



# Application Based Home Automation System Using IoT

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## ABSTRACT:

*The home automation market is quickly expanding, driven by the need to provide assistance systems for the elderly and disabled, particularly those who live alone. In addition, the global population is confirmed to be ageing. Home automation systems must meet household requirements and be user-friendly. Home automation is one of the major rising businesses that has the potential to improve people's lives. Some of these home automation systems are aimed at individuals looking for luxurious and sophisticated home automation platforms, while others are aimed at those with specific requirements, such as the elderly and the disabled. A typical wireless home automation system allows one to operate household appliances from a wireless centralized control unit. Most commercially available home automation systems require these items to be properly engineered to be compatible with one another and with the control unit. The developed system can be integrated as a single portable unit and allows one to wirelessly control lights, fans, air conditioners, television sets, security cameras, electronic doors, computer systems, audio/visual equipment, and other appliances that are plugged into a wall outlet, as well as turn on or off any appliance that is plugged into a wall outlet, as well as obtain the status of various sensors and make decisions accordingly. The system is portable and designed to be simple to install, setup, run, and maintain. The perfect user interface does not yet exist, and creating a decent interface necessitates knowledge of both sociology and technology.*

*KEYWORDS: IoT, Home automated control, Arduino home control remotely.*

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## I. INTRODUCTION

People are demanding more comfort in their lives as a result of new technology. In this new era of automated things like automatic automobiles, automatic dishwashers, automatic bots, and so on, there is a demand for automated homes where people can accomplish things with the least amount of effort.

The Internet of Things, abbreviated as IOT (Internet of Things), refers to any device that can be connected to the Internet and operated via it. Home Automation Systems (HAS) control and automate lights, ventilation, and security. Home Automation is a new technology that alters our homes so that a variety of duties are carried out automatically.

Home Automation Systems (HAS) are designed to save energy and reduce human labour. This technology is also designed to assist disabled people with walking difficulties or elderly people who struggle to walk and turn off/on household appliances. The primary motivation for developing this product is to make people's lives more pleasant and easy. It will allow users to remain in their current location while controlling systems using voice commands. This paper describes how to control home automation equipment using voice commands or an Android application.

A microcontroller board called Arduino Uno was created by Arduino CC. A microcontroller board called the Arduino UNO has several input and output pins. It serves as a centralized controller as well as a processing node in a wireless sensor network (WSN), among other things. (WSN). The Home Automation System (HAS) can be operated through voice commands thanks to further



integration with the voice assistant. The motion sensor in the system will in fact activate the light sensor, which will then assess the ambient light level and turn on the light if the sensor detects a reading below the threshold value. The only way to manage the fan circuit will be with a single tap on an Android app or short voice instructions. Another type of home automation system uses Bluetooth for communication. However, Bluetooth has problems with connectivity in addition to having trouble getting its signals through walls. Most of the home automation systems (HAS) suggested in the literature are too expensive for the average person to buy, in addition to connectivity and compatibility problems. The suggested home automation system is a low-cost, adaptable solution that is simple to install and can be integrated with mobile devices in this situation. The next section discusses the experimental setup for this home automation system (HAS).

## II. LITERATURE SURVEY

The accuracy of Implementations satisfies the expectation in the suggested model of paper [1]. This home automation system responds to user wants and requests, and the modes of function operate as requested throughout implementation. Users must issue the appropriate commands via their smartphone, and the system will operate in accordance with the prescribed algorithm. This project is adaptable, user-friendly, and simple to use. As a result, this system has improved accuracy while also being very efficient.

The architecture for smart house control and monitoring systems utilising Arduino is proposed and implemented in this study [2]. It demonstrates how to use an Arduino Uno to manage various home appliances and provide security via a desktop programme. In our project, we attempted to create an embedded system that fulfils the primary objectives of home automation for lighting management, habitat security, and temperature and humidity control. As a result of these factors, a desktop programme was developed to interface with an Arduino via the serial connection.

In the paper [3], The light sensor was properly configured to identify when the laser was broken while not tripping due to variations in ambient light situations. Furthermore, the temperature and light control subsystem outputs have been verified to be operational. The firmware, in particular, has been tested and proven to be sending the correct signals to the subsystem BJT switches that regulate lighting and furnace operations. Overall, the project adhered to design specifications and upheld a high quality standard that can be integrated into modern dwellings.

In the primary paper no [4] we discovered that in this computer age, smart house technology has become a reality. It is a clever technology that provides us with a higher standard of living. We are completely reliant on a system that does everything automatically. We use sun tracking technology to maximise the efficiency of solar power. It features two user functions, one controlled manually and the other automatically. Security is password and/or biometrically protected, and sensing capability provides this home with the potential to defend itself.

### III. SYSTEM DESIGN

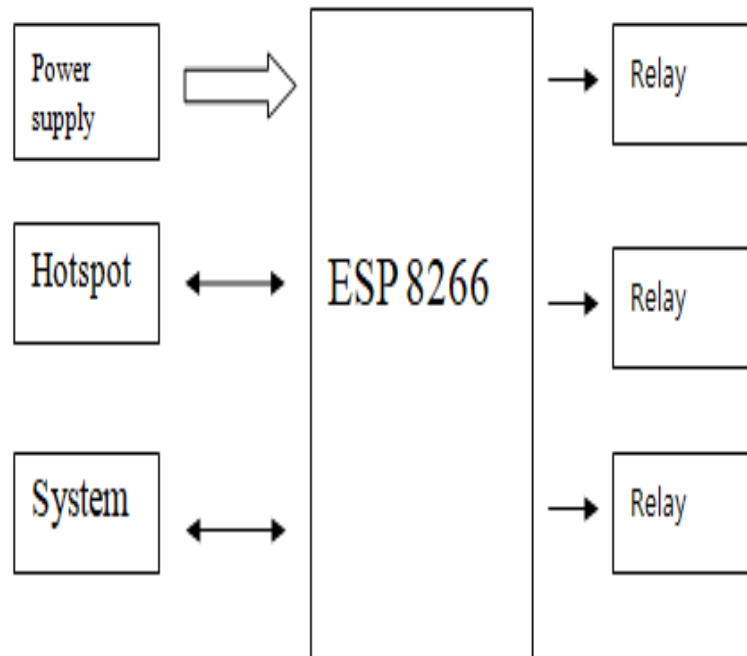


Figure 1: Block Diagram

- 1) Smart Home is a very valuable project for those who are unable to execute various chores efficiently at home and require the assistance of others to complete such duties.
- 2) The complication of wiring in the case of wired automation is avoided with the Android Application. Home automation via Wi-Fi would allow a man to turn on and off lights from anywhere. The Android application system allows for safe access to your home. The development of numerous wireless technologies has resulted in significant advancements in Home Automation systems in recent years.
- 3) The Home Automation market is quickly expanding, driven by the desire to provide supporting technologies designed to make our lives easier. Automation solutions are intended to be implemented in existing home environments with no infrastructure upgrades. The automation is based on an Android application and employs a Wi-Fi module as well as a microcontroller. This book describes the overall design of the 'IOT-based Home Automation' that we are now working on.
- 4) The automation recognises commands sent by the app via the user and sends them to our microcontroller, which recognises the command and initiates the switching in response. To put our concept into action, we're employing the ESP8266 Node MCU WiFi module and Arduino microcontroller module. We are also working to expand and make the same implementation more user-friendly. The goal of the home automation system is to use voice commands to manage all of the lights and electrical devices in a house or workplace.

**FLOWCHART**

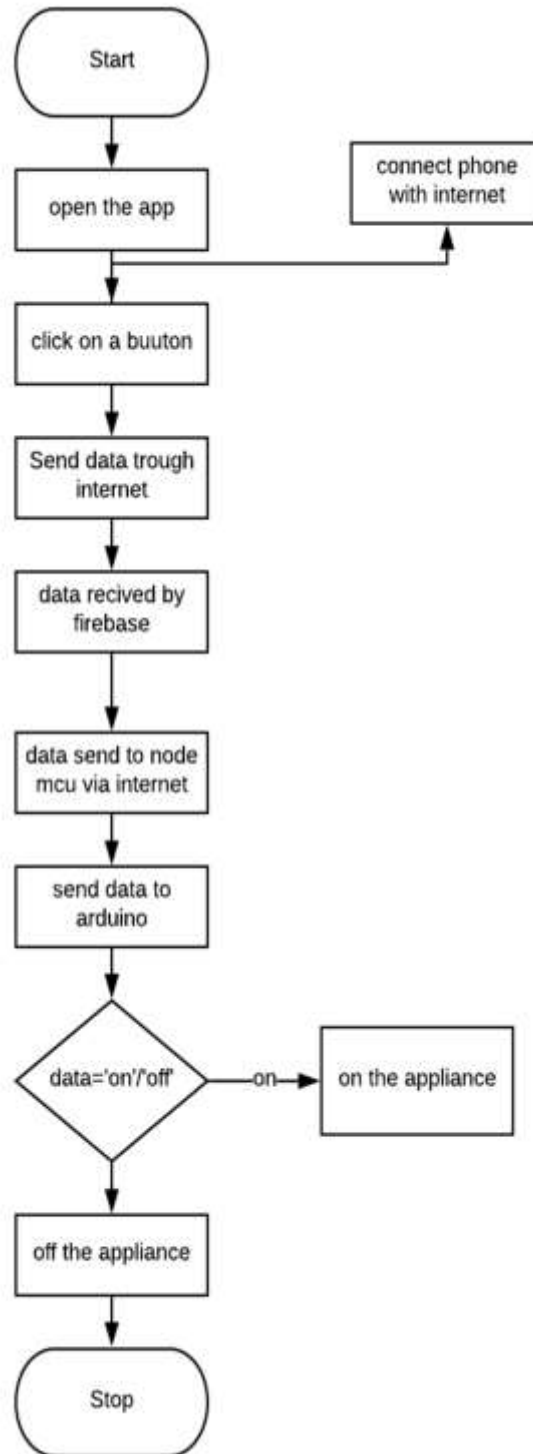


Figure 2 : Flow of our model (Flowchart)

A. *Components Used*

- 1) **Arduino** : The ATmega328P-based Arduino Uno is a microcontroller board. (datasheet). It contains 14 digital input/output pins, 6 analogue inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header, and a reset button.



Figure 3: Arduino Atmega 328p

- 2) **Relay**: An electrically controlled switch is a relay. It is made up of a set of working contact terminals and a set of input terminals for one or more control signals. Any number of connections in different contact configurations, such as make contacts, break contacts, or combinations of both, may be included on the switch.



Figure 4: Relay

- 3) **LED**: Visible LEDs are employed as indication lamps in a variety of electrical equipment, as rear-window and brake lights in automobiles, and as alphanumeric displays or even full-color posters on billboards and signs.



Figure 5 : LED

- 4) **Fan**: Concerning the power source, since your fan consumes 100mA at maximum speed (I suppose), it is still possible to power it via the Arduino's 5V input. It can supply approximately 500mA. (including the current for the Arduino itself).





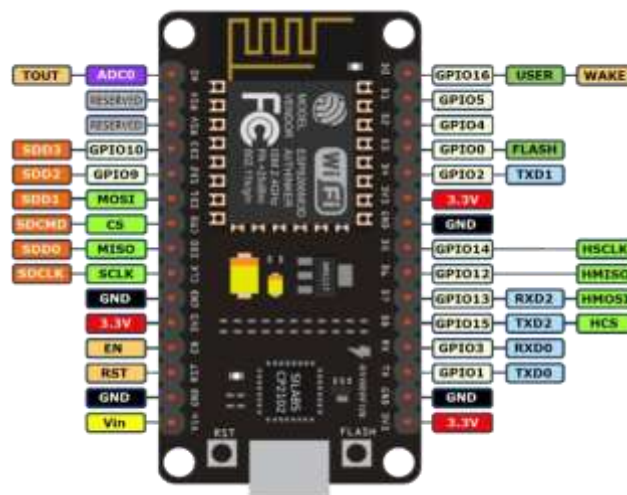
Figure 6: Dynamic Mini Fan

- 5) *Node MCU* : Node MCU is an open source firmware with open source prototype board designs. The name "NodeMCU" is a combination of the words "node" and "MCU." (micro-controller unit). The word "NodeMCU" refers to the firmware rather than the development kits that go with it.



Figure 7: Node MCU

*B. Pin-out Diagram*



Specifications :

1. Voltage:3.3V
2. Wi-Fi Direct (P2P), soft-AP
3. Current consumption: 10uA~170mA.
4. Flash memory attachable: 16MB max (512K normal).
5. Integrated TCP/IP protocol stack.
6. Processor: Ten silica L106 32-bit.
7. Processor speed: 80~160MHz.
8. RAM: 32K + 80K.
9. GPIOs: 17 (multiplexed with other functions).
10. Analog to Digital: 1 input with 1024 step resolution.

11. +19.5dBm output power in 802.11b mode
12. 802.11 support: b/g/n.
13. Maximum concurrent TCP connections: 5.

#### IV. IMPLEMENTATION

- 1) The term "home automation using Internet of Things" (IOT) refers to automation that enables users to control their devices via the Internet. This automation requires the user to connect his/her appliances, which he/she wishes to be remotely controlled, to the Arduino circuit. It also requires the user to connect the Arduino to the NodeMCU Wi-Fi module.
- 2) In order to send signals to the Arduino circuit from the front end, we created an Android app. To convey signals via the Internet, we built the project around a real-time database. Using the publicly available Firebase API, the Android app is connected to the database.

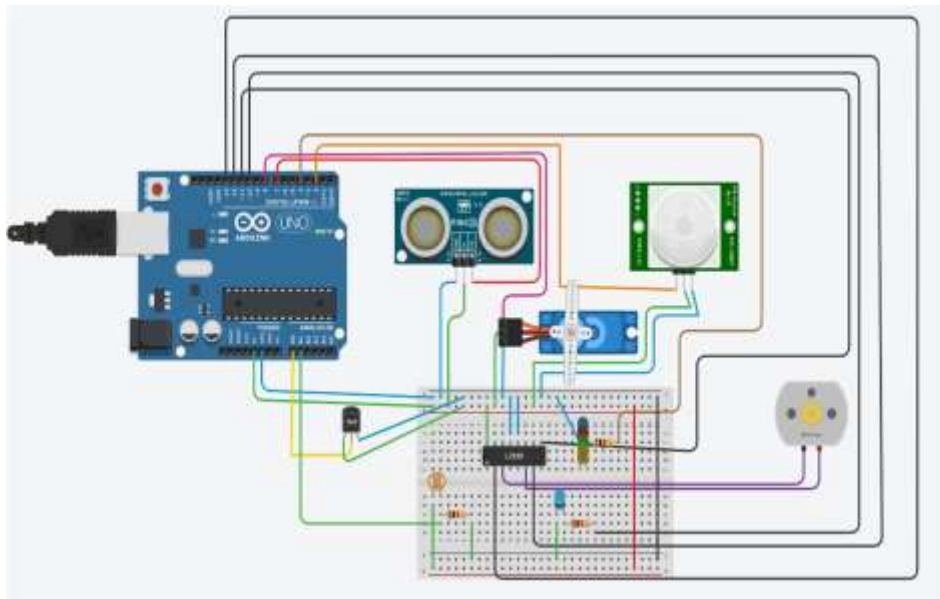


Figure 8: Circuit diagram

#### SOFTWARE DESCRIPTION

**BLYNK :** For use with the Internet of Things, Blynk was created. It has several fascinating features, like remote hardware control, sensor data display, data storage, data visualisation, and many more.





**Source Code:**

```
#include <SoftwareSerial.h>

SoftwareSerial SwSerial(10, 11); // RX, TX

#include <BlynkSimpleStream.h>

char auth[] = "d0e68eae86a3446995a256415bd6cfc4";

Terminal terminal(V1);

BLYNK_WRITE (V1)

{

    if (String("Marco") == param.asStr()) {

        terminal.println ("You said: 'Marco'");

        terminal.println ("I said: 'Polo'");

    } else {

        Terminal. Print ("You said :");

        Terminal. Write (param.getBuffer (), param.getLength ());

        terminal.println ();

    }

    terminal. Flush();

}

void setup()

{

    SwSerial. Begin (9600);

    Serial.begin(9600);

    Blynk. Begin (Serial, auth);

    terminal.println (F ("Blynk v" BLYNK_VERSION ": Device started"));

    terminal.println(F(" ----- "));

    terminal.println(F("Type 'Marco' and get a reply, or type"));

}
```



```
terminal.println(F("anything else and get it printed back."));
```

```
terminal.Flush();
```

```
}
```

```
void loop()
```

```
{
```

```
  Blynk.Run();
```

```
}
```

Test Case Table

TEST CASE #	TEST SCENARIO	TEST STEPS	TEST DATA	EXPECTED RESULTS	ACTUAL RESULT	PASS/FAIL
1	Check whether the firebase value changes	1)Open the android app. 2)Click on a	Light Button: ON/OFF Fan button:	The database value changes corresponding to	As expected	PASS
2	Check whether the light bulb or fan starts or stops when	1)Open the google firebase website.	Light:ON/OFF Fan:ON/OFF	The blub lights up or the fan starts rotating	As expected	PASS
3	Check whether the light bulb or fan starts or	1)Open the android app. 2)Click on a	Light:ON/OFF Fan:ON/OFF	the bulb lights up or the fan strats rotating	As expected	PASS
4	Check whether the arduino uno is working correctly	1)Connect the arduino to your computer. 2)Open arduino IDE and select the	Code for blinking an LED	The inbuilt LED 13 starts blinking	As expected	PASS
5	Check whether the NodeMCU is working correctly	1)Connect the NodeMCU to your computer. 2)Open arduino IDE and select the	Code for blinking an LED	The Built-in LED starts blinking	As expected	Pass

Figure 9 : Test case table

## V. RESULTS

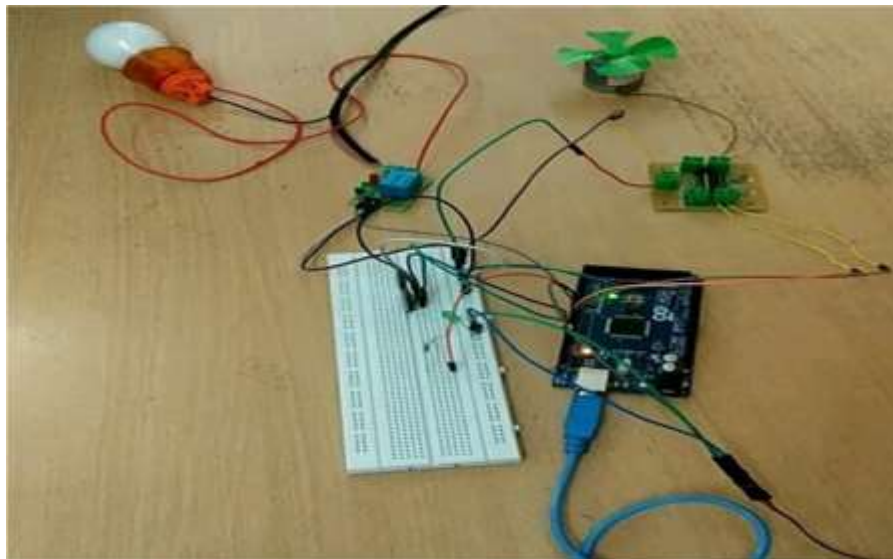


Figure 10 : Home automation system

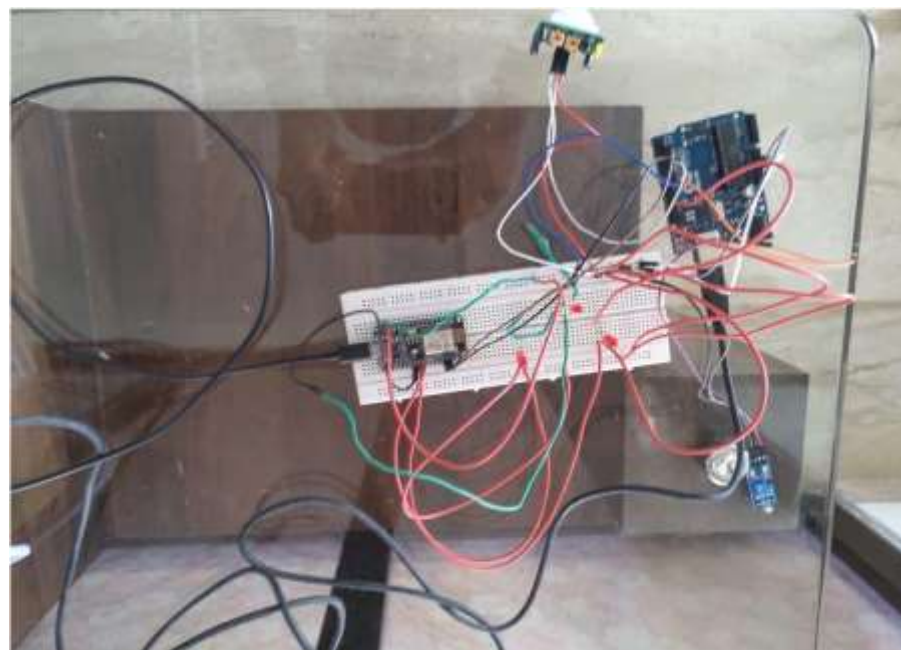


Figure 10.a : Home automation system



Figure 11 : Home automation system app made with Blynk displaying that the fan is turned on



Figure 12 : Home automation system app created through blynk showing the fan is off now



## VI. CONCLUSION

Home automation based on IoT is a totally different notion than what is currently available on the market. This would make automation easier and more intuitive. People will be able to interact with the system from anywhere on the planet. It is also an important component in today's society where people are so busy because it will aid them with the basic functionality of their life. The world around us is becoming more digital in every way we can conceive, and it is happening quickly; we must likewise keep up. Our solution is a significant step forward in automation, and it will also provide security in the near future. Because it is built on IOT, we can grant access to our electronic gadgets from anywhere in the world. Our system has the following characteristics:

- A. It is simple to use.
- B. Reduces needless energy consumption.
- C. It is less expensive than other automation systems.
- D. Simple to implement.
- E. Has sufficient processing capability to handle many functions at the same time.
- F. Makes use of a dependable wi-fi connection.

## VII. REFERENCES

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