Mini-Project

Batch Number

II

SMART HOME AUTOMATION USING IOT (NODE MCU)

Project report submitted in partial fulfilment of the requirement for the award of the degree of B. Tech in Information Technology.

BY

.....

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G. Narayanamma Institute of Technology and Science

(for Women)

Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad

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CERTIFICATE

This is to certify that the project report entitled **SMART HOME AUTOMATION USING IOT (NODE MCU)** is bonafide work done by

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under the guidance of **B.Vijay Kumar** during April 2021 to July 2021, in partial fulfilment for the award of degree in B.Tech in Information Technology, from G. Narayanamma Institute of Technology and Science.

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ABSTRACT

Internet of Things (IoT) conceptualizes the idea of remotely connecting and monitoring real world objects through the Internet. Home monitoring and automation is utilized in order to uphold the comfortable living conditions within a home. This IoT project focuses on building a smart wireless home automation system. A low-cost, flexible and reliable home automation system with additional security using ESP-8266 microcontroller, with IP connectivity through local Wi-Fi for accessing and controlling devices by authorized user remotely using Smart phone. Motion and Light detection sensors add additional features of controlling the devices in an optimum way when the user is away. The proposed system is server independent and uses Internet of Things to control human desired appliances starting from industrial machine to consumer goods. To demonstrate the effectiveness and feasibility of this system, we present a home automation system using Arduino IDE software and ESP-8266 microcontroller as a connectivity module. It helps the user to control various appliances such as light, fan, TV with just a single click from the web browser through their mobile phones. This project provides easy controllability of devices for elderly and physically challenged people as well. It has also been made cost effective enabling its real time implementation.

Table of Contents

List of Figures and Tables

1.INTRODUCTION

The concept of smart homes is getting more attention in the present Indian power system scenario, which possesses the ability to turn ON/OFF the devices remotely. The smart phones add the advantage of making this process simpler and cheaper. The main purpose of doing this is to convert present devices into smart devices by connecting them to internet. There are numerous smart home controllers developed which work on Bluetooth technologies, GSM (mobile) based and Internet based technologies. But they all have their inherent drawbacks in terms of the cost, range of operation and number of devices that they can be connected to. Internet of Things (IOT) is a new Information and Communication Technology (ICT) evolution which connects any number of devices to the internet, and makes it highly scalable. Among the various applications of IOT, a smart home is a very important application. IOT provides the necessary communication infrastructure through which information exchange is done at a faster rate. This kind of system creates a smart environment for controlling devices through IOT. In case the user forgets to turn off his/her devices it can be done remotely from any part of the world, once connected to internet. The system referred to in this paper provides easy controllability of devices for elderly and physically challenged people as well. It has also been made cost effective enabling its real time implementation. The cost of the controller is reduced with the use of node MCU's and less complicated hardware.

1.1 INTERNET of THINGS

Internet of Things, or IoT, refers to the billions of physical devices around the world that are now connected to the internet, all collecting and sharing data. With the help of the wireless networks, it is possible to turn anything, from something as small as a pill to something as big as an aeroplane, into a part of the IoT. Connecting up all these different objects and adding sensors to them adds a level of digital intelligence to devices that would be otherwise dumb, enabling them to communicate real-time data without involving a human being.

Fig-1.1: Internet of Things

A “thing” in the Internet of Things can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an Internet Protocol (IP) address and is able to transfer data over a network. IoT is shaping the way we live our lives. It helps humans to operate and control their devices remotely with the help of internet connectivity at just their fingertips.

Applications of IoT:

- Smart home
- Wearables
- Smart city
- Smart grids
- Industrial internet
- Connected car
- Connected health
- Smart retail
- Smart supply chain
- Smart farming

1.2 Smart Home Automation and IoT

Home automation is the application of computer and information technology that controls home appliances easily. Home Automation system allows the users to manage and handle all the electrical appliances. As the technology is developing, people tend to live a comfortable and flexible life. Now-a-days, due to huge advancement in

wireless sensor networks and other computational technologies, it is possible to provide flexible and low-cost home automation system. This IOT based home automation system helps the people to connect to their appliances at any time just with a single click. This wireless system uses a web browser to control the home appliances and function automatically through internet. The sensors adds additional advantage here even if the user mistakenly turns on the devices the sensors after the specified delay time turns off the devices. It reduces the electricity, man involvement and wastage of resources.

Fig-1.2: Smart Home Automation using IOT

1.3 OBJECTIVE AND SCOPE

Objective: The main objective of the project is to provide a reliable home automation system that helps the people to control and access their appliances with just a single click at their fingertips. People now-a-days are used to live a comfortable life in which they can control all their devices and get their works done then and there through gadgets over the Internet. This project aims to provide great comfort to the users as they can operate all their home appliances remotely with their smart phones, tablets or

laptops by connecting them to the WI-FI. Motion and Light detection sensors add additional features of controlling the devices in an optimum way when the user is away. The proposed system is server independent and uses Internet of Things to control human desired appliances starting from industrial machine to consumer goods.

Scope: The project delivers an effective system that is reliable, portable and extensible. The system allows the users to lead a more comfortable life in their busy schedule.

1.4 ORGANIZATION OF PROJECT REPORT

The chapter one of the project deals with the introduction of IoT and the objective and scope of the project. The second chapter contains literature review of the project that describes the existing systems and their drawbacks. The motivation of the proposed system is clearly described. The third chapter contains the requirement specifications that briefs about the functional and non-functional requirements and also includes the hardware and software requirements. The fourth chapter contains the implementation details with the system architecture, description of modules, and the methodology. The fifth chapter deals with the test cases. The sixth chapter consists of the result analysis, conclusion and future scope. The appendix one contains the source code and appendix two contains the references.

2. LITERATURE SURVEY

2.1 EXISTING SYSTEMS

There are systems similar to the proposed system in existence which have sensors for the feasible operating of the appliances. These systems work with human sensors as well as the voice recognitions. Their working with the human sensors is just limited to a particular area which cannot be operated outside the site. In this competitive world and busy schedule, human cannot spare time to perform their daily activities manually. As these systems require the presence of human to control the appliances it may lead to the wastage of power and electricity in the absence of people. Sometimes it is way risky when we forget to turn off the devices and it is not that simple to stop our work and rush to the site to turn them off. It is time consuming as well.

There are few technologies that are used for the home automation such as Bluetooth Technology which may fail as we cannot access the system outside the Bluetooth range, there are some other systems that work with the help of voice recognition, that may not work if the system fails to recognize the voice. Some systems use internet connectivity to send alert messages and alarms to the users if they find any issue.

During our literature survey we have come across various home automation technologies where different authors have mentioned different technologies that they have used for their project implementation.

- Ali Ziya Alkar in 2005 introduced a model on secure wireless home automation which was made using the unified modelling language. They have provided security with authorization whereas unauthorized people cannot have the access to the system.
- Amrutha S in 2015 presented a system which is based on voice recognition. In this the system must be trained beforehand with the commands. But if recognizing the voice fails, the user cannot access the system.
- K Vidyasagar in 2015 focused on the automation of home appliances using Bluetooth. In this the commands are sent through Bluetooth and the monitoring of the device status is done using IEEE 802.15.4 wireless device which is interfaced to the internet.

- R Piyare in 2011 used the Bluetooth technology for smart automation using a cell phone. But sending commands from software is not feasible and Bluetooth has a short range where if a user is not in the range of the system he cannot access and control the devices using the technology.
- Shiv Kumar in 2014 proposed a prototype which is android based and uses internet connectivity as well as Bluetooth technologies. It has an android application where we can select the technology by which we can access the system. But for the internet connectivity the user has to enter the IP address as well as the password and even for the Bluetooth we need to have the password. This is a bit long process as people now a days wants everything to happen at just a blink of an eye.
- Vinay sagar in 2015 presented an automation system using Intel Galileo. In this they have used the Wi-Fi technology which connects the web server with the sensors. Alarms will be raised when the sensor parameters are beyond the threshold parameters.
- IoT based Smart Home Automation System in 2018 using Sensor Node they used only sensors They achieved the development of Smart Home by using the Internet of Things technologies. From the experiment, it was found that we can manage to make low cost, flexible and energy efficient smart homes.

There are many applications of the existing systems, but some of their disadvantages make them difficult to handle.

2.2 DRAWBACKS IN EXISTING SYSTEMS

- High development cost
- High installation cost
- User unfamiliarity with technology
- Complex user interface

2.3 MOTIVATION FOR PROPOSED SYSTEM

The existing systems are not user friendly and have a complex user interface with technologies that are unfamiliar to the users. To overcome the drawbacks of the existing systems, the proposed system has come up with new features and advancements.

The main focus of the proposed system is phone which helps the users to control the appliances from their mobile phones with just a single click which provides the user with great comfort. This is one of the optimal ways of controlling and handling the

devices. This automation system uses Arduino IDE and Node MCU microcontroller and works with Wi-Fi technology.

It has both hardware and software components. The hardware components contribute to the handling and controlling of the home appliances through internet and the Node MCU microcontroller helps to develop an interface between the hardware and software components.

It is server independent and is better from the scalability and flexibility point of view than the commercially available home automation systems.

3. REQUIREMENT SPECIFICATION

3.1 FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENTS

3.1.1 Functional Requirements

The only module of the project is Node MCU. The requirements of the module are:

- The system must be able to connect the home appliances with the devices through which we operate them.
- The system must enable through sensors.
- The system must enable Wi-Fi.

3.1.2 Non-Functional Requirements

3.1.2.1 User Friendliness

- The system must be easy to understand.
- The system must be easy to operate and handle.
- The system must have a consistent and descriptive UI.

3.1.2.2 Accessibility

- The system must be easy to access.
- The system must be highly accessible such that all the users should have access to all the content and functionality.

3.1.2.3 Privacy and Security

- The system shall protect the user's privacy.
- The system must be highly secure.

3.1.2.4 Scalability

- The system must be able to be used by different kinds of people due to its easy implementation.
- The system must be able to be used anywhere irrespective of the place and time.

3.1.2.5 Maintainability

- The system must be easy to be maintained by the users.

- The system must be portable to be maintained easily. 3.2 HARDWARE AND SOFTWARE REQUIREMENTS

3.2 Hardware Requirements

The hardware components required for the project are:

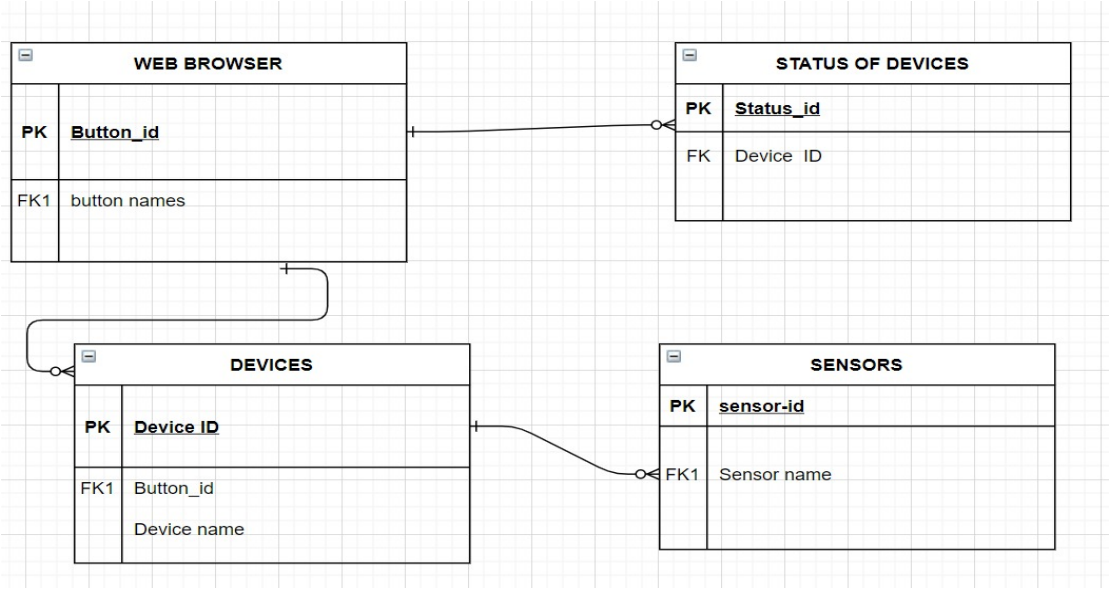
- Node MCU
- PIR sensor
- LDR Sensor
- Bread board
- LED
- Fan
- Resistor
- Relay
- USB
- Connecting wires

3.3 Software Requirements

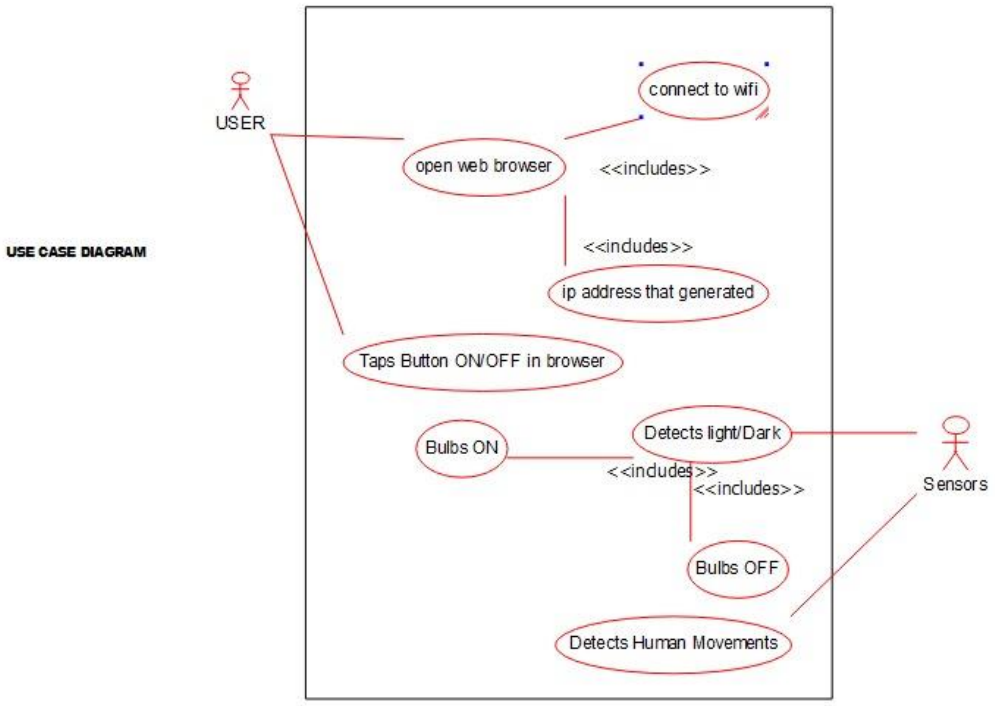
- Arduino IDE – C language
- Web browser

3.4 UML Diagrams

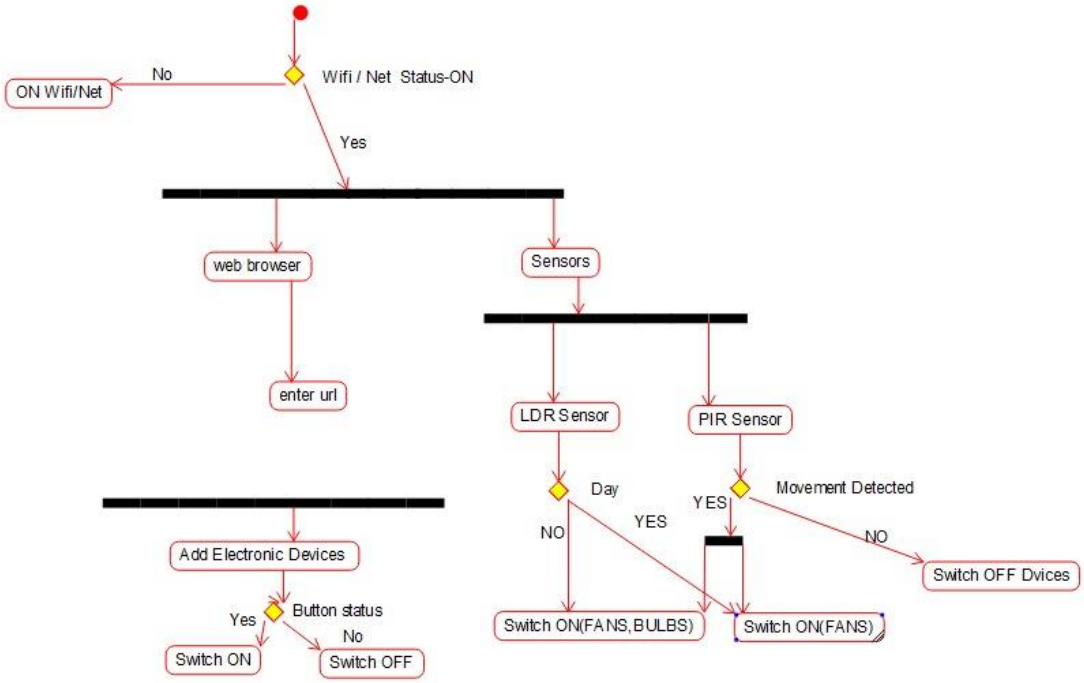
3.4.1 ER Diagram



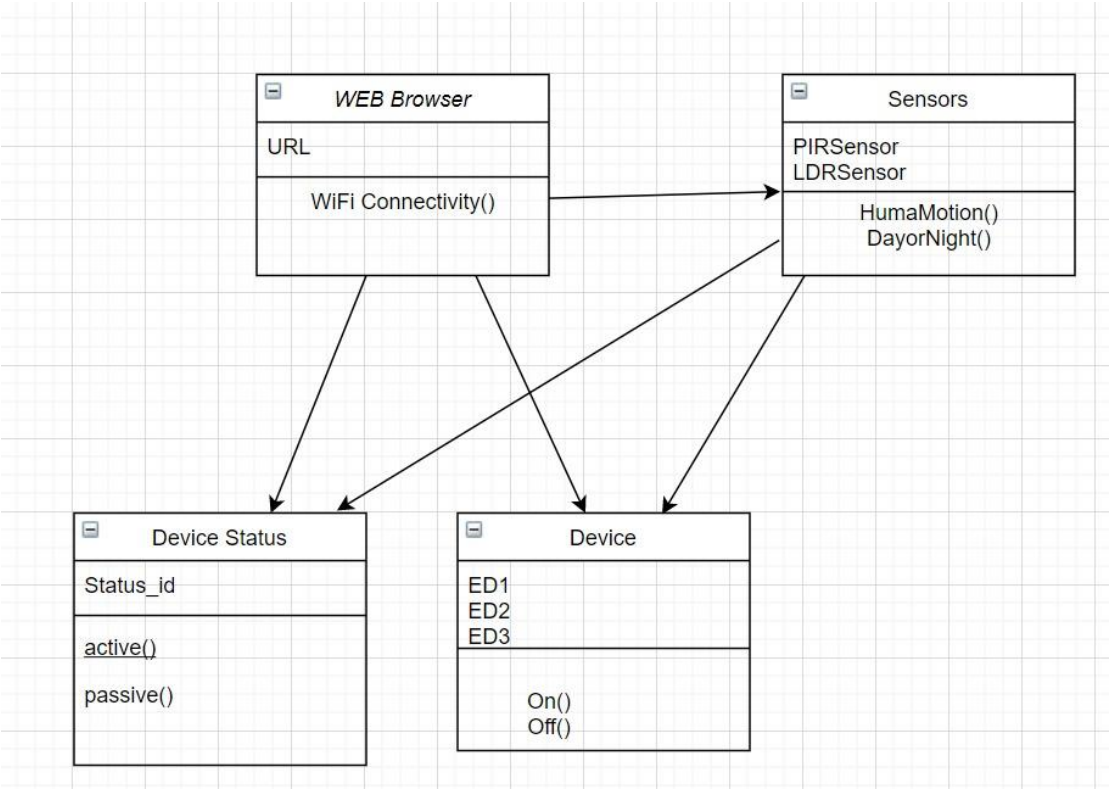
3.4.2 Use Case Diagram



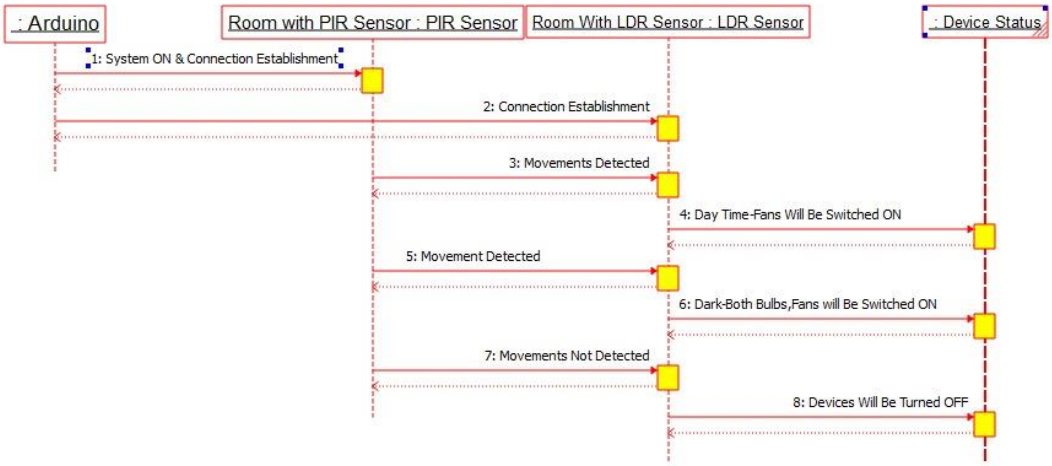
3.4.3 Activity Diagram



3.4.4 Class Diagram



3.4.5 Sequence Diagram



4. IMPLEMENTATION

4.1 METHODOLOGY

The ESP8266 microcontroller is connected to the laptop through the USB cable for loading the code onto the module. The Bulb & Fan through which we get the output is connected to the Relay module. Since it is Wi-Fi enabled, ESP8266 and Arduino IDE must be compatible with each other. After all the connections are done, the ESP8266 is powered up with 5V power supply.

The code that is written in Arduino IDE is loaded onto the module, ensuring that the module and the mobile through which we operate the devices are connected to the same Wi-Fi network. Since ESP8266 has built-in Wi-Fi port, there is no need of an external Wi-Fi module.

Once after compiling the code, the device through which we operate is connected to the Wi-Fi network and the IP address of the particular network is displayed on the Serial Monitor in Arduino IDE. This IP address is given as a URL to the web browser from which we give the input. The browser contains a toggle button which when turned on, the commands are transmitted to the module and the readings of the GPIOs are directly taken by the touch function of the module. When the readings are set, it enables the Bulb & Fan to turn ON.

The status of the Bulb & Fan is shown in the Serial Monitor and in the web browser it is shown as the “Light is : on” & ”Fan is: on” and the output is seen at the Bulb &

Fan. The user can turn off the Bulb & Fan by directly operating it from the web browser by switching the toggle button OFF.

The sensors PIR & LDR will consider the human movement & brightness respectively. Based on the value obtained they automatically change the status of the devices. Here LDR value greater than or equals to 300 will indicate day time otherwise night time. PIR sensor also consider value to 1 if motion detected or else 0. The delay considered here is 10000ms.If the user turns on the devices even it is not necessary based upon the values consideration the sensors will turn off the devices.

4.2 SYSTEM ARCHITECTURE

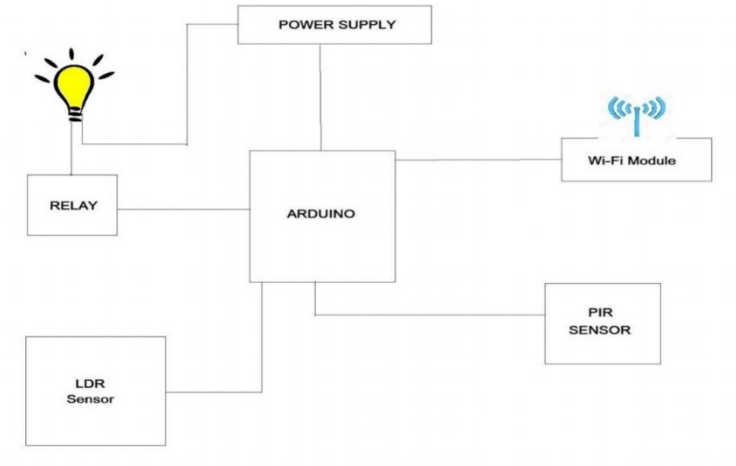


Fig-4.1: Proposed Architecture

4.3 MODULE DESCRIPTION

4.3.1 Node MCU

Node MCU is an open-source firmware for which open source prototyping board designs are available. The name "Node MCU" combines "node" and "MCU" (micro-controller unit). The term "Node MCU" strictly speaking refers to the firmware rather than the associated development kits. Both the firmware and prototyping board designs are open source. The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications.

As Arduino.cc began developing new MCU boards based on non-AVR processors like the ARM/SAM MCU and used in the Arduino Due, they needed to modify the Arduino IDE so that it would be relatively easy to change the IDE to support alternate toolchains to allow Arduino C/C++ to be compiled for these new processors. They did this with the introduction of the Board Manager and the SAM Core. A "core" is the collection of software components required by the Board Manager and the Arduino IDE to compile an Arduino C/C++ source file for the target MCU's machine language. Some ESP8266 enthusiasts developed an Arduino core for the ESP8266 WiFi SoC, popularly called the "ESP8266 Core for the Arduino IDE". This has become a leading software development platform for the various ESP8266-based modules and development boards, including Node MCUs.

Fig-4.2: Node MCU

Technical Specifications:

- Microcontroller: Tensilica 32-bit RISC CPU Xtensa LX106
- Operating Voltage: 3.3V
- Input Voltage: 7-12V
- Digital I/O Pins (DIO): 16
- Analog Input Pins (ADC): 1

- UARTs: 1
- SPIs: 1
- I2Cs: 1
- Flash Memory: 4 MB
- SRAM: 64 KB
- Clock Speed: 80 MHz
- USB-TTL based on CP2102 is included onboard, Enabling Plug n Play
- PCB Antenna
- Small Sized module to fit smartly inside your IoT projects

Pin Description:

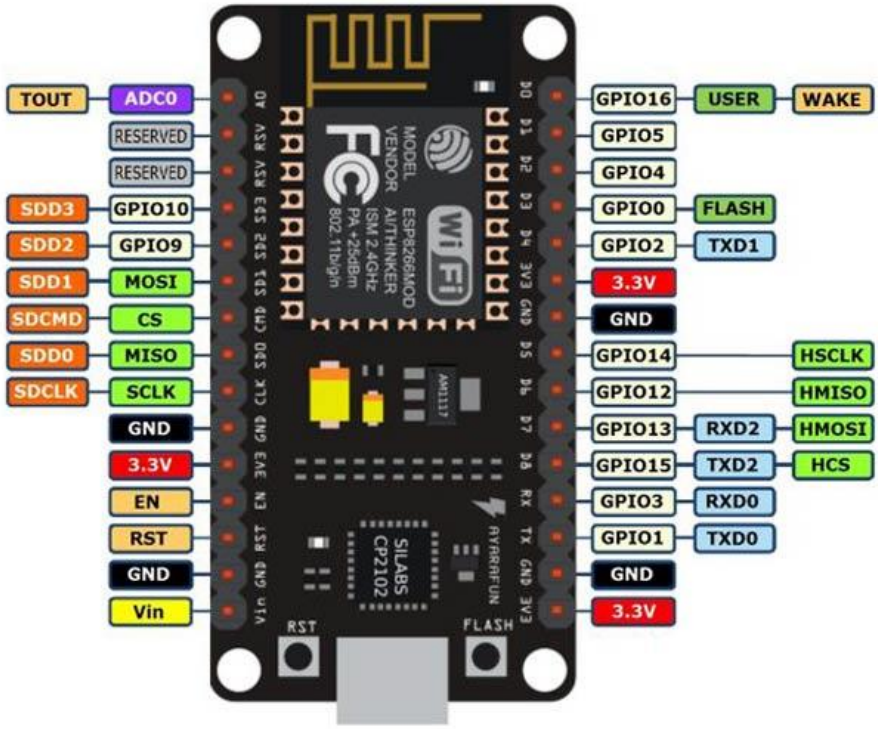


Fig-4.3: Node MCU Pin Description

The **Node MCU ESP8266 development board** comes with the ESP-12E module containing ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHz to 160 MHz adjustable clock frequency. Node MCU has 128 KB RAM and 4MB of Flash memory to store data and programs. Its high processing power with in-built Wi-Fi / Bluetooth and Deep Sleep Operating features make it ideal for IoT projects.

General pin functions used in the project:

- **GND:** Ground pin.

- **GPIO 4:** This pin is connected to the Bulb (Node MCU).
- **GPIO 5:** This pin is connected to the Fan (Node MCU).
- **PIN 7:** This pin is connected to the Bulb (Arduino).
- **PIN 5:** This pin is connected to the Fan (Arduino).
- **PIN A0:** This pin is connected to the PIR(Arduino).
- **PIN 6**: This pin is connected to the LDR(Arduino).
- **GPIO 21:** This is a General-Purpose Input Output pin used to give input and get output from the same pin.
- **En,RST**: The pin and the button resets the microcontroller

Pin Category	**Name**	**Description**
Power	Micro-USB, 3.3V, GND, Vin	**Micro-USB:** Node MCU can be powered through the USB port **3.3V:** Regulated 3.3V can be supplied to this pin to power the board **GND:** Ground pins **Vin:** External Power Supply
Control Pins	**EN, RST**	The pin and the button resets the microcontroller
Analog Pin	A0	Used to measure analog voltage in the range of 0-3.3V
GPIO Pins	GPIO1 to GPIO16	NodeMCU has 16 general purpose input-output pins on its board
SPI Pins	SD1, CMD, SD0, CLK	NodeMCU has four pins available for SPI communication.
UART Pins	TXD0, RXD0, TXD2, RXD2	NodeMCU has two UART interfaces, UART0 (RXD0 & TXD0) and UART1 (RXD1 & TXD1). UART1 is used to upload the firmware/program.

I2C Pins		NodeMCU has I2C functionality support but due to the internal functionality of these pins, you have to find which pin is I2C.

4.3.2 PIR Sensor

A **passive infrared sensor** (**PIR sensor**) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in PIR-based motion detectors. All objects with a temperature above absolute zero emit heat energy in the form of electromagnetic radiation. Usually this radiation isn't visible to the human eye because it radiates at infrared wavelengths, but it can be detected by electronic devices designed for such a purpose.

A PIR sensor can detect changes in the amount of infrared radiation impinging upon it, which varies depending on the temperature and surface characteristics of the objects in front of the sensor. When an object, such as a person, passes in front of the background, such as a wall, the temperature at that point in the sensor's field of view will rise from room temperature to body temperature, and then back again. The sensor converts the resulting change in the incoming infrared radiation into a change in the output voltage, and this triggers the detection. Objects of similar temperature but different surface characteristics may also have a different infrared emission pattern, and thus moving them with respect to the background may trigger the detector as well.

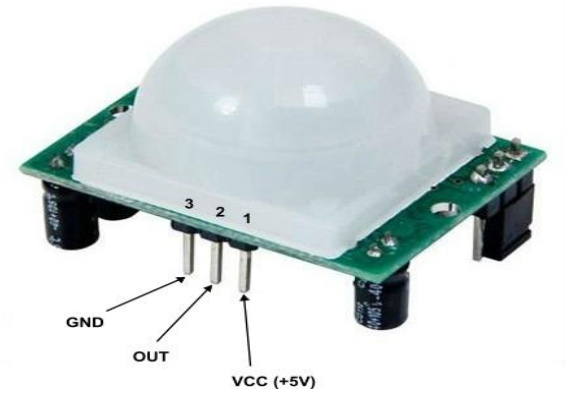


Fig-4.4: PIR sensor

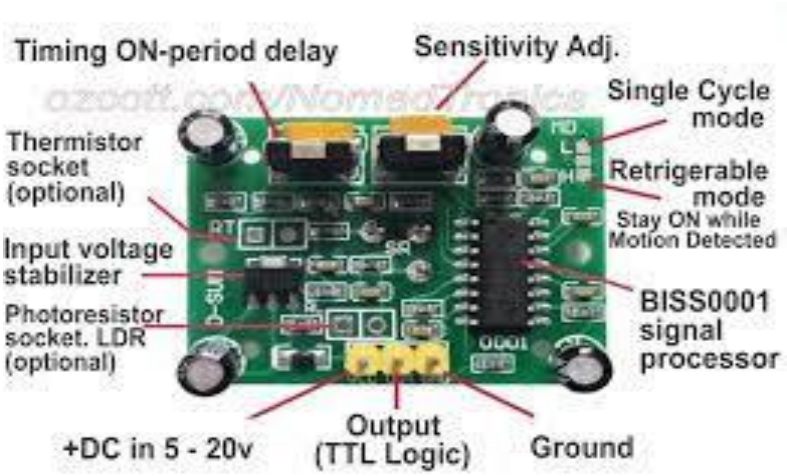


Fig-4.5: PIR sensor Pin Description

4.3.3 LDR Sensor

LDR-Light Dependent Resistors. A Light Dependent Resistor (LDR) is also called a **photoresistor** or a cadmium sulfide (CdS) cell. It is also called a photoconductor. This optoelectronic device is mostly used in light varying sensor circuit, and light and dark activated switching circuits.

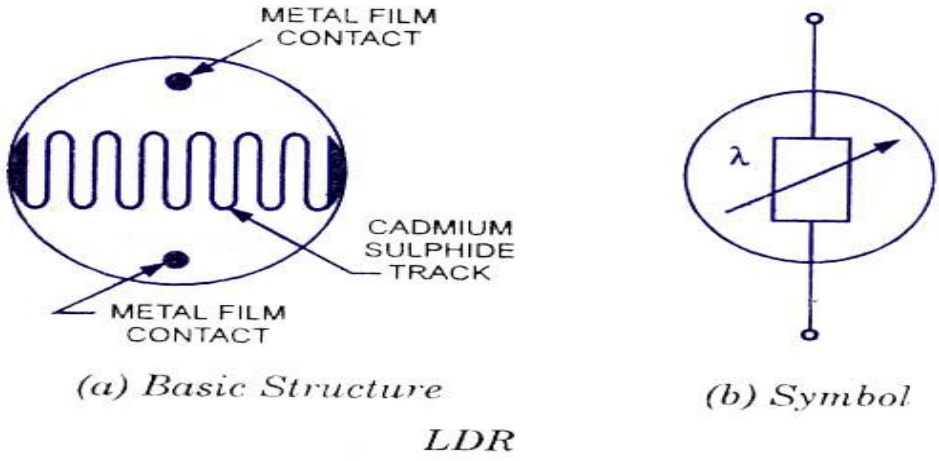


Fig-4.6: LDR sensor structure

An LDR is a component that has a (variable) resistance that changes with the light intensity that falls upon it. This allows them to be used in light sensing circuits. Light Dependent Resistors (LDR) are also called photoresistors. They are made of high resistance semiconductor material. When light hits the device, the photons give electrons energy. This makes them jump into the conductive band and thereby conduct electricity. Light dependent resistors, LDRs or photoresistors are often used in circuits where it is necessary to detect the presence or the level of light. They can be described by a variety of names from light dependent resistor, LDR, photoresistor, or even photocell, photocell or photoconductor. A Light Sensor is something that a robot can use to detect the current ambient light level - i.e. how bright/dark it is. There are a range of different types of light sensors, including Photoresistors, Photodiodes and Phototransistors. A photoresistor (or light-dependent resistor, LDR, or photo-conductive cell) is a light-controlled variable resistor. The resistance of a photoresistor decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. A photoresistor is made of a high resistance semiconductor. However, when light shines onto the LDR its resistance falls and current flows into the base of the first transistor and then the second transistor. The LED lights. The preset resistor can be turned up or down to increase or decrease resistance, in this way it can make the circuit more or less sensitive.

Fig-4.7: LDR sensor

5. RESULTS AND CONCLUSION

5.1 RESULT ANALYSIS

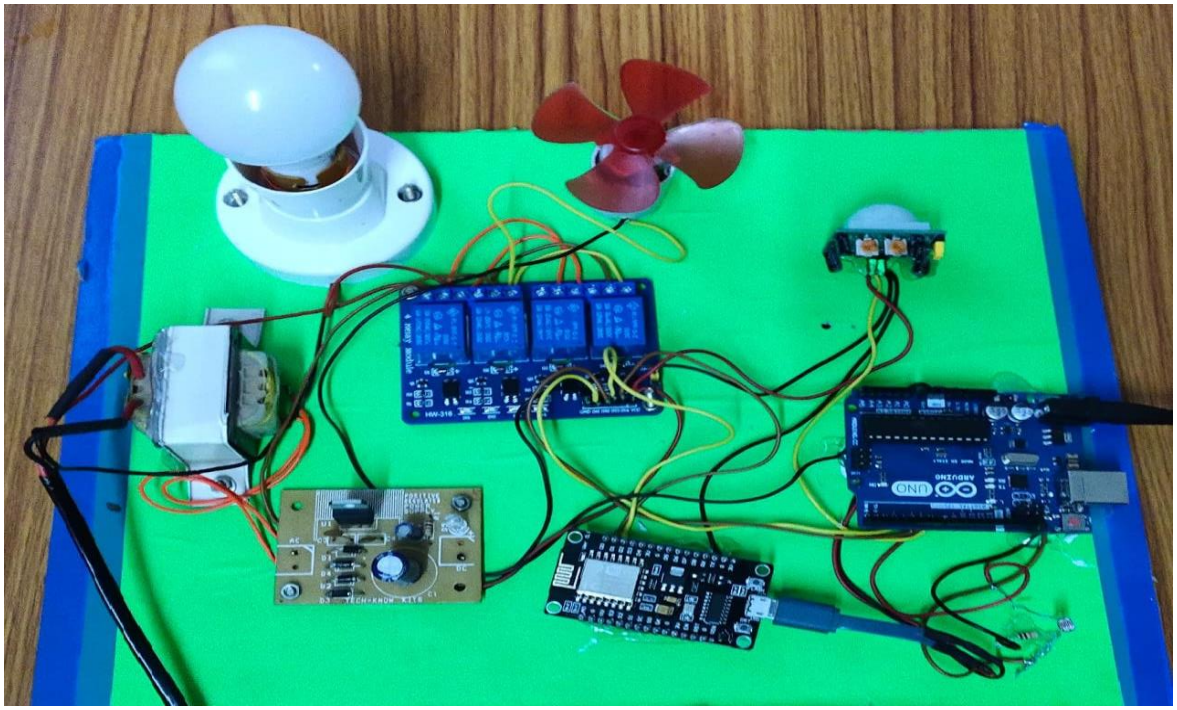


Fig-5.1: Setup of the components

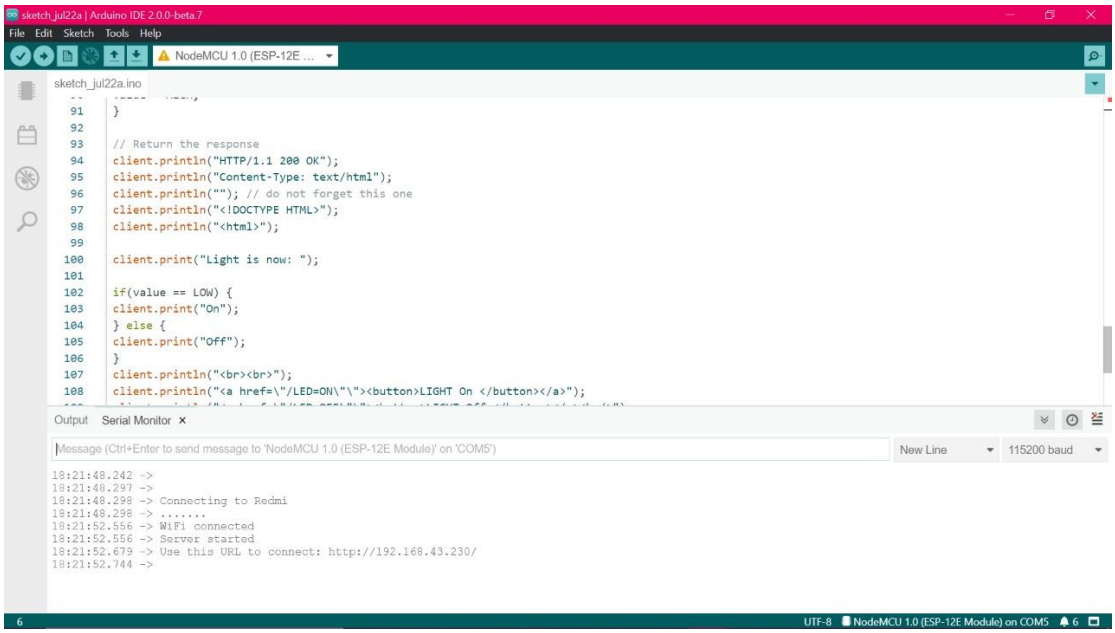


Fig-5.2: Connecting through specified WIFI

Fig-5.3: Web Buttons

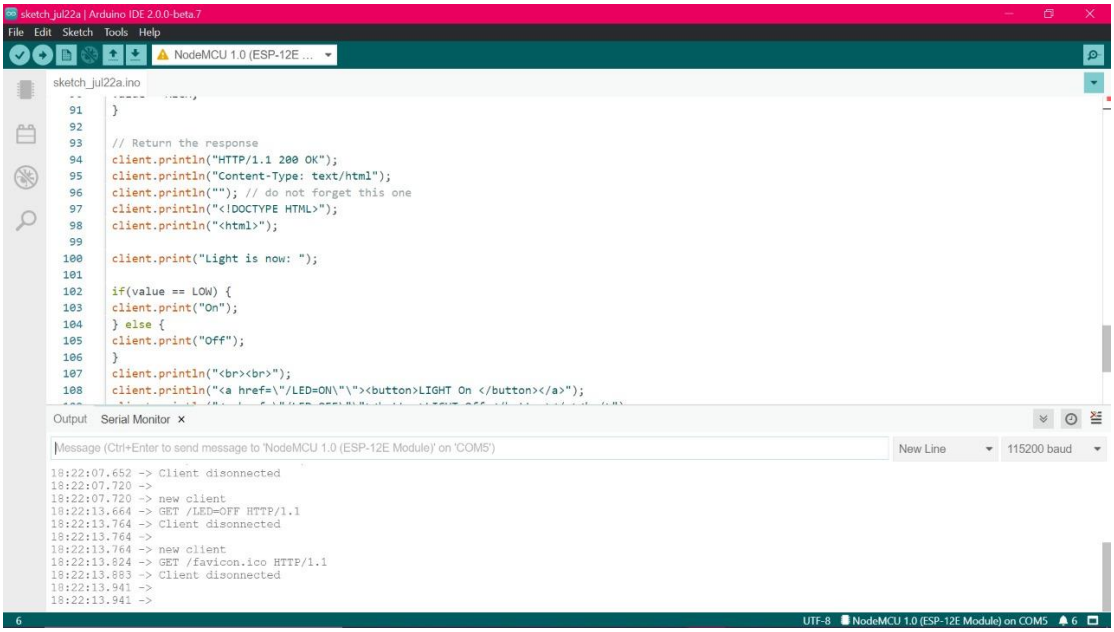


Fig-5.4: Indicates that on-board Bulb is off

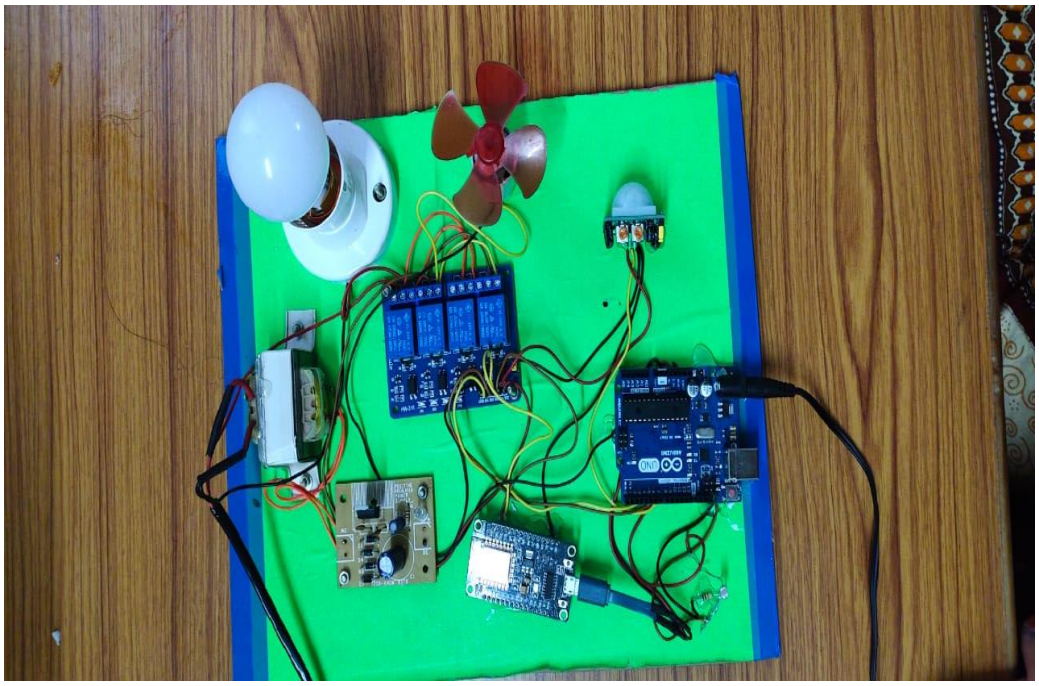


Fig-5.5: Bulb is off

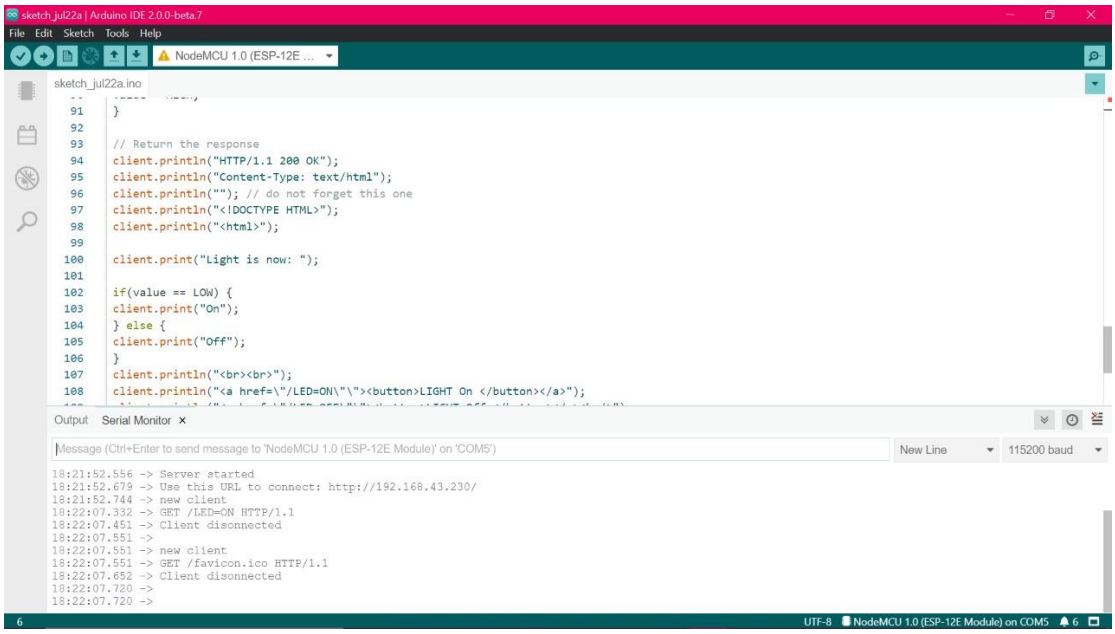


Fig-5.6: Indicates that on-board Bulb is on

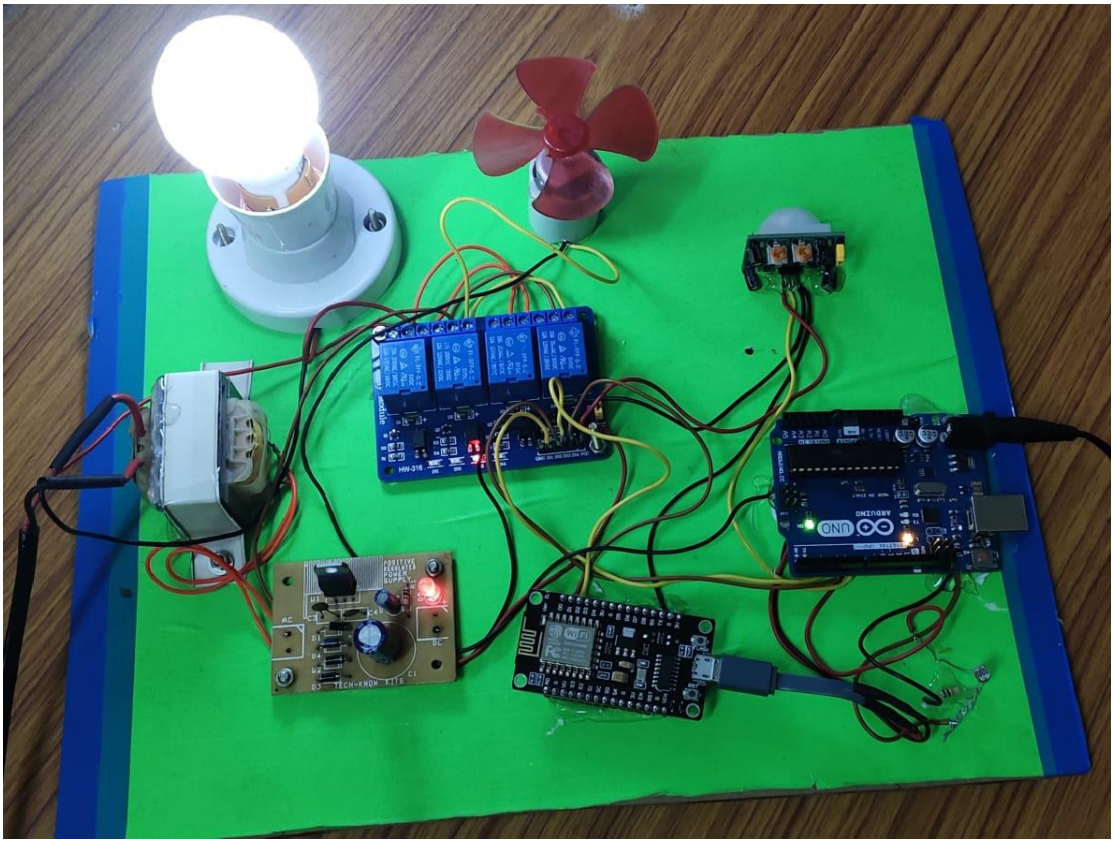


Fig-5.7: Indicates the Bulb is on

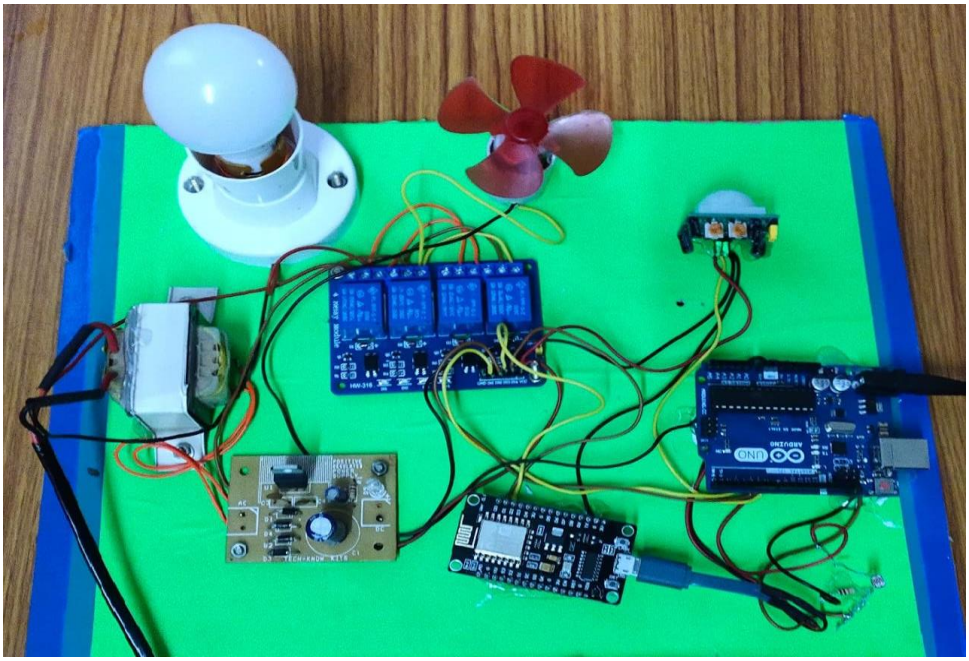


Fig-5.8: Indicates the Fan is off

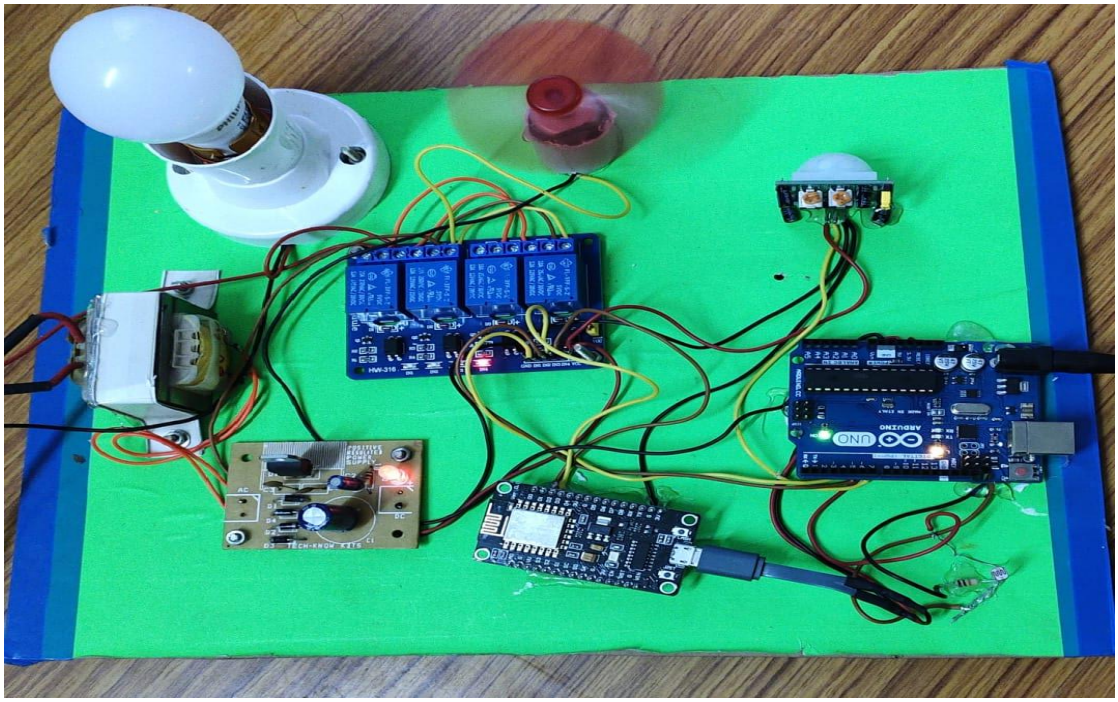


Fig-5.9: Fan is on

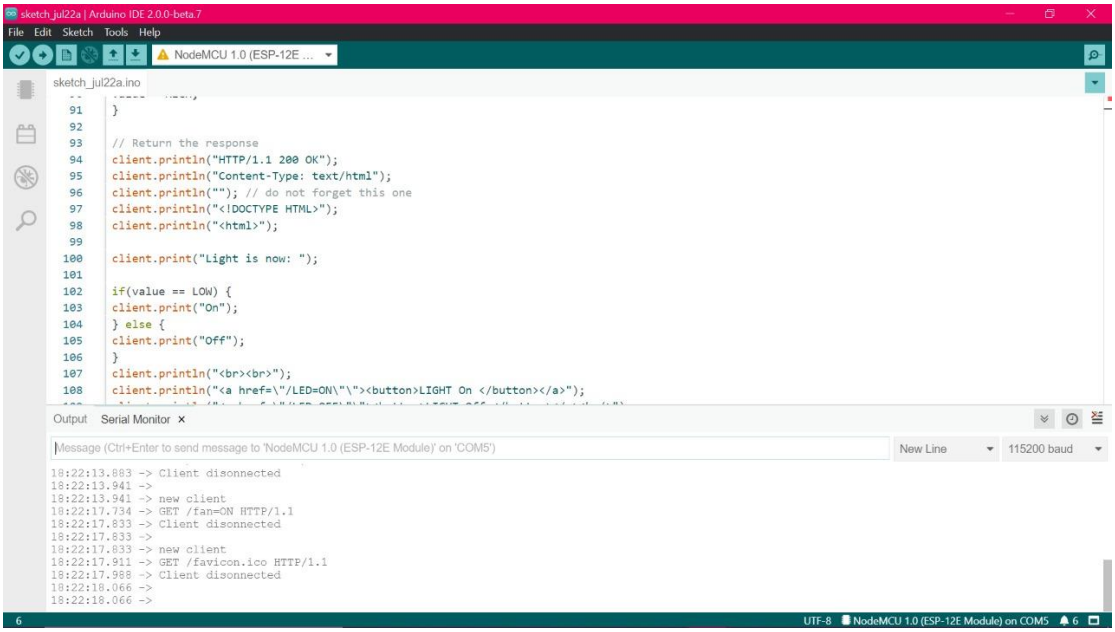


Fig-5.10: Indicates that on-board Fan is on

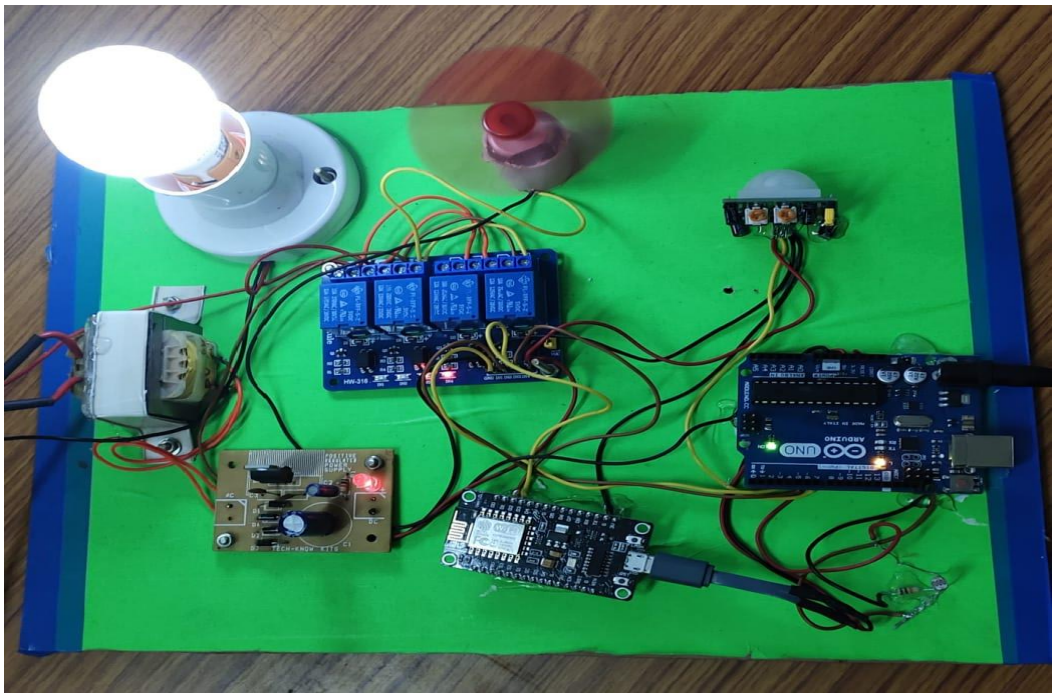


Fig-5.11: Indicates that on-board Fan is on and Bulb is on

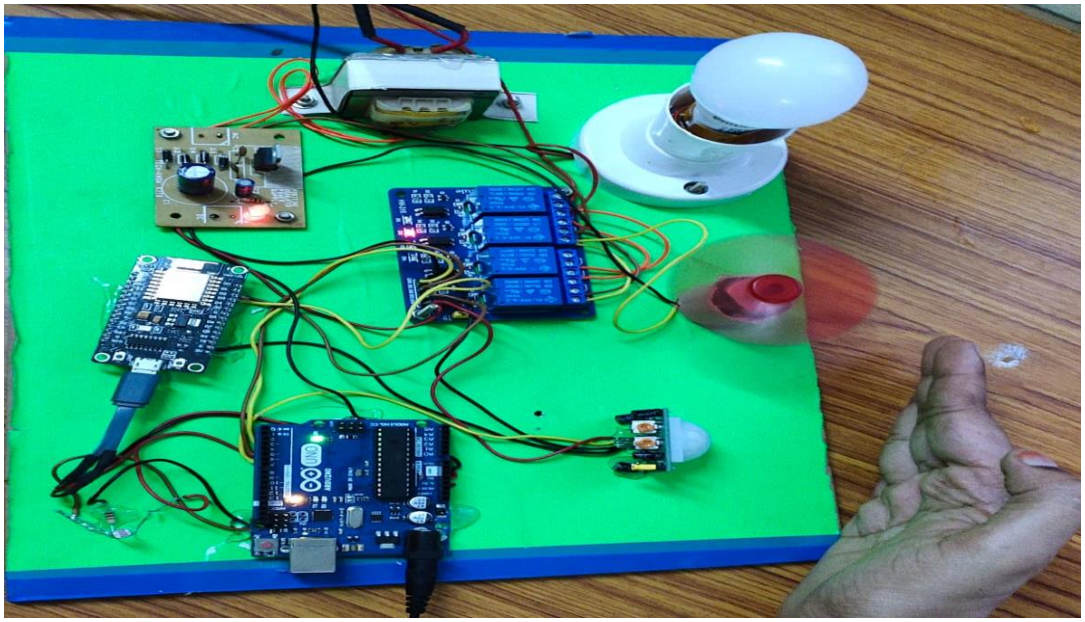


Fig-5.12: Day Time with Sensors

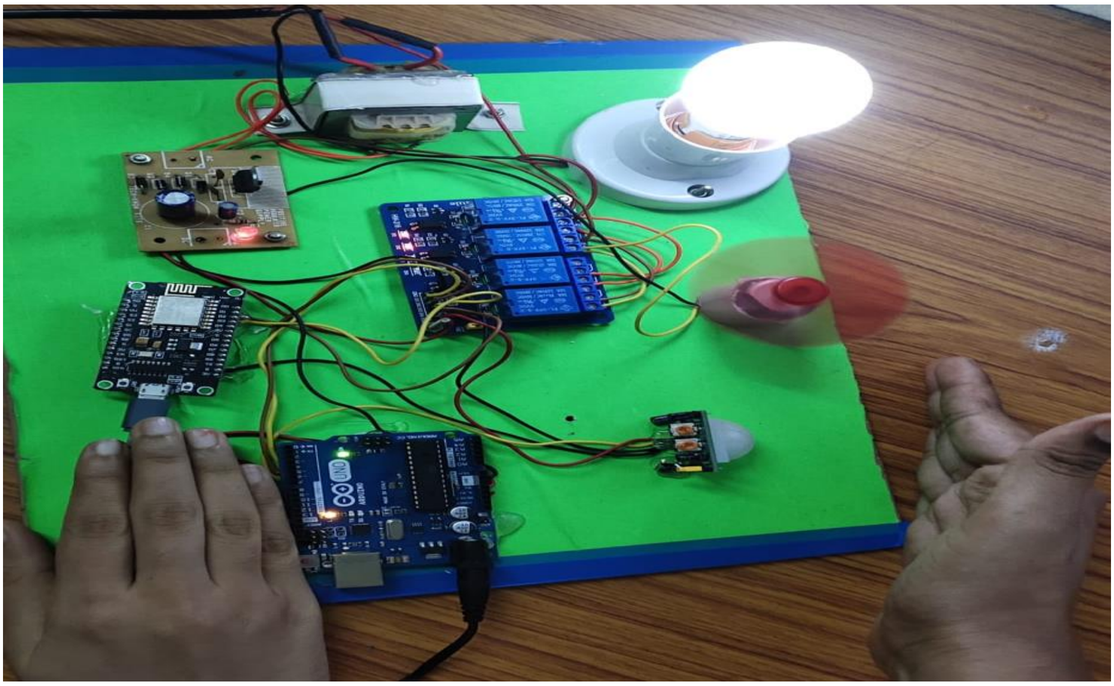


Fig-5.13: Night Time with Sensors

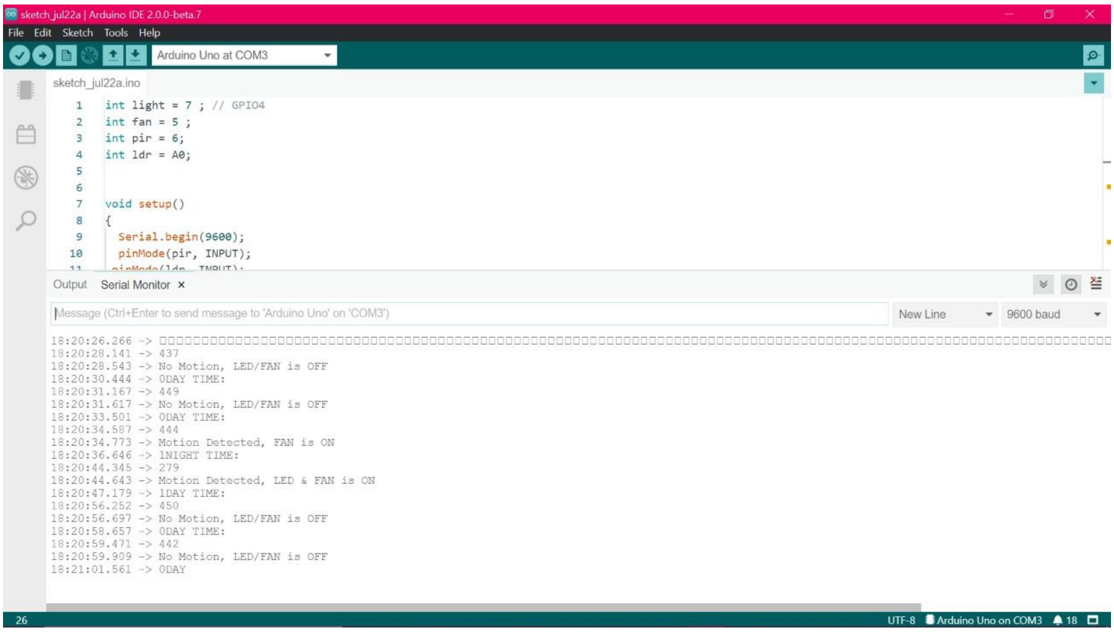


Fig-5.14: With Sensors

5.2 PERFORMANCE ANALYSIS

Parameters\Papers	Our Project	Ali Ziya	Vinay Sagar
Technology/Microcontroller used	Wi-Fi, ESP8266	Wi-Fi/PIC16F877A	Intel Galileo
Cost effective	Yes	Yes	Yes
Flexible	Yes	Yes	Yes
Energy usage	5µA	10mA	15 W
User-friendly	Yes	Yes	Yes
Light and motion sensors	Yes	No	No

Table-1: Comparison of different technologies used for home automation

We have compared the system with other prototypes on which they have done the survey. We considered few parameters for the comparison. Every project has different technologies used. Though they have variant applications and features, some barriers like the range or the internet connectivity shows some disadvantages of them. The touch feature of this system makes it unique from all the existing systems.

5.3 CONCLUSION AND FUTURE SCOPE

This project presents a cost effective and secure prototype of Smart Home Controller which can control the web-interactive Home appliances through the web browser and also automatically using sensors. As an extension, the web server can be replaced by dedicated local server wherein features like monitoring of loads and automatic controlling of loads may be realized along with the controlling. It is simple and can be accessed easily by the novice users. Due to its performance, simplicity, low cost and reliability smart home automation system is making its position in global market.

The system now works with Wi-Fi technology. ESP-8266 not only contains built-in Wi-Fi port, but also works other sensors as well. The system can be further extended by adding hall sensors and temperature sensors. It can be used in homes, offices and industries. This makes it more feasible and can have many more applications than before.

APPENDIX

I.CODE

FOR NODE MCU:

```
#include <ESP8266WiFi.h>

const char* ssid = "WiFi name";
const char* password = "WiFi Password";

int light =4 ; // GPIO4
int fan =5 ;
int pir = 12;
int ldr = A0;

int weblight = 0;
int webfan = 0;
WiFiServer server(80);

void setup() {
 Serial.begin(115200);
 delay(2000);
 pinMode(pir, INPUT);
 pinMode(ldr, INPUT);
 pinMode(light, OUTPUT);
  pinMode(light, HIGH);
  pinMode(fan, OUTPUT);
  pinMode(fan, HIGH);

 // Connect to WiFi network
 Serial.println();
 Serial.println();
 Serial.print("Connecting to ");
 Serial.println(ssid);

 WiFi.begin(ssid, password);

 while (WiFi.status() != WL_CONNECTED) {
 delay(500);
 Serial.print(".");
 }
 Serial.println("");
 Serial.println("WiFi connected");
 // Start the server
 server.begin();
 Serial.println("Server started");
 // Print the IP address
 Serial.print("Use this URL to connect: ");
 Serial.print("http://");
 Serial.print(WiFi.localIP());
 Serial.println("/");
```

```
}

void loop() {
 // Check if a client has connected



 WiFiClient client = server.available();
 if (!client) {
 return;
 }
 // Wait until the client sends some data
 Serial.println("new client");
 while(!client.available()){
 delay(1);
 }
 // Read the first line of the request
 String request = client.readStringUntil('\r');
 Serial.println(request);
 client.flush();
 // Match the request
 int value = LOW;
 if (request.indexOf("/LED=ON") != -1) {
  weblight = 1;
 digitalWrite(light, LOW);
 value = LOW;
 }
 if (request.indexOf("/LED=OFF") != -1) {
 digitalWrite(light, HIGH);
 weblight = 0;
 value = HIGH;
 }
  if (request.indexOf("/fan=ON") != -1) {
 digitalWrite(fan, LOW);
 webfan = 1;
 value = LOW;
 }
 if (request.indexOf("/fan=OFF") != -1) {
 digitalWrite(fan, HIGH);
 webfan = 0;
 value = HIGH;
 }

 // Return the response
 client.println("HTTP/1.1 200 OK");
 client.println("Content-Type: text/html");
 client.println(""); // do not forget this one
 client.println("<!DOCTYPE HTML>");
 client.println("<html>");
```

```
 client.print("Light is now: ");

 if(value == LOW) {
 client.print("On");
 } else {
 client.print("Off");
 }
 client.println("<br><br>");
 client.println("<a href=\"/LED=ON\"\"><button>LIGHT On </button></a>");
 client.println("<a href=\"/LED=OFF\"\"><button>LIGHT Off </button></a><br/>");
 client.println("<a href=\"/fan=ON\"\"><button>FAN On </button></a>");
 client.println("<a href=\"/fan=OFF\"\"><button>FAN Off </button></a><br/>");
 client.println("</html>");

 delay(1);
 Serial.println("Client disonnected");
 Serial.println("");
}
```

FOR AURDINO:

```
int light = 7 ; // GPIO4
int fan = 5 ;
int pir = 6;
int ldr = A0;

int ldrStatus = 0;

void setup()
{
  Serial.begin(9600);
  pinMode(pir, INPUT);
 pinMode(ldr, INPUT);
 pinMode(light, OUTPUT);
  pinMode(light, HIGH);
  pinMode(fan, OUTPUT);
  pinMode(fan, HIGH);
}

void loop(){
int pir1 = digitalRead(pir);

 if(pir1 == 1)
 {
  digitalWrite(light, LOW);
  digitalWrite(fan, LOW);
  delay(10000);
  Serial.print(pir1);
  Serial.println("Motion Detected, LED/FAN is ON");
 }
 else
```

```
{
 digitalWrite(light, HIGH);
 digitalWrite(fan, HIGH);
 Serial.print(pir1);
 Serial.println("No Motion, LED/FAN is OFF");
}



int ldrStatus = analogRead(ldr);
Serial.println(ldrStatus);

if (ldrStatus <= 30) {

 digitalWrite(light, LOW);
 //Serial.print(ldrStatus);
 Serial.println("LDR is DARK, LED is ON");
 delay(2000);
 }
 else
 {
 digitalWrite(light, HIGH);
 Serial.println("LED is OFF");
 }
}
```

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