A MINI PROJECT REPORT

ON

IOT Based Smart Society

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Third Year of Engineering

In

Electronics and Telecommunication

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2022-2023

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CERTIFICATE

This is to Certify that the Project Report Entitled

"IOT Based Smart Society"

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is a bonafied work carried out satisfactorily by them under supervision and guidance and it is submitted towards the partial fulfillment of the requirements of Savitribai Phule Pune University, Pune for the award of degree Third Year of Engineering (Electronics and Telecommunication) during the academic year 2022-2023.

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ACKNOWLEDGMENT

This is to thank and recognise everyone who contributed significantly to the creation of this project report.We gratefully applaud Dr. Jyoti Rangale for her inspiration, personalised oversight, timely advice, and constant encouragement in helping us complete this study.We would like to extend our sincere gratitude to Dr. B. H. Patil, the department head of electronics and telecommunication engineering at VPKBIET, Baramati, and the departmental personnel for their assistance.We also want to thank our honourable principal Dr. R.S. Bichkar for his constant encouragement of us. Last but not least, we would like to send our profound gratitude to all of our friends who patiently provided all assistance necessary to complete this task. We would want to express our gratitude to everyone who is involved, both directly and indirectly involved in the timely and effective completion of this project job. We appreciate Bharat Forge for providing the tools and space. we are grateful.

ABSTRACT

In an IoT-based smart society, various objects and systems are embedded with sensors and connected to the internet, enabling the exchange of data and facilitating intelligent decision-making. This integration of IoT technology across different domains such as transportation, healthcare, energy, and infrastructure enables optimized resource management, improved service delivery, and enhanced quality of life for residents. However, challenges such as data privacy, security, interoperability, and scalability need to be addressed to ensure the successful implementation of an IoT-based smart society. By harnessing the power of IoT, a smart society has the potential to revolutionize urban living, making cities more sustainable, connected, and responsive to the needs of their citizens.

We have highlighted how smart cities give their citizens a more effective and high-quality living below, along with the strategies they employ to do so.

In today's modern times society has many problems. for example like opening and closing gate or filling water tank or starting a motor on time and time to time on/off parking light etc. In today's modern time everything is done automatically. We will also try to solve this problem of the society in an automatic and simple way through this project. Using new technologies we will create an app through which all these things can be done at home and timing.

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List of Abbreviations

Abbreviation		Meaning
1.	IOT	Internet OF Things
2.	RAM	Random Access Memory
3.	GPIO	General Purpose Input Output
4.	SOC	System on Chip
5.	EEPROM	Electrically Erasable Programmable Read-Only Memory

1 INTRODUCTION

The way we engage with technology has been revolutionised by the Internet of Things (IoT). transforming it from standalone devices to interconnected systems. This paradigm shift has opened up exciting possibilities for the development of a smart society, where IoT technology plays a pivotal role in creating an intelligent and efficient community.

In today's modern times society has many problems. for example like opening and closing gate or filling water tank or starting a motor on time and time to time on/off parking light etc. In today's modern time everything is done automatically. We will also try to solve this problem of the society in an automatic and simple way through this project.

One of the key advantages of an IoT-based smart society is optimized resource management. Through real-time monitoring and control of resources, such as energy consumption, water usage, and waste management, efficiency can be maximized while minimizing waste and environmental impact. This sustainable approach contributes to the long-term well-being of the community and supports the goals of environmental conservation.[4]

Moreover, an IoT-based smart society fosters citizen engagement by providing individuals with access to information, services, and platforms that enable active participation in decision-making processes.

A crucial component of this IOT-based society automation project is the Esp8266 WiFi Module. Your smartphone will send commands wirelessly via the internet to a Esp8266 module. A certain application must be running in order to encrypt the commands on a smartphone and deliver them to the ESP8266. There are numerous available programmes, but we're going to pick the greatest and most accessible one, which is "Blynk" this application. Additionally, it supports both platforms, including iOS and Android.

1.1 Motivation

Improved Quality of Life: Smart technologies have the potential to enhance the well-being and convenience of individuals within a society. By automating mundane tasks, providing personalized services, and creating connected environments, smart societies can offer improved healthcare, transportation, safety, and overall comfort to residents.

Sustainable Development: Smart societies prioritize sustainable development by adopting eco-friendly practices and minimizing environmental impact. By optimizing energy usage, promoting renewable energy sources, and implementing smart waste management systems, smart societies contribute to the preservation of natural resources and reduce carbon emissions.

1.2 Smart Energy

Deep insights into the total amount of electricity used by buildings, businesses, and residences are provided by smart energy. It assists in developing and putting into practise different power-saving measures. Smart grids and smart streets are only being used in a small number of cities today. Additionally, smart metres are set up in the residences. Cities can improve grid management, distribute energy more efficiently, and optimise power generation with the aid of IoT integration. On the other side, the smart grid gives companies the chance to enhance data collection, grid modernisation, outage detection, field operations, and disaster recovery techniques.

1.3 Smart Parking

With smart parking, the city may make more money by regularly using the same parking space. The rooms may be used to the utmost extent possible. It also increases the amount of money.

1.4 Objective

Data and technology are used by smart societies to increase productivity, enhance sustainability, and raise quality of life standards for city dwellers and workers. To build an intelligent infrastructure for energy conservation, a number of different datasets might need to be combined.

1.5 Specifications of System

The NodeMCU (Node MicroController Unit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266, designed and manufactured by Espressif Systems, contains the crucial elements of a computer: CPU, RAM, networking (WiFi), and even a modern operating system and SDK. That makes it an excellent choice for Internet of Things (IoT) projects of all kinds.

1.6 Literature Survey

1.”Smart Campus Monitoring System using IoT and Blynk for IIT Environments” Authors: A. Kumar and S. Jain Summary: This research paper proposes a smart campus monitoring system using ESP8266 and Blynk at IIT campuses. The system monitors various environmental parameters such as temperature, humidity, air quality, and noise levels. Real-time data visualization and alerts are provided through the Blynk platform, enabling effective management of campus resources.

2.”Smart Energy Management System for IIT Hostels using ESP8266 and Blynk” Authors: P. Sharma et al. Summary: This study focuses on designing a smart energy management system for IIT hostels. ESP8266 modules are used to monitor electricity consumption of individual rooms and common areas. Blynk is utilized to provide real-time energy usage data to students and hostel administrators, promoting energy conservation and cost reduction.

3.”Smart Parking System using ESP8266 and Blynk for IIT Campuses” Authors: N. Verma and A. Gupta Summary: This research paper introduces a smart parking system tailored for IIT campuses. ESP8266 modules are integrated with parking sensors to detect vehicle occupancy, and Blynk is employed to provide real-time parking availability information to the users. The study evaluates the system’s performance and its impact on reducing parking congestion.

1.7 Block Schematic of Proposed System

Home automation using a real-time clock is a sophisticated project for timely and methodical device control. The gadgets can be wirelessly managed by other devices. All of the operating parameters in the devices or appliances may be recorded using the RTC with EEPROM technology.A smartphone app will be used to operate every device in society. For orderly operation, the appliances in a community or house will be connected to a centralised microcontroller called a NODE MCU.

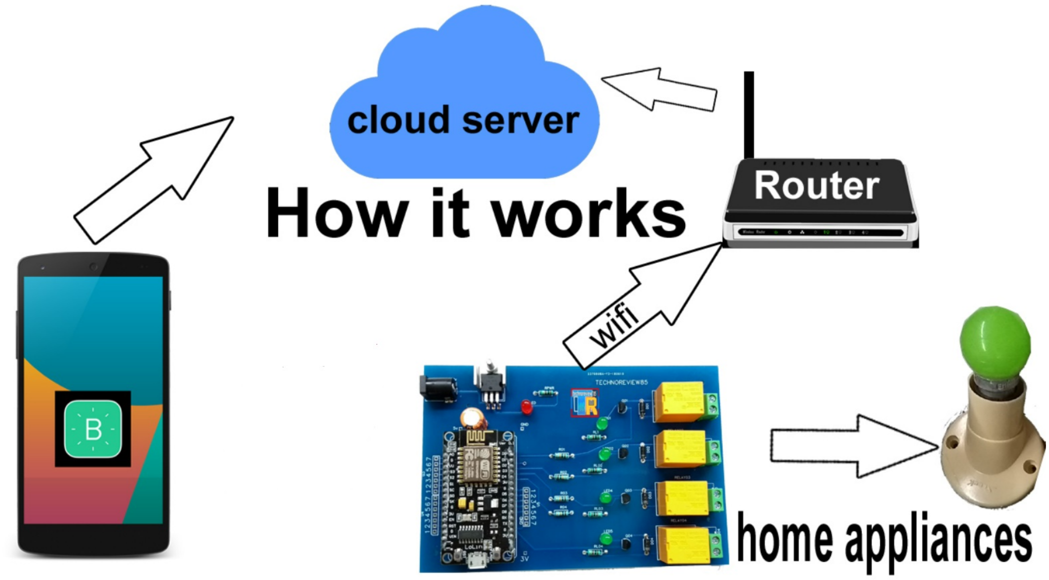

Figure 1: Block Diagram

The controller's built-in RTC and EEPROM technologies will be turned on for the operation. In order to accept control orders from Wi-Fi shield material (Wi-Fi hotspot), the controller is interfaced with WIFI devices. Devices like light switches, power plugs, temperature sensors, gas sensors, motion sensors, etc. have been combined with the suggested home control systems to show the viability and efficacy of this system. It uses an integrated micro-web server with IP connection built into the NODE MCU microcontroller to enable remote access to and control of appliances and devices.

2 SYSTEM DEVELOPMENT

2.1 Schematic of System

According to Figure 2, every appliance in society will be managed by a smartphone app. The centralised micro controller NODE MCU will connect with household and commercial equipment to enable systematic operation. RTC and EEPROM technologies that are already present inside the controller will be turned on.

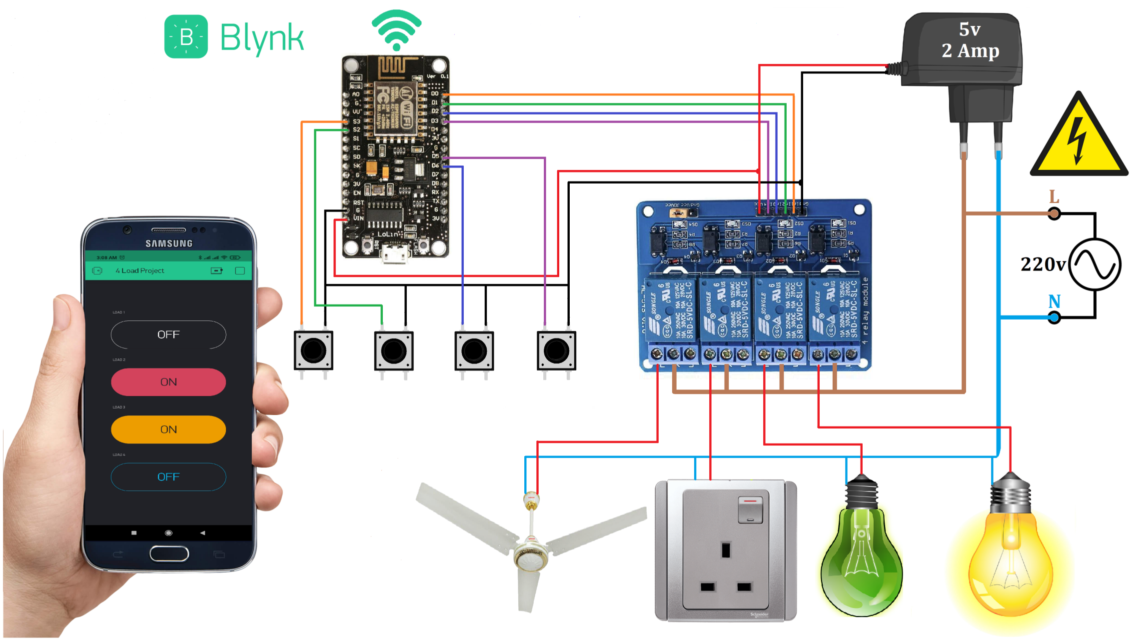

Figure 2: Schematic of System Diagram

To receive the controlling instructions from the Wi-Fi shield (Wi-Fi hotspot), the controller also included a WI-FI interface. A mobile app with Wi-Fi will be given to the operator. Operator must use the switch control button given in the app to turn on or off the light.

2.2 Hardware Design

2.2.1 NODE MCU(ESP8266)

A typical circuit board contains the ESP8266 chip. A built-in USB port that is already connected up in the chip is included on the board. Wi-Fi antenna, LED lights, and pins of the GPIO (General Purpose Input Output) standard size that may be plugged into a bread board. Its CPU, the L106 32-bit RISC microprocessor core, is based on the Ten-Silica Xtensa Diamond Standard 106Micro and operates at 80 MHz. Its memory includes 32 Kbit instruction RAM, 32 Kbit instruction cache RAM, 80 Kbit user data RAM, and 16 Kbytes of system data RAM. It has built-in Wi-Fi modules that use the (IEEE802.11 b/g/n) Wi-Fi standard. Figure below depicts the NODEMCU (ESP8266).

Figure 3: NODE MCU

2.2.2 RELAY

The electromagnetic switching is all that a relay is. When two circuits are apart, a relay enables one circuit to switch the other. Relays are used in low voltage circuits to turn ON and OFF equipment that needs high voltage to function. For instance, a 5V supply linked to the relay is enough to run a 230V AC mains-operated light bulb. Relays come in a variety of operating voltage configurations, including 6V, 9V, 12V, and 24V.

Relay having three contactors: 1 st Normally closed (NC), 2 nd normally opened (NO) and

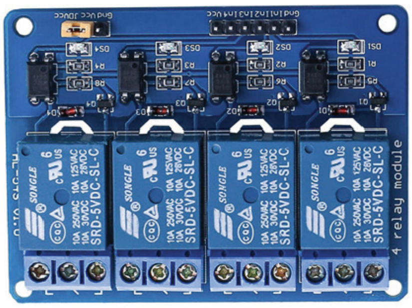

Figure 4: 4 channel Relay Module

3 rd common (COM). By using the proper combinations of the contactors electrical appliances may turn ON or OFF.

2.2.3 BreadBoard

A breadboard is a device used in electronics prototyping that allows for the construction and testing of circuits without the need for soldering. It consists of a plastic board with a grid of holes arranged in rows and columns. The holes are interconnected by metal clips or strips running underneath the board, providing a means to easily connect electronic components and wires.

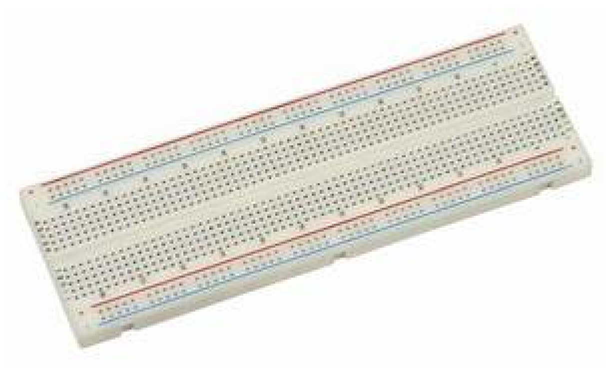

Figure 5: Breadboard

The rows and columns are typically electrically isolated from each other, allowing for convenient placement of components and creating complex circuits. Breadboards are reusable and provide a convenient platform for experimenting with different circuit designs before committing to a permanent soldered solution. They are widely used by hobbyists, students, and professionals in the field of electronics.

2.2.4 Jumper Wires

Jumper wires are flexible, insulated wires used in electronics to create temporary connections between components. They come with connectors on both ends, typically male pins or female sockets, making it easy to connect and disconnect them. Jumper wires are commonly used on breadboards or prototyping boards to establish electrical connections without the need for soldering. They come in various lengths and colors, enabling organization and easy identification of different signals. Jumper wires are a versatile tool in circuit building, allowing for quick experimentation, testing, and modification of electronic circuits.

Figure 6: Jumper wires

2.3 Software Design

2.3.1 Algorithm:

Here is an algorithmic explanation of the code:

1. Import necessary libraries: ESP8266WiFi.h: Library for connecting to WiFi on ESP8266 module. BlynkSimpleEsp8266.h: Library for integrating Blynk IoT platform with ESP8266. EEPROM.h: Library for reading and writing to the EEPROM memory.

2. Define constants and variables: AUTH: Blynk authentication code. WIFI-SSID and WIFI-PASS: WiFi network credentials. Pins for relays (Relay1, Relay2, Relay3, Relay4) and switches (Switch1, Switch2, Switch3, Switch4). wifiLed: Pin for indicating WiFi connection status. load1, load2, load3, load4: Variables to store the state of each relay. wifiFlag: Flag to indicate if WiFi connection is established.

3. Initialize Blynk and setup function: Set baud rate for serial communication. Set pin modes for switches as input with internal pull-up resistors. Begin EEPROM memory. Read the stored state of relays from EEPROM into variables. Set pin modes for relays as output. Call Relays function to update the relay states. Set pin mode for WiFi LED indicator as output. Connect to WiFi network using provided credentials. Set an interval to check Blynk server connection status. Configure Blynk with the authentication code.

4. Main loop: Check if WiFi is not connected, print the status (optional). If WiFi is connected, call Blynk.run() to handle Blynk communications.

5. Conditional execution based on WiFi connection: If there is an internet connection (wifiFlag == 0), call with-internet() function. Otherwise, call without-internet() function.

6. with-internet() function: Check the state of each switch using digitalRead. If a switch is pressed (LOW state), toggle the corresponding load variable and call Relays and update-blynk functions. Add a delay after each switch press to debounce.

7. without-internet() function: Similar to with-internet(), but without calling update-blynk function.

8. update-blynk() function: Send the current relay states to the Blynk app using Blynk.virtualWrite.

9. Relays() function: Update the state of each relay based on the load variables. Write the updated relay states to EEPROM using write-eeprom function.

10. write-eeprom() function: Write the current relay states to EEPROM memory for persistence. Note: The code assumes that you have already installed the required libraries and set up the Blynk app with the appropriate widget configuration (Virtual Pins V0-V3).

2.3.2 Flowchart

The whole flowchart, which shows how the system functions as a whole and is managed by a mobile app.

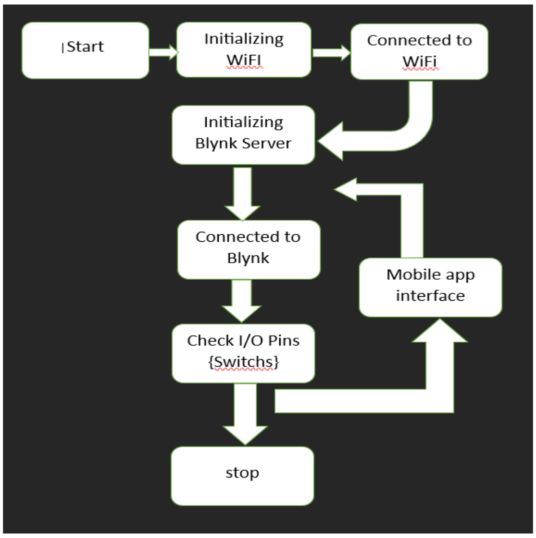

Figure 7: Flow Chart

This project's main goal is to introduce automation into society. The WiFi shield (WiFi hotspot) connects to the current network infrastructure before initialising the open source Blynk server. Next, the WiFi module sends a signal to an app that provides for the client (operate) informing it whether the system is online or offline. Finally, it checks the input-output pins, or switches. When a client changes any of the switches, the Blynk server receives the data and displays the user's status on the Blynk interface.The system will circle back to the starting situation while this process proceeds.

3 RESULTS AND CONCLUSION

3.1 Simulation Results

Create a Schematic: Open Proteus and create a new schematic design. Use the components library to select and place the devices you want to include in your simulation. Connect the components together using wires to represent the electrical connections. Assign Properties: Once you have placed the components, assign appropriate properties to each component. For example, specify the voltage levels, input/output configurations, and other relevant parameters for devices like switches, sensors, and actuators.

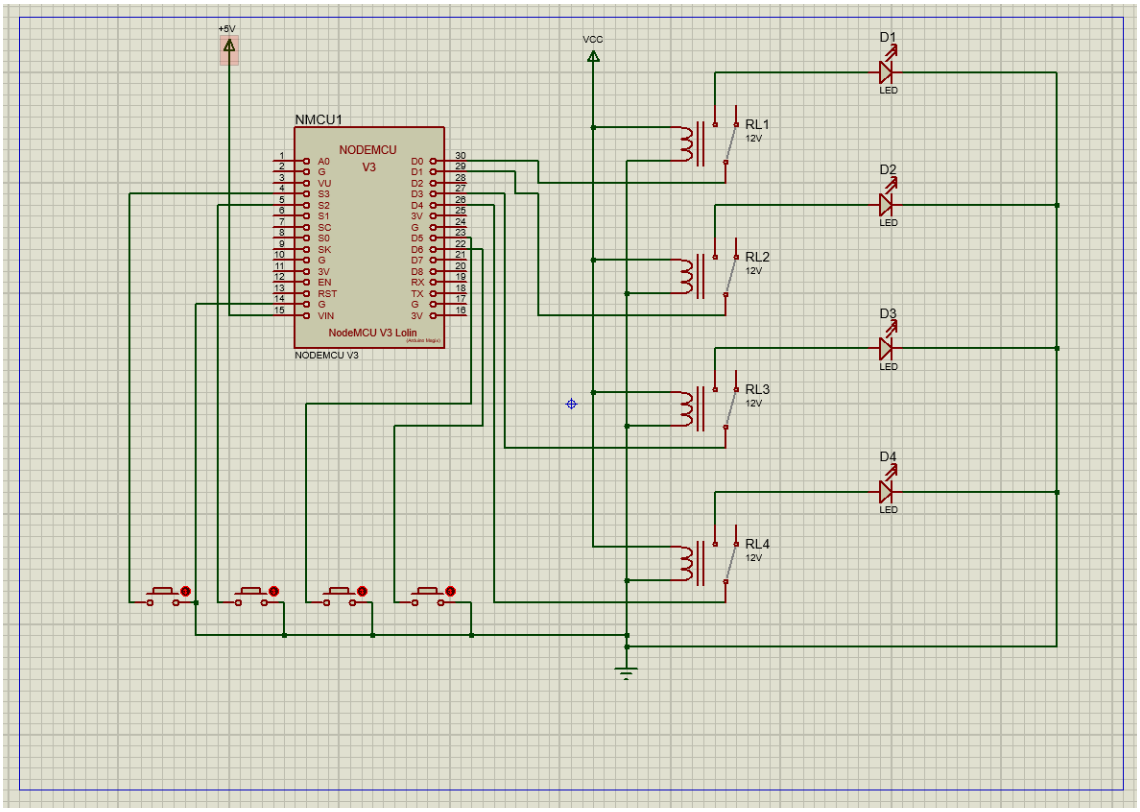

Figure 8: Simulation Result

Write Firmware: If your home automation system includes microcontrollers or programmable devices, you need to write the firmware or program for them. Proteus supports a variety of microcontrollers, so choose the one that matches your system and write the necessary code to control the devices' behavior.

Simulate the System: Once you have the schematic and firmware ready, you can simulate the behavior of your home automation system. Proteus provides a virtual environment to test the functionality of your design. You can use the simulation tool to observe the interaction between different components, monitor sensor readings, and trigger actions based on various conditions.

Debug and Fine-tune: During the simulation, you may encounter issues or unexpected behavior. Debug the problems by examining the circuit connections, firmware code, and simulation settings. Make necessary adjustments to fix any errors or improve the system's performance.

Test Different Scenarios: Home automation systems often involve various scenarios, such as turning on lights when a sensor detects motion or adjusting temperature based on predefined conditions. Use Proteus simulation to test different scenarios and evaluate the system's response to different inputs and conditions.

Analyze Results: Once you have completed the simulation, analyze the results and observe how the system behaves under different circumstances. Check if the desired automation tasks are being performed correctly and if the system meets the expected requirements.

Iterate and Improve: Based on the simulation results, you may identify areas for improvement or optimization. Modify the schematic, firmware, or simulation settings as needed to enhance the system's performance, efficiency, or reliability.

Document the Simulation: Finally, document your Proteus simulation, including the schematic, firmware code, simulation settings, and any other relevant information. This documentation will be helpful for future reference or if you need to share your simulation with others.

Remember that Proteus is a powerful simulation tool, but it is essential to validate your design in real-world conditions to ensure its proper functionality.

Regenerate response

3.2 Hardware Testing

3.2.1 Node MCU ESP8266 Testing:

Hardware testing with NodeMCU and an LED involves verifying the proper functionality of the NodeMCU board and ensuring that the LED can be controlled through it. First, the NodeMCU board should be connected to a power source, either through a USB cable or an external power supply. The presence of power can be confirmed by observing the onboard

LED on the NodeMCU board. To test the LED, it should be connected to one of the GPIO pins on the NodeMCU, typically using a current-limiting resistor.

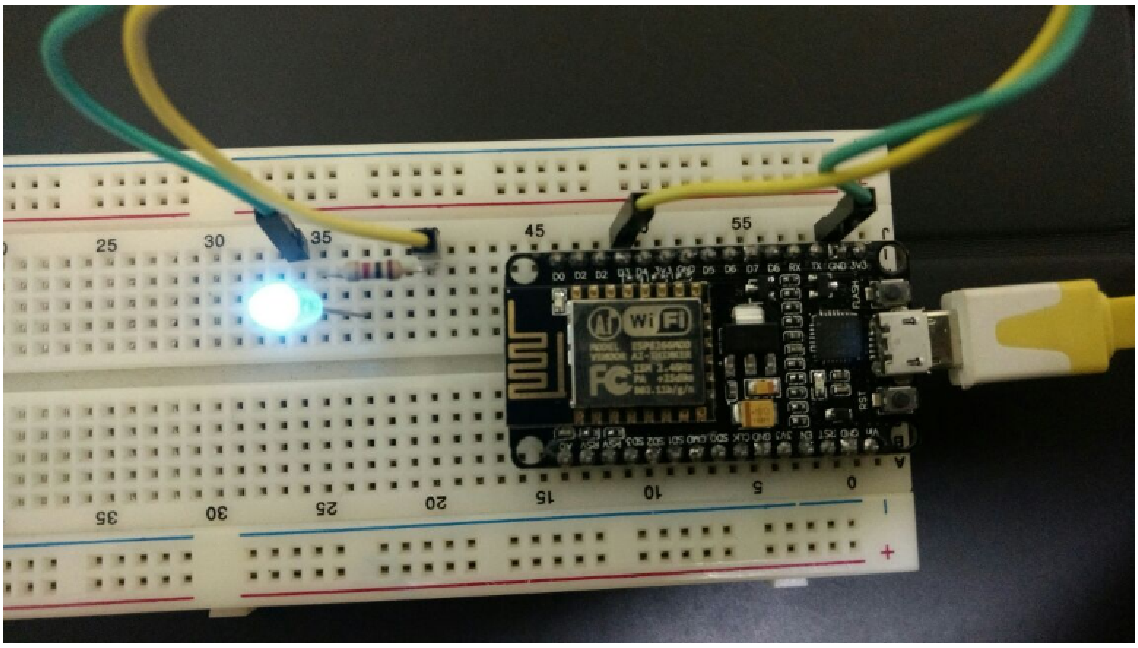

Figure 9: NodeMCU testing with LED

By writing a simple code to control the GPIO pin, such as turning it on and off at specific intervals, the LED can be made to blink. This test ensures that the GPIO pins of the NodeMCU are functioning correctly and can be used to control external devices like LEDs. By performing hardware testing with NodeMCU and an LED, developers can verify the proper setup and operation of the board, as well as gain confidence in its ability to interface with other electronic components for more complex projects.

3.2.2 Relay testing with Nodemcu :

Hardware testing with NodeMCU and a relay involves ensuring that the NodeMCU board can effectively control the relay module. The relay module serves as an electronic switch that can control high-power devices or circuits using low-power signals from the NodeMCU. To begin testing, the NodeMCU should be powered up through a USB cable or an external power supply. Next, the relay module should be connected to the appropriate GPIO pin on the NodeMCU, typically using jumper wires. It is important to ensure that the relay module is properly powered and that the signal pin is connected correctly.

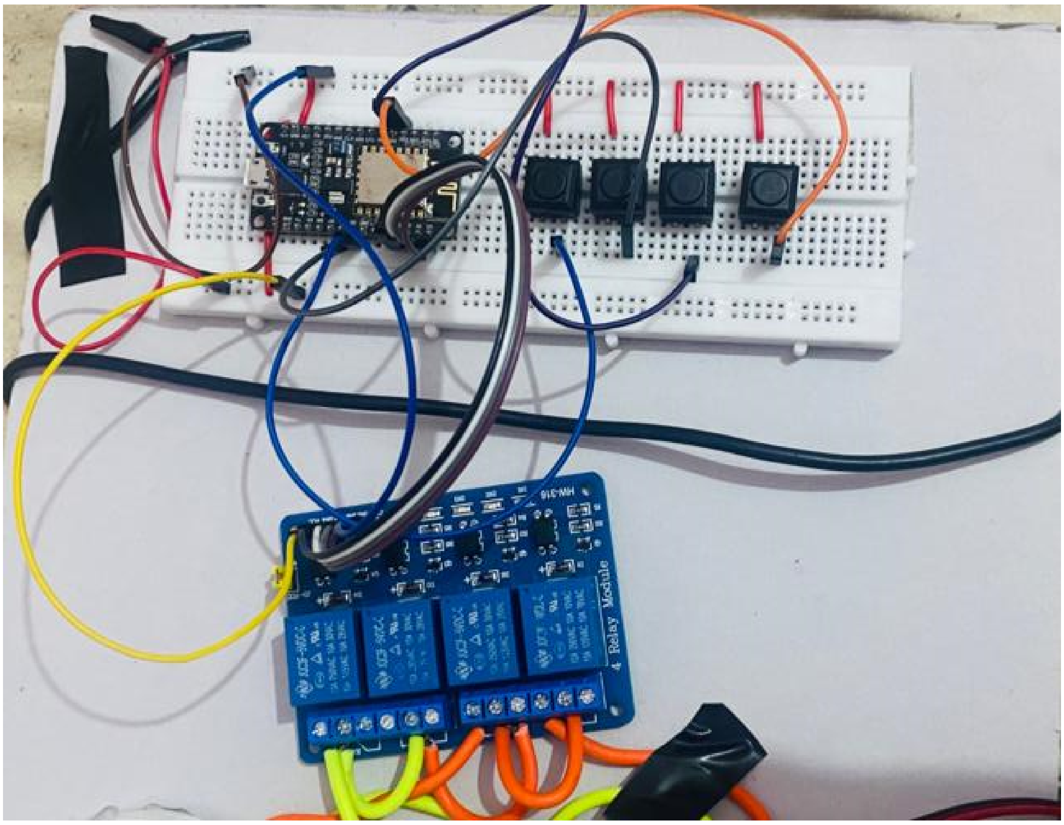

Figure 10: NodeMCU testing with Relay

To test the relay, a simple code can be written to control the GPIO pin. For example, setting the GPIO pin to a HIGH state will activate the relay and close the circuit, while setting it to a LOW state will deactivate the relay and open the circuit. By running the code and observing the behavior of the relay, developers can confirm that the NodeMCU can successfully control the relay module. This testing process is crucial for projects that require the NodeMCU to switch high-power devices or circuits, such as controlling lights, motors, or other electrical appliances.

3.3 Results

The Figure 12 shows the working condition of project. At this stage the Node MCU (ESP8266) esatblish the connection with wifi routuer, then blynk server gets started. now we have to open the blynk application for controlling the switches and blubs using blynk server database. From mobile interface in blynk app when we turn the switch 1 ON it sent the high load to pin D1 of the NodeMCU through the Blynk server. and Relay 1 get on. Same process is repeated to remaining switches.

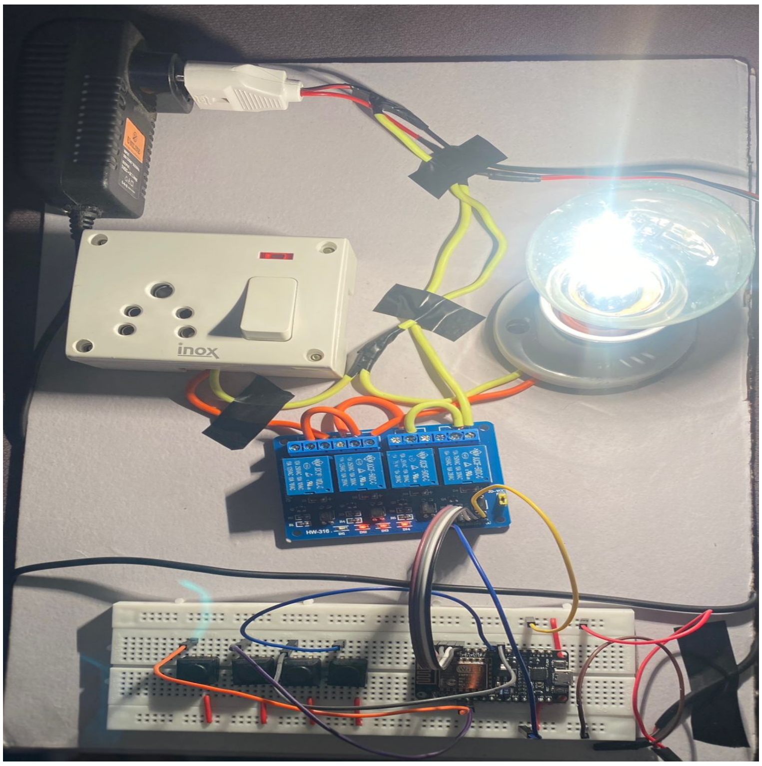

Figure 11: Working Condition

3.4 Conclusion

It is clear from this project's work that an individual control society automation system can be made for a reasonable price using inexpensive locally available parts and used to control a variety of appliances, including security lamps, water pumps, automatic gates, and even the entire home lighting system. Better still, the few and tiny number of components needed allow them to be packed into a discrete, compact container. The planned societal automation system was put through a variety of tests and certified to manage various household appliances utilised in the home entertainment system, lighting system, and water pumps, among other things. As a result, this system is adaptable and scalable.

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