are being brought out with screw terminal. It also comes with a LED indicator to indicate the status of relay. A relay module is an electrical switch that is operated by an electromagnet. The electromagnet gets activated by a separate low-power signal from a micro controller. When activated, the electromagnet pulls to either open or close an circuit.

Fig:3.3 bulb

Fig:3.4 bulb holder

Bulb: A bulb refers to the component of an electric lighting device that produces light when an electric current passes through it. It typically consists of a filament.

Bulb Holder: Also known as a lamp holder or socket, a bulb holder is the device that holds the bulb and provides the necessary electrical connection between the bulb and the power source.

Fig:3.5 jumper wires

Fig:3.6 AC adaptor

Jumper Wires: Jumper wires are electrical wires used to create connections between electronic components.

AC Adapter: A device used to supply power to the Node MCU board.

3.2 Software Requirements:

Fig:3.7 blynk app

- **Blynk App :** Blynk is an IoT platform that allows you to quickly build user interfaces for controlling and monitoring your hardware projects from your android phones. you can download this app from Google Play Store.
- Whether it's personal IoT projects or commercial connected products in the millions, Blynk empowers users to connect their hardware to the cloud and create iOS, Android, and web applications, analyze real-time and historical data from devices, remotely control them from anywhere, receive important notifications, and much more.
- Blynk offers native iOS and Android mobile apps which allow to remotely control connected devices and visualize data from them. App operates in two modes: The primary function of Developer Mode in the mobile app is to build and edit the Mobile Dashboard User interface (GUI) for the given Device Template.

Fig:3.8 arduino IDE app

Arduino IDE : Arduino Integrated Development Environment(IDE) is open source software that facilitates the development and uploading of codes to the microcontroller. Programs written in Arduino IDE are known as sketch. These sketch files are saved with the file extension ino.

The Arduino IDE (integrated development environment) is a cross platform application which is written in the functions from C, C++ and JAVA. The Arduino IDE is also a derivative of Processing IDE. The Arduino IDE is used for easy to write and upload programs in Arduino boards by using a cable that is connected between board and IDE. The operating system for Arduino software can be Windows, Mac Os and Linux depending upon the user. The IDE has a software library from the wiring projects and to provide a common input and output proceduresPrograms written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors.

4. ARCHITECTURE

4.1 Block Diagram

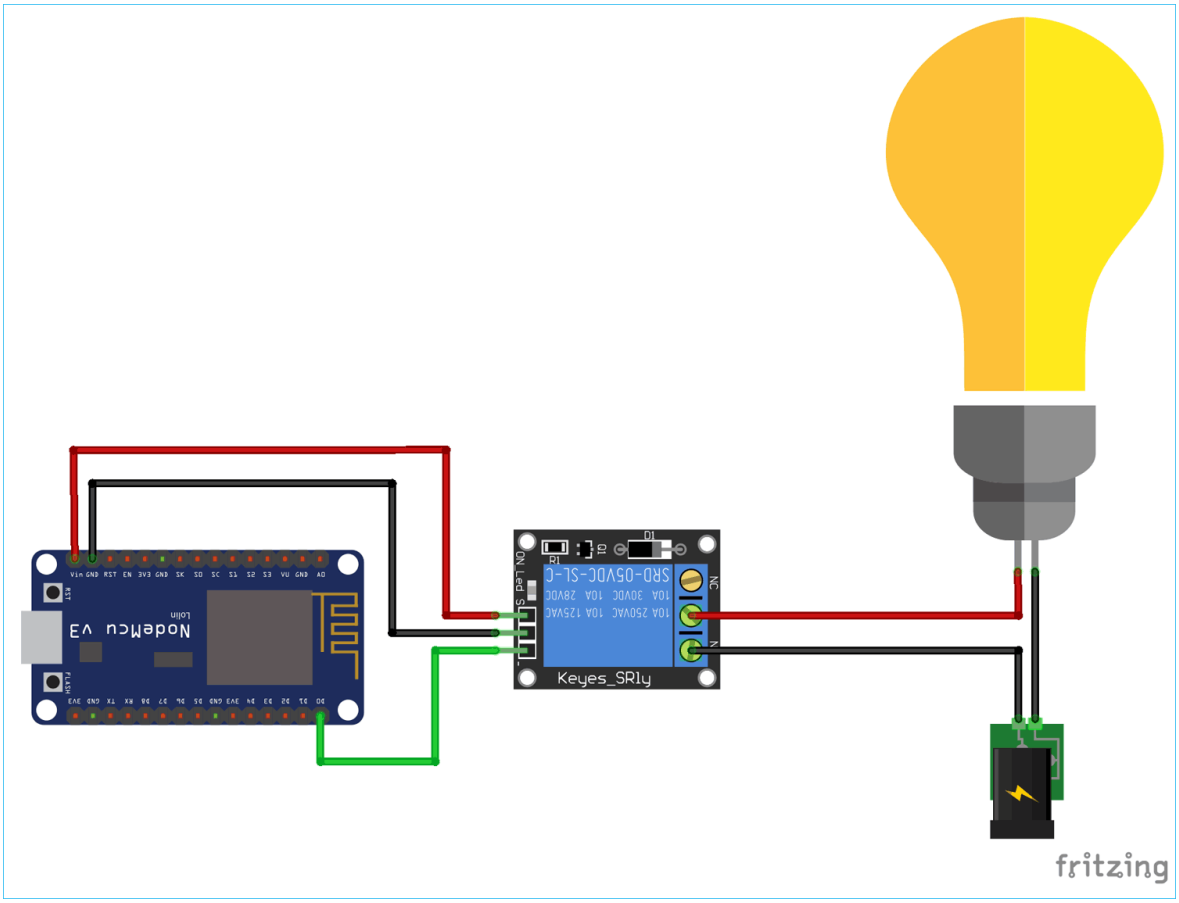

Figure :4.1 block diagram

4.2 Flowchart

Start

↓

Initialize System

(Microcontroller, Wi-Fi/

Bluetooth Connection)

Mobile App Connection

(Open App, Connect to

Microcontroller)

Receive Command

(ON/OFF from Mobile)

Command Received by MCU

(Check Command Type)

Decision: Command

Type?

Turn ON Bulb Turn OFF Bulb Invalid Command

Confirm

| Bulb ON | | Bulb OFF |

| Send Status| | Send Status|

Decision: Continue?

(Another Command?)

Receive Command

5. IMPLEMENTATION

5.1 Blynk Software

Click on the following link to create a Blynk Cloud account.

https://blynk.cloud/dashboard/register

1. Enter email ID, then click on "**Sign Up**". You will receive a verification email.

2. Click on **Create Password** in the email, Then set the **password**, click on **Next**.

3. Enter your **first name**, click on **Done**.

4. consequently Blynk cloud dashboard will open.

Create a Datastream in Blynk Cloud

Concequently, you have to create Datastreams. Here we will control 4 relays, so we have to create 4 Datastreams.

1. Go to the **Datastreams** tab.
2. Click on **New Datastream** and select **Digital** .
3. Enter a **name** and select the **pin 2**.
4. Then click on **Create**.

Now, the Digital Datastream is created.

Set Up Blynk Cloud Web Dashboard

Now go to the web dashboard tab.

1. Drag and drop Switch widgets.
2. Go to the settings of the widget, and select a Datastream.
3. Then click on save.
4. Again click on save option on the top right coner.

Create a New Template in Blynk Cloud

First, you have to create a template in the Blynk cloud.

1. Go to My Devices and select New Device.
2. Click on **From Template.**
3. Enter a template **name**, select the hardware as **ESP8266**, and the connection type will **WiFi**.
4. Then click on **DONE**.

You will get the **BLYNK_TEMPLATE_ID, BLYNK_DEVICE_NAME, and BLYNK_AUTH_TOKEN** after creating the temple.

The BLYNK_TEMPLATE_ID and BLYNK_DEVICE_NAME will be required while programming the NodeMCU.

5.2 Arduino IDE software

Programming Node MCU ESP8266 with Arduino IDE The Node MCU Development Board can be easily programmed with Arduino IDE since it has an easy access. Programming Node MCU with the Arduino IDE may hardly take 5-10 minutes or depending upon the task that is to be performed. All you need is the Arduino IDE, a USB cable and the Node MCU board.

- **Inserting the Code into NodeMCU ESP8266**

1. Open the Arduino IDE app.
2. Go to File and select Examples.
3. Under Examples > Blynk option > Boards_WiFi > ESP8266 Standalone.
4. A new ESP8266 Standalone page will open, along with the code(the code is inbuilt).
5. Change the BLYNK_TEMPLATE_ID, BLYNK_DEVICE_NAME, and BLYNK_AUTH_TOKEN parameters to the parameters which was given in the Blynk app.
6. Go to Tools and select Board.
7. Under Board > ESP8266 Board > NodeMCU 1.0 (ESP-12E Module).
8. Go to Tools > Port > COM4 (any port available).
9. Connect the NodeMCU ESP8266 to the laptop using a USB Cable.
10. Then upload the Code into the NodeMCU by clicking the → (arrow) on the top.

11. The code is upload into the NodeMCU.

Now the NodeMCU is activated over the Wifi and it is ready to work

5.3 Circuit Setup

1. Take the electric wire and connect it to the bulb holder and the 2-pin plug.
2. Then cut the one row line of the electric wire in half.
3. Connect that wire to the relay. One end to the Normally Closed Port and other end to the common line.
4. Now take the 3 female – female jumper wires.
5. Connect the jumper wires to the Relay and NodeMCU ESP8266

Relay	NodeMCU ESP8266
IN	D4
GND	GND
VCC	3V

Table:5.1 circuit setup

6. Connect USB Cable and the Adaptor to the NodeMCU ESP8266.
7. Then connect the adaptor and 2-pin plug to the power supply. Now the circuit is ready to connect with the Mobile.

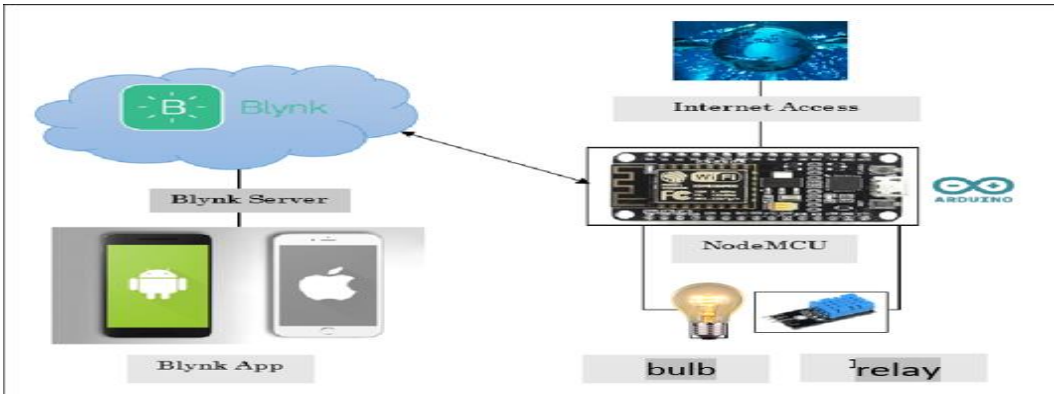

Figure:5.1 working model

Install Blynk IoT App to Configure Mobile Dashboard

1. Install the **Blynk IoT app** from Google Play Store or App Store. Then **log in.**
2. You can see the Template which we have created from the Wed Dashboard before.
3. Tap on the **template** that you have already made.
4. Click on Setup Dashboard.
5. Now go to the **Widget box** (on the right) to add widgets.
6. Add **a Button** widgets from Widget Box.
7. Go to **Button widget settings** by tapping on it.
8. Enter the **name**, select **Datastream**, Mode will be **Switch**. Then exit.
9. After setting all the Buttons tap on **exit**.
10. Now connect the Mobile to the circuit through Wifi.

Now you can control the ON and OFF the Electric BULB.

5.4 Sample Code

One of the easiest way to program Node MCU is via the Arduino IDE. This, however, requires setting up the Arduino IDE by installing the board support file for Node MCU. The code is based on the ESP8266WiFi.h library which allows the easy use of WiFi functionalities of the board. It contains all we need to create or join a WiFi access point and also create a server and client which are all important for this project. The library comes attached with the Node MCU board files for the Arduino, so there is no need to install it once the board files have been installed. The code for this project will enable us to control appliances connected to the GPIOs (via relays) of the Node MCU board remotely. To start with, we include the library that we will use for the project, which in this case, is the ESP8266WiFi.h library.When working with mains voltage (typically 110V or 220V depending on your location), ensure safety by disconnecting power before making or adjusting connections.

Properly isolate low-voltage components (microcontroller, relay) from high-voltage components (mains electricity) to avoid damage or electric shock.

You can enhance your project by adding features like remote control via Wi-Fi (using ESP8266 or ESP32), scheduling (using real-time clock modules), or integrating with smart home systems.

6. TESTING AND DEBUGGING RESULTS

6.1 Code testing

```
/* Comment this out to disable prints and save space */

#define BLYNK_PRINT Serial

/* Fill in information from Blynk Device Info here */

//#define BLYNK_TEMPLATE_ID           "TMPxxxxxx"

//#define BLYNK_TEMPLATE_NAME         "Device"

//#define BLYNK_AUTH_TOKEN            "YourAuthToken"

#define BLYNK_TEMPLATE_ID "TMPL3p6HfzU2r"

#define BLYNK_TEMPLATE_NAME "Electric Bulb"

#define BLYNK_AUTH_TOKEN "G8a56L7wSDXIbN9xFdlOjDNJElwW8VYQ"



#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>

// Your WiFi credentials.

// Set password to "" for open networks.

char ssid[] = "varshitha";

char pass[] = "varshitha_01";
```

```
void setup()
{
  // Debug console
  Serial.begin(9600);
  Blynk.begin(BLYNK_AUTH_TOKEN, ssid, pass);
}
void loop()
{
  Blynk.run();
}
```

6.2 Testing and Debugging

From testing the entire system above, the smart home works according to the purpose of this project. Comparison of this research with previous studies, namely this study uses control buttons, thus increasing the diversity of the smart home system itself. Also, used a microcontroller that is different from previous studies that is the Node MCU ESP8266 module which has advantages compared to other microcontrollers. The smart home has been successfully built with hardware arranged in such a way that it can achieve results that are as expected. In this case the hardware plays a very important role as the main device is the Node MCU ESP8266 module. The advantages of using the Node MCU ESP8266 are more practical than buying various components and then assembling them by yourself.

6.3 Output

The Light Control Test is done by pressing the ON / OFF button widget on the Web application on the respective Android smart phone/Pc 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.

Figure:6.1 output

7. CONCLUSION

7.1 Conclusion

In conclusion, controlling electric bulbs using mobile technology brings a multitude of benefits that enhance convenience, energy efficiency, and security. This modern approach to lighting allows for seamless remote access and customization, fitting effortlessly into daily routines and personal preferences. Overall, mobile-controlled electric bulbs not only offer practical advantages but also promote a smarter, more connected, and efficient household environment.

7.2 Future scope

Controlling an electric bulb using a mobile phone offers convenience and flexibility in home automation. By integrating hardware like the NodeMCU ESP8266 microcontroller and a relay module with a custom mobile application, users can effortlessly manage lighting remotely. The system allows for intuitive control via a mobile app interface, offering options to switch the bulb on/off, adjust brightness, and schedule operations, enhancing energy efficiency and convenience. Implementation involves careful hardware setup, firmware development for the microcontroller, and mobile app design to ensure seamless communication and user-friendly interaction. Security measures are crucial to protect against unauthorized access. Overall, this solution not only modernizes traditional lighting systems but also demonstrates the potential of IoT technologies in enhancing everyday tasks with remote accessibility and smart functionalities tailored to user preferences.

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