HOME AUTOMATION WITH BLUETOOTH

EMBEDDED SYSTEMS INTERNSHIP

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Introduction

- Home automation enables remote control of home appliances.
- Bluetooth technology allows wireless communication with devices.
- Embedded systems are used to control and automate appliances efficiently.

Objective

- Design and implement a Bluetooth-based home automation system.
- Control devices like lights, fans, etc., via smartphone.

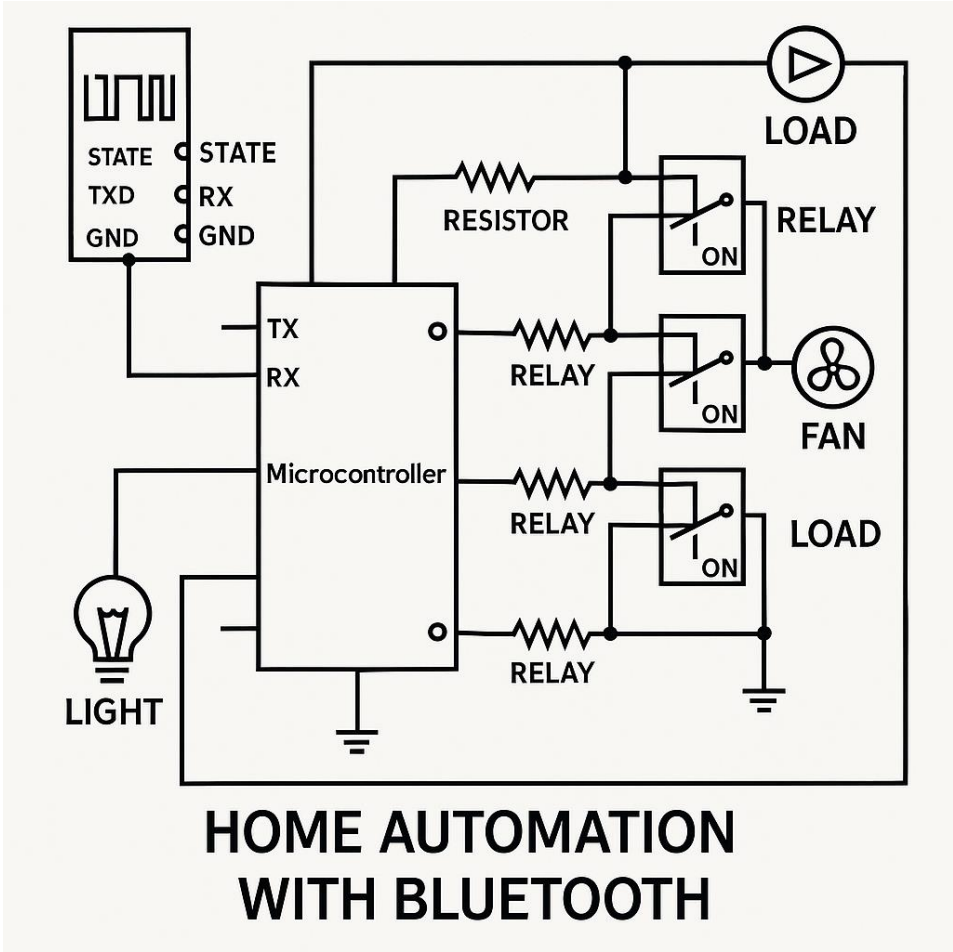
Components Used

- Microcontroller: Arduino UNO / ESP32
- Bluetooth Module: HC-05
- Relays: To control high-voltage appliances
- Smartphone: Android with Bluetooth terminal app
- Power Supply and Connecting Wires

Working Principle

- Smartphone sends commands via Bluetooth.
- HC-05 receives the signal and sends it to the microcontroller.
- Microcontroller processes the command and triggers corresponding relays.
- Appliances turn ON/OFF accordingly.

Circuit Diagram



Software & Tools

- Arduino IDE for coding
- Bluetooth Terminal App for testing
- Serial Monitor for debugging

Arduino Code

```
char data = 0;
void setup() {
  Serial.begin(9600);
  pinMode(13, OUTPUT); // Light
}
void loop() {
  if (Serial.available()) {
    data = Serial.read();
    if (data == '1') digitalWrite(13, HIGH); // Turn ON
    else if (data == '0') digitalWrite(13, LOW); // Turn OFF
  }
}
```

Advantages

- Easy to use and low-cost setup
- Wireless and compact
- Energy efficient and customizable

Applications

- Smart Homes
- Offices
- Hospitals and Labs
- Disabled Assistance

Future Enhancements

- Use Wi-Fi/IoT for internet-based control
- Add voice assistant integration
- Real-time monitoring through mobile apps

Conclusion

- Demonstrated Bluetooth-based home automation
- Embedded system is a scalable and affordable solution
- Gained experience in microcontrollers and wireless tech