

Bluetooth Based Device For Integrating Wireless WT Sets With Smartphones Through An App Using Arduino

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ABSTRACT

Smart homes are the domestic counterpart of building automation. The administration and automation of systems that provide human comfort, such as lighting, heating, ventilation, air conditioning, and security, were first included. The design and implementation of a low-cost smart home managed by an Android phone are discussed in this study. The goal of this framework is to support and accommodate the needs of the elderly and disabled people who live in our homes. Additionally, the idea of a smart home system will improve our homes' overall wellbeing. A wireless Bluetooth device and analogue sensors, which provide wireless access to smart phones, are used in the fundamental control system. Instead of doing rid of the present electrical switches, the system design gives users safer control over them. Every user interface shows the most recent switch status, and the switch state is synced everywhere. This system's goal is to manage electrical appliances around the house while being easy to install, straightforward to operate, and reasonably priced.

Keywords: - House automation, Arduino, Bluetooth, SmartLighting, Low-cost.

I. INTRODUCTION

In this digital age, we need everything that is practical to be automatic to reduce human effort. The greatest challenge we have today is the energy problem; we must save energy. We use the use of sensors to do this. By converting these physical qualities into signals that can be detected electrically, sensors are devices that detect and measure nonelectrical variables including temperature, motion, humidity, speed, distance, weight, etc. Our daily lives now include sensors on a regular basis. Everyone uses sensors, from big businesses to little families. The latest fad is smartphones, which have simplified life more than before. They fit easily into pockets and are constantly with you. Because of the mobility of smartphones, designers and marketers have created services and products specifically for the mobile market. The Systems continue to be cut off from mobile technologies! This project involves designing a home automation system that can be operated with smartphones.

Bluetooth is used to link the automation system with the smartphone. The smart phone uses a Bluetooth interface to send control signals to an Android app, which turns on or off household appliances. Four household appliances are connected to the Arduino by relays, and the project is created on an Arduino UNO. To couple with the smartphone, the Arduino board is connected to an HC-05 Bluetooth module.

The smartphone is used to communicate text strings to a linked device via the "Bluetooth Terminal" app. On the smartphone, "BT Voice Control for Android" is an additional app that may be utilized. US English voice instructions are translated into text strings and sent to a linked device by the BT Voice app. Through the HC-05 Bluetooth Module, either app may link with the home automation system. The Bluetooth interface on the smart phone sends user commands to the Arduino board as integers. The household appliances are given these numbers, and when they get the numerical instruction, they turn ON or OFF. The Arduino program searches for the Bluetooth module's numerical commands and activates relays to switch appliances.

Because of the technology's quick development, we now use cellphones to remotely operate household equipment. Automated equipment has the capacity to operate diligently, with minimal mistake, and with variety. Researchers and home appliance manufacturers are concerned about the concept of home automation systems. In addition to reducing the need for human labor, automation systems also save time and resources.

A home automation and monitoring system based on an Arduino Uno and a Digilent chip KIT was also studied the usage of Bluetooth technology allowed for remote control of wireless access. There are two key components of the proposed system: hardware and software.

II. OVERVIEW OF HARDWARE ARCHITECTURE

The recommended home automation system consists of three hardware components: a smartphone, an Arduino board, and a Bluetooth module. To communicate with an Arduino board, a smartphone application and Bluetooth technologies are used. Bluetooth module HC 05 and Arduino Uno are used for hardware implementation in this research project.

II.I Arduino UNO

Arduino is a tool for building computers that are more capable than a desktop computer of sensing and controlling the physical environment. It is an open-source physical computing platform that includes a development environment for writing software for the board's basic microcontroller. Arduino may be used to construct interactive items by using switches or sensors as inputs and a variety of lights, motors, and other physical outputs as controllers. Arduino projects may communicate with computer software (such as Flash or Processing) or function independently. The open-source IDE is free to download, and the boards may be assembled by hand or purchased pre-assembled. The Arduino Uno is a microcontroller board based on the ATmega328. It contains a 16 MHz ceramic resonator, 6 analogue inputs, 14 digital input/output pins (of which 6 may be used as PWM outputs), a USB port, a power connector, an ICSP header, and a reset button. It comes with everything needed to support the microcontroller; to get started, just plug in a USB cable, an AC-to-DC converter, or a battery.



Fig 1: Arduino UNO

II.II Bluetooth module HC-05

The Bluetooth module HC-05 is used to wirelessly connect between the Arduino Uno and a smartphone. The HC-05 is a slave device that operates between 3.6 and 6 volts. There are six connections on it: State, RXD, TXD, GND, VCC, and EN. For serial connection, connect the TXD pin of the blue tooth module HC-06 to RX (pin 0) of the Arduino Uno and the RXD pin to TX (pin 1) of the Arduino Uno. Adriano's connection diagram with the Bluetooth (BT) module is shown. The HC-05 contains a red LED that indicates whether Bluetooth is connected. This red LED blinks constantly and in a periodic way before connecting to the HC-05 module. The HC-05 contains a red LED that indicates whether Bluetooth is connected. This red LED blinks constantly and in a periodic way before connecting to the HC-05 module.



Fig 2: Bluetooth Modules HC-05

II.III Channel Relay board 4

The 4 Channel Relay Board is a quick and easy solution to connect four relays for a switching application in your project. This board is primarily intended for low voltage applications due to its tiny design. A 4-channel relay interface board is required, with each relay requiring 15- 20mA driver current.

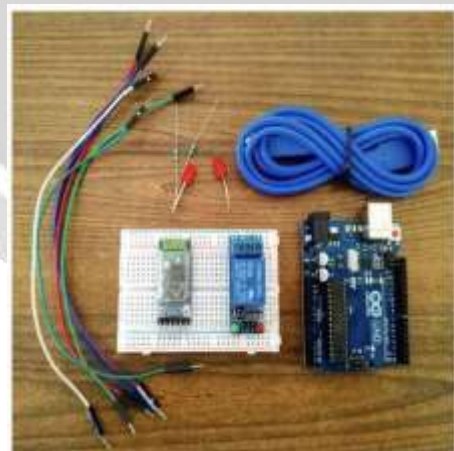


Fig 3: 4-Channel Relay Board

III. OVERVIEW OF SOFTWARE ARCHITECTURE

The Arduino Integrated Development Environment (IDE) and a Bluetooth terminal application are utilized in this investigation.

III.I Arduino IDE

The Arduino IDE tool is used to program the entire system. IDE stands for Integrated Development Environment. The serial connection baud rate between the Arduino board and a smartphone is set at 9600 bits per second. The Arduino IDE command "Serial.available()" is used to receive serial data from a smartphone, and "Serial.println()" is used to send serial data from an Arduino board to a smartphone. The code that is used to read serial data from a smartphone. The state variable is used to store the received byte's value, which is then compared to numerous criteria to perform the desired action. The Arduino IDE code for turning the light on and off is shown below:

```

if (state == '0')
{
Serial.println("LIGHT_ON");
digitalWrite(LIGHT, HIGH);
}
if (state == '1 ')
{
Serial.println("LIGHT_OFF");
digitalWrite(LIGHT, LOW);
}

```

IV. WORKING OF THE CIRCUIT

This is the complete circuit diagram which uses the WT sets as home appliances like bulb which is connected through the relay board and that relay is connected to the Arduino UNO. The Arduino UNO is connected through the Bluetooth module which gets connected once we turn on the Bluetooth in the smartphone and connect HC-05. Once it is connected it will start blinking and the appliances will be operated using the smartphone.

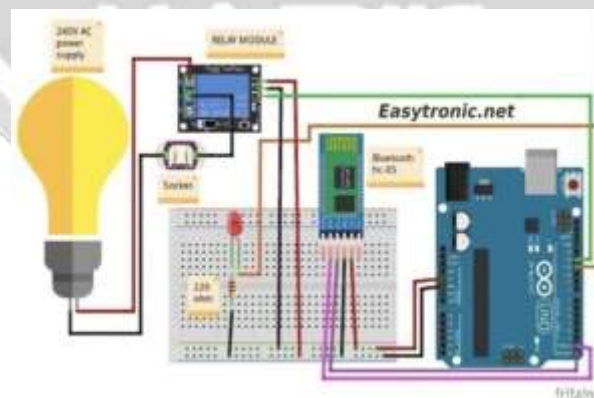


Fig 4: Circuit Diagram

IV.I Arduino Code

```
void setup()
```

```

{
Serial.begin(9600);
pinMode(12, OUTPUT);
pinMode(11, OUTPUT);
digitalWrite(12, HIGH);
}
void loop()
{
if(Serial.available(>0)
{
char data= Serial.read();
Serial.println(data);
if(data=='a')
{
digitalWrite(12, LOW);
digitalWrite(11, HIGH);
Serial.println("RELAY AND LED ON");
}
if(data=='b')
{
digitalWrite(12,HIGH);
digitalWrite(11,LOW);
Serial.println("RELAY AND LED OFF");
}
}
}
}

```

V. CONCLUSION

For some years, intelligence has been welcomed to develop our linked homes, and it continues to impact our everyday lives. First, with the automations put on things (garage door, for example), then with their programming (washing machine, for example) and remote control (heating regulation, for example), up to robots and objects connected. Home automation systems on cellphones and/or tablets control the entire system. In this regard, a house automation system was built and constructed in this work by monitoring a few household gadgets locally or remotely utilizing the Arduino Mega controller as the suggested system's brain and the Bluetooth communication protocol. This research focuses on lighting control to minimize energy consumption and make the home more comfortable for residents and consumers. The Arduino-based automated control system was designed and implemented in-house using low-cost components that may be extensively used in poor nations. The created circuit will make the house more pleasant and safer for the residents while also consuming less energy. This concept is easily adaptable to any home that requires the usage of sensors. The entire cost of the control might be reduced by using this design.

VI. REFERENCES

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