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IoT based Smart Home Automation using NodeMCU

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Abstract: ***With the expansion of Automation technology, life is getting simpler and easier altogether aspects. In the present world, Automatic systems are dominant over manual systems. The rapid increase within the number of users of the internet over the past decade has made the Internet a neighborhood and parcel of life, and IoT is that the latest and emerging internet technology. The Internet of things could also be a growing network of everyday object-from industrial machines to a commodity that can share information and complete tasks while you're busy with other activities. Wireless Home Automation system using IoT could also be a system that uses computers or mobile devices to manage standard home functions and its features automatically through the web from anywhere around the globe, an automatic house is sometimes called a sensible home. It is meant to save a plethora of electrical power and human (manual) energy. The home automation system differs from another system by admitting the user to figure the system from anywhere around the world through an online connection (internet). In this paper, we present a Home Automation system using Blynk Community that employs the mixing of cloud networking, wireless communication, to supply the user with a remote of various appliances within their home and storing the data logs in the cloud. This system is meant to be low cost and expandable allowing a spread of devices to be controlled.***
Keywords: IoT, Home Automation, NodeMCU, Blynk App, Relay Module

I. INTRODUCTION

IoT or the internet of things is an upcoming technology that allows us to command hardware devices through the internet. Here, we propose to use IOT to control home appliances and thus automating modern homes through the internet. This system uses 2-loads to demonstrate as house Appliances Controlling. Our user-friendly app (Third Party App) interface allows users to easily control their home appliances through the internet. For this system, we used a NodeMCU (Node Microcontroller Unit). This microcontroller is allianced with a Relay modem to get user commands over the internet. Relays were used to switch loads. The whole system is powered by a 5V Adaptor/Charger (Micro-type). After receiving user requests over the internet, NodeMCU processes these sets of orders to operate these loads accordingly and display the system status on a Smart Phone Display. Thus, this system provides efficient home automation over the use of the internet.

In this, we have used the Blynk Community Application for controlling home appliances. The Method used for controlling is Swiping the fingers on Smartphone and it will trigger the circuit as it gets input command from the Blynk App itself.

II. LITERATURE SURVEY

Reference	Methodology	Advantages	Future Scope
[1]	In this, we have used Raspberry Pi instead of Arduino and PIR sensors which are more effective than normal IR sensors for home security.	The biggest advantage of using Raspberry Pi instead of Arduino is the clock speed of Raspberry Pi. The PIR sensor is directly connected to the led array which will provide a better light environment for the camera to capture a clear photo	Raspberry pi might be one day used as it has multiple GPIO pins which can be built by or programmed and used to interface various devices in the real world and controlled by python programming language.

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[2]	The basic methodology is signal sent from Android Phone to Wi-Fi module. The android application consists of GUI buttons for each appliance. Eventually, end users can access appliances over mobile devices.	This home automation works according to the user's needs and demands and also the modes of function work as desired during the implementation. These smart switches can be used manually, on mobile phones and computers through the internet.	The project which is to be implemented is home automation using an easy IoT web server and wi-fi and has very good future development.
[3]	Using Raspberry Pi IR Camera to prevent unauthorized people from entering the house.	The Pi camera helps in streaming the live feed and also captures images at a higher resolution.	Using the biometric sensors present on the mobile of the user, the door can be locked or unlocked.
[4]	In this project, the lights and fans are automatically controlled by the external light as well as Human presence and room temperature respectively.	Reduced power consumption; Cost-efficient; User Friendly; Easy maintenance.	The use of upgraded sensors increases the precision of the sensor making the system more efficient.
[5]	The most basic implementation includes the use of an LDR sensor for light intensity and an IR sensor to detect human presence.	This system, rather than making people physically go and turn appliances on or off, makes people control from sitting anywhere not only in its circumference but from anywhere in the world.	The project can be scaled by adding more control towards household components.

III. PROPOSED SYSTEM

The Home automation would be controlled by the wi-fi network in Blynk android application. The wi-fi home automation can be used easily to make "ON" and "OFF" by using the command in the Blynk application. We would make the home automation do the various task using Wireless Fidelity (Wi-Fi) network technologies.

These are the major objectives of our project:

1) Would be able to control your home appliances such as Tv, Fan, Bulb, LED's, etc. with the help of your smartphone from anywhere around the globe.
2) An Esp8266 Module (NodeMCU) will accept the commands from your smartphone wirelessly through the internet.
3) The command logs are stored in the Blynk app server.

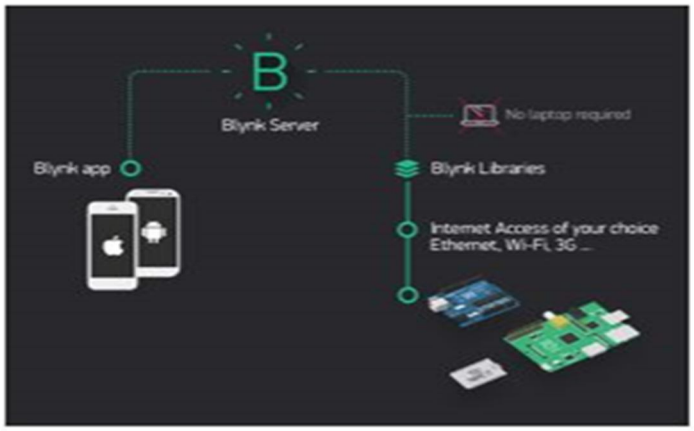

Figure 1: Working principle of Blynk

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IV. SYSTEM DESIGN AND ANALYSIS

A. System Design and Analysis

The system block diagram represents the interface of all major system components to give a brief overview of the overall functionality/working details of the system. It should show all major system components, interfaces to the outside world, and interfaces between subsystems.

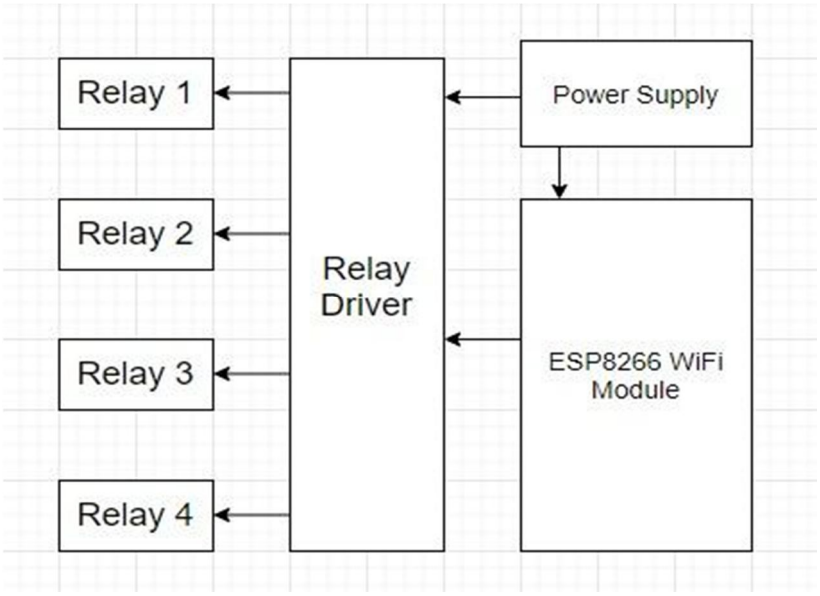

Figure 2: Block diagram

B. Hardware Requirements

1) NodeMCU-ESP8266 Wi-Fi Development Board

Figure 3 : NodeMCU

NodeMCU is a low-cost open-source IoT platform, It initially included firmware that runs on the ESP8266 Wi-Fi SoC from Express if Systems, and hardware that was based on the SEP-12 module. Later, support for the ESP32 32, 32-bit MCU was added.

The term NodeMCU stands for the Node Microcontroller unit. It has an open-source hardware and software environment. NodeMCU is also called Devkit 1.0. It is a board system on chips (SoC) called ESP-8266. The ESP8266 is a low-cost microchip full of TCP/IP stack and microcontroller capability. The ESP8266 is the name of a microcontroller designed by Express if Systems. The ESP8266 itself is a self-contained WiFi networking solution offering as a bridge from the existing microcontroller to WiFi and is also capable of running self-contained applications. This module comes with a built-in USB connector and a rich assortment of pinouts. With a micro USB cable, you can connect the NodeMCU devkit to your laptop and flash it without any trouble, just like Arduino. It is also immediately breadboarded friendly.

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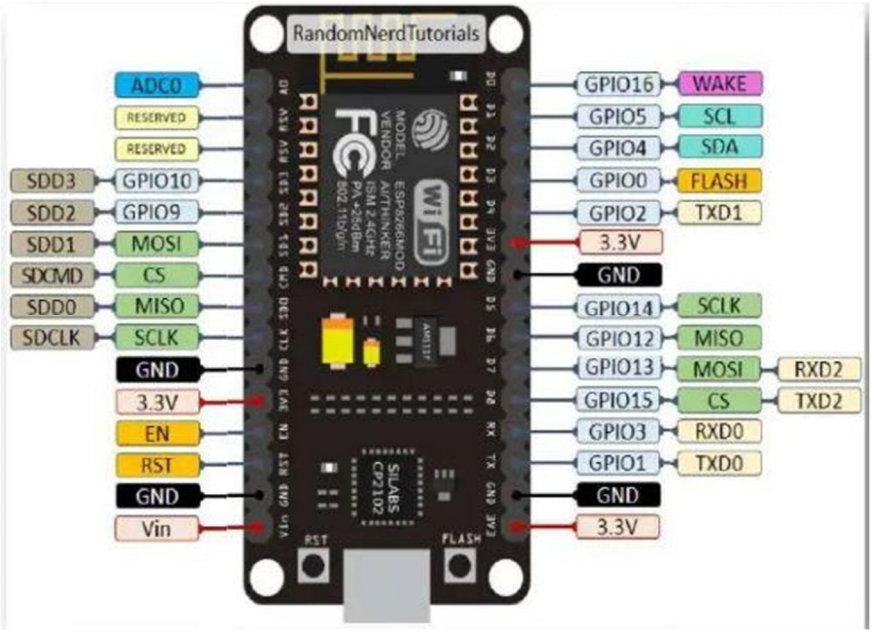

Figure 4: Pin Diagram of NodeMCU

2) 2-Channel Relay Module

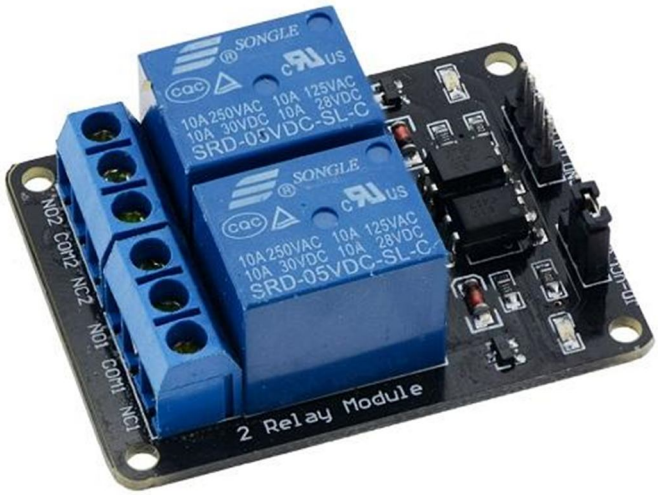

Figure 5: 2-Channel Relay Module

This is a 5V 2-channel relay interface board, and each channel needs a 15-20 mA driver current. It can be used to control various appliances and equipment with a large current. It is equipped with high-current relays that work under AC250V 10A or DC30V 10A. It has a standard interface that can be controlled directly by the microcontroller.

3) Pin Description

a) Input: 0-5 V
b) VCC: Positive supply voltage
c) GND: Ground
d) IN1--IN4: Relay control port
e) Output: supports various types of loads
f) Connect a load, DC 30V/10AC, 250V/10A

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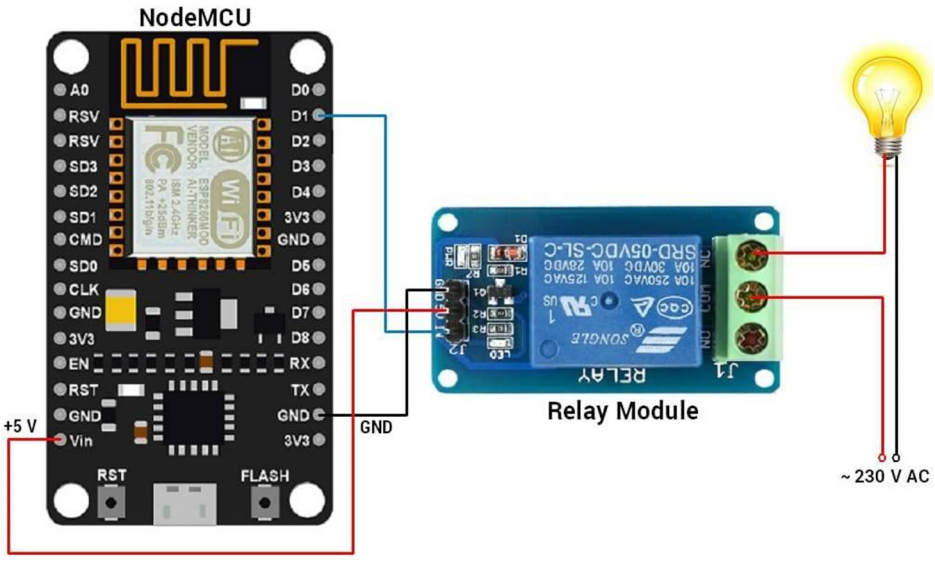

Figure 6: Schematic Representation

This is the actual circuit diagram/ schematic diagram of the implemented hardware project. A thorough explanation of the working operation of the project will be presented here in different scenarios.

C. Software Requirements

The required software with its version that has been used either for simulation or implementation of the proposed project will be described here with their features. Examples, like the use of Arduino IE and other similar tools. The system requirements for the software to work will also be listed here.

Blynk application and Arduino IDE Preparation and Running:

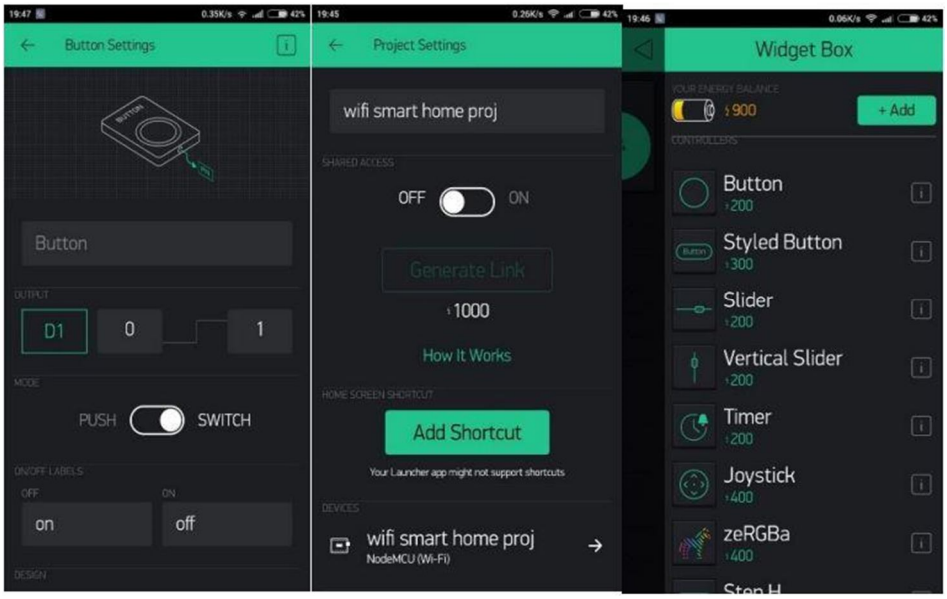

Figure 7: Blynk App

This project is running by the Blynk application. Download the application to a smartphone from the Google play store and then create a project on it with four switches. Set buttons to be switched on D1, D2. Figure 5 shows screenshots from the Blynk application.

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V. IMPLEMENTATION

A. NodeMCU Code via Arduino IDE

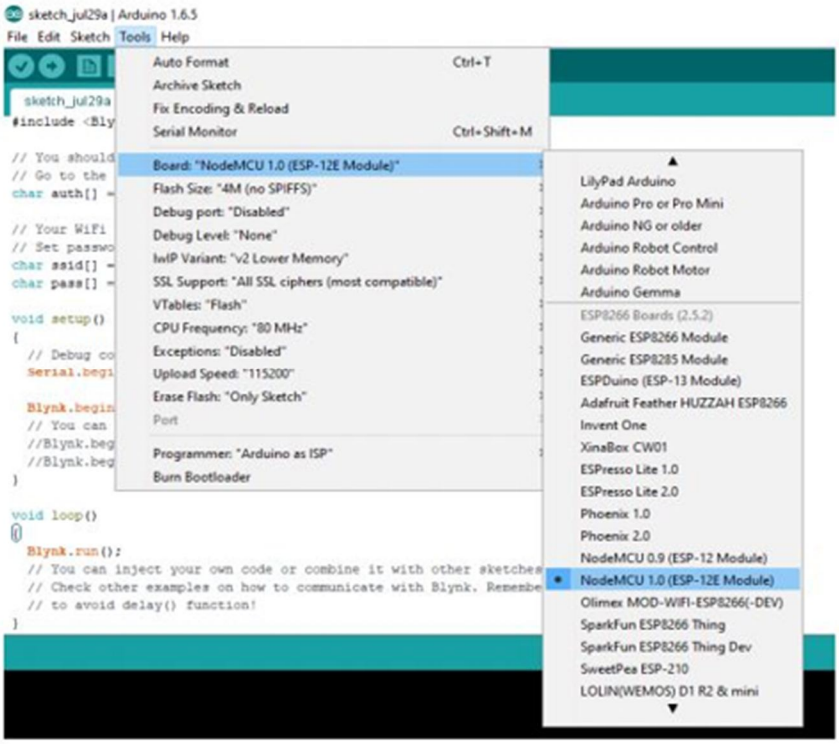

Figure 8: Arduino IDE – Selecting NodeMCU Board

To code NodeMCU via Arduino IDE, the NodeMCU needs to be added to the Arduino IDE library first by adding this address to Arduino IDE preferences. After this reference is added to Arduino IDE, download NodeMCU to boards manager and then select NodeMCU 1.0 (ESP12E Module). After nodeMCU is added to Arduino IDE library, upload this code with changing hotspot name and password also token code.

Figure 9: Arduino IDE - Code

The code includes the hotspot name and password match with the android. The code does not need to identify the relay input, as it is included in [Blynk. run();]. When auth (auth token) is given by Blynk application sent as email and SSID is the name of smartphone hotspot.

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VI. SIMULATION

The purpose of the discussion of the results is to communicate what was learned and how the results lead to the conclusions. The results are discussed in terms of what they show about the results and what they mean in the context of the goal of the report.

A. System Flowchart

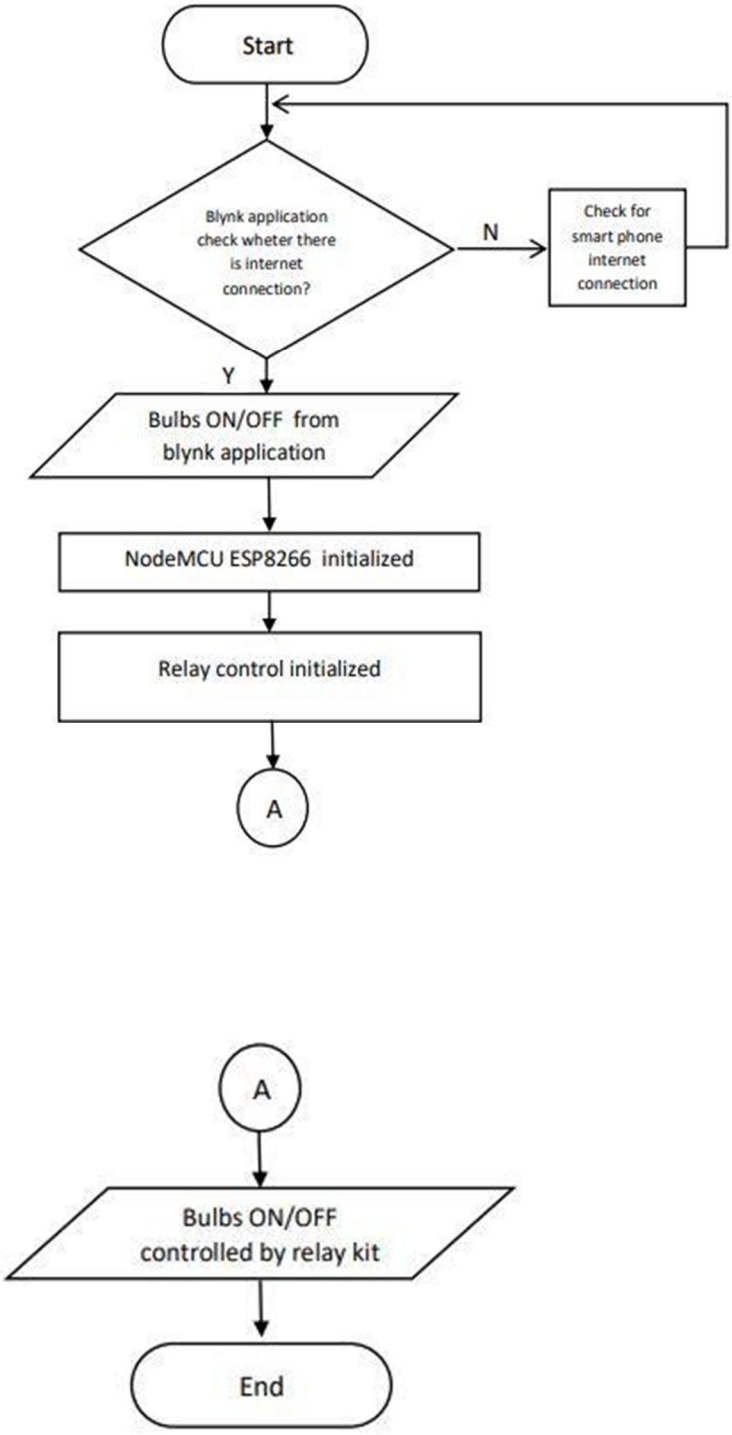

Figure 10: Flowchart

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B. Simulation

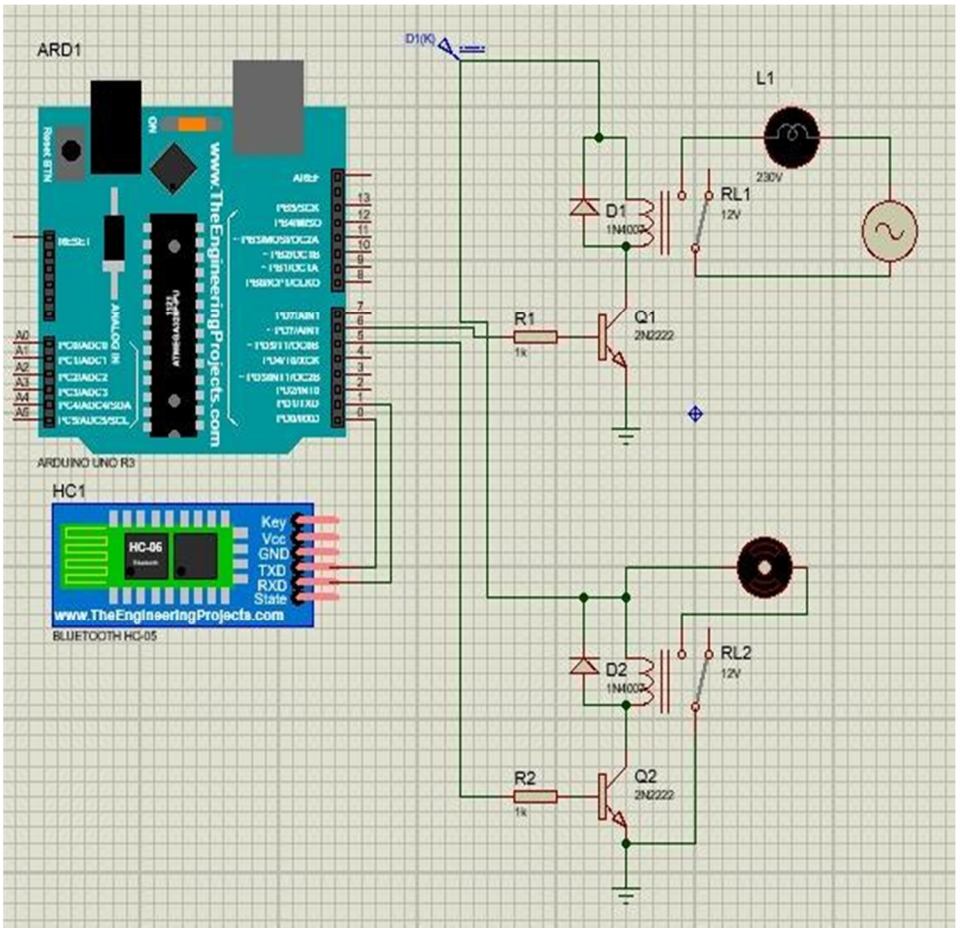

Figure 11: Simulation

VII. IMPLEMENTATION

Figure 12: Home Automation System

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Figure 13: After giving ON command to the LED

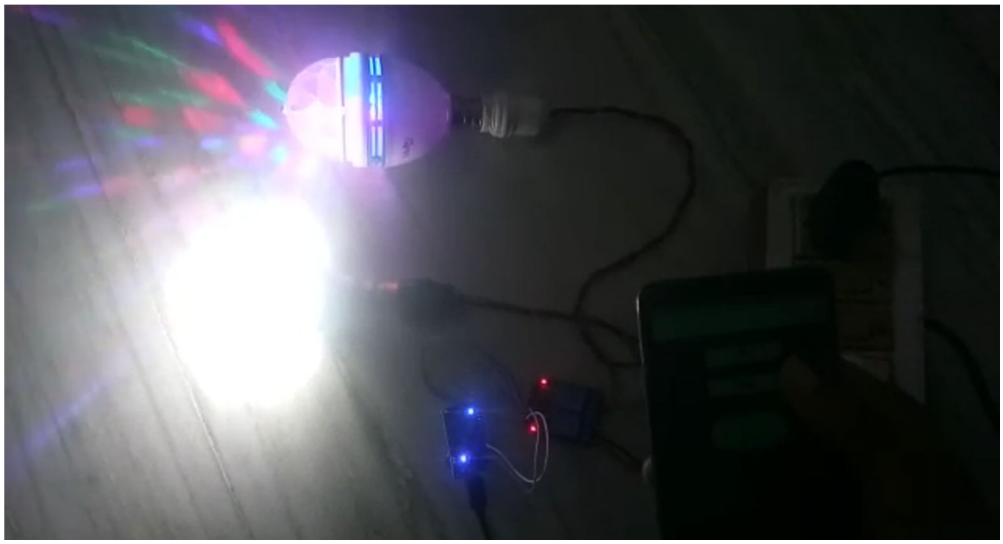

Figure 14: After giving ON command to Disco Lamp

Figure 15: After switching OFF both the bulbs

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VIII. CONCLUSIONS

While wearing down this struggle, we have grabbed a lot of finding out about various modules being used in this task. We are glad we could build this project as a part of this endeavor and set up new deliberation. We believe the responsibility completes as needed and the data grabbed in the nucleus of this period will be used in our prospective corporate life. Furthermore, we might want to include that home computerization would be the fate of places of the new world. Home automation is a resource that can make the home environment labor-saving. People can control their electrical devices via smartphones. These home automation devices are established controlling action through smartphones. In the future, these outcomes may have tremendous marketing potential.

Future Scope for the home automation system involves:

1) Making homes even smarter. Homes can be combined with the sensors including the motion sensors, light sensors, and temperature sensors, and consequently, this may provide the automatic toggling of the devices according to the situations and conditions.

2) More energy can be conserved by guaranteeing the occupation of the house before turning ON devices and checking the brightness and turning OFF the light if not required.

3) The system can be integrated closely with the home security solutions improving the safety of homeowners.

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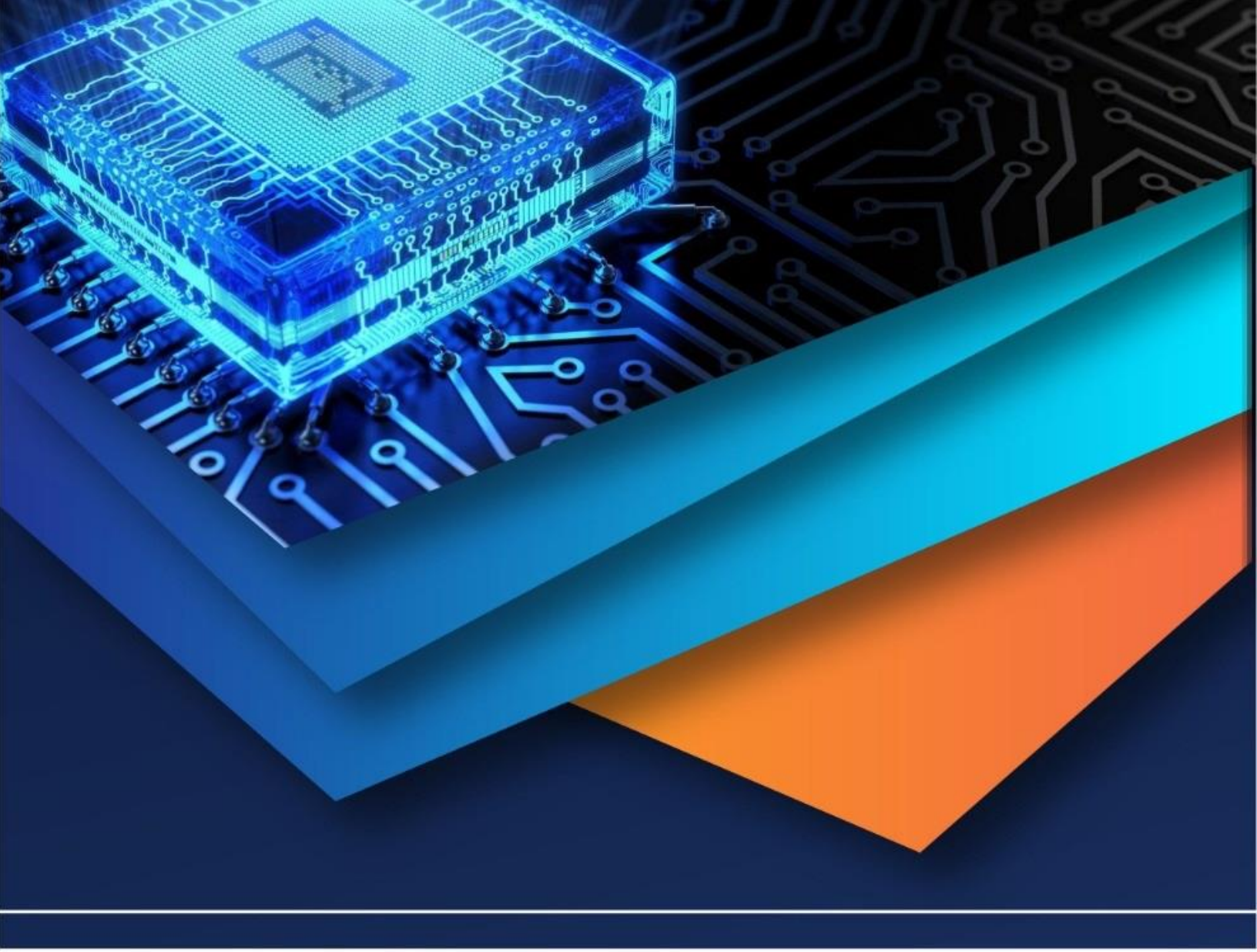

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