

Smart Home Automation

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1 Document Version History

S.No	Version	Notes
1	1.0	First Version

Table 1: Document Version History

2 Project Description

Objective of this project is to design a Smart Home Automation system for controlling devices ON/OFF from an Android powered phone over a Bluetooth connection. Arduino Uno is the microcontroller used in this project along with various module like bluetooth module HC-06 and a Relay module for controlling high voltage , high current wall powered devices.

Application of such a device is to be able to easily control different devices in a home or office. The concepts used here can easily be extended to include features like automatic ON-OFF at specified time periods, sending alerts if high power devices like water geysers, heaters, etc are ON for more than a specified duration, etc.

3 Bill of Materials

Below is a list of components, materials and tools required for the project

1. Arduino Uno Rev3 Board
2. Relay Module
3. HC-06 Bluetooth Module
4. 9V battery and connector
5. Breadboard, 4x Resistors (1Kohm-1.5Kohm), Connecting wires - male-to-male, male-to-female
6. 1x LED, 1x Buzzer

7. 1x Bulb, holder and wires
8. Tools like wire stripper, screw driver

4 Module Level Functionality

4.1 Arduino Uno Rev3 Board

This is the main board containing the microcontroller responsible for system level logic and control flow and interfacing with all the other modules like HC-06 bluetooth module and Relay module.

4.2 HC-06 Bluetooth Module

This module is used for bluetooth connectivity between Arduino and Smartphone. It is a really nice module and includes all the RF components like antenna, etc required for bluetooth communication and provides a very easy to use interface. Communication between Arduino and this module happens over a 2 wire UART Serial Interface.

This module is powered by the 5V supply from Arduino. However, HIGH IO Logic level for this module is 3.3V versus 5V as logic HIGH used in Arduino UNO. For transmitting data from HC-06 to Arduino, nothing special needs to be done and a direct connection from TX of HC-06 to RX of Arduino can be used since Arduino also treats 3.3V as HIGH. However, for receiving data from Arduino to HC-06, a simple resistive voltage divider circuit can be used so that when Arduino transmits a 5V high signal, the voltage level at HC-06 RX pin is reduced to near 3.3V by the resistive divider circuit. This ensures HC-06 circuitry is protected from a high voltage of 5V.

4.3 Relay Module

Relay is an electronic switch which can be controlled ON or OFF electronically by setting its input SIG(signal) pin to HIGH or LOW respectively.

For controlling wall powered devices which operate at high voltages of 120-240V and high currents from few hundred milliamps to few Amps, we can use a relay instead of powering the device directly from an Arduino GPIO

which can only provide 5V and few milliamps of current.

Interfacing Arduino with a relay module is also very simple. On one side of the relay, it has three pins - one for 5V power from Arduino, second for Ground and third for SIG(signal) for switching ON/OFF the device connected to the relay. On the other side, we have screw connectors for connecting wires from the device to be controlled. When SIG input pin is set to HIGH 5V, the device connecting wires are shorted together (assuming connections at COM and NO(normally open) terminals) otherwise the wires are unconnected/open.

5 High Level System Interface Diagram

Figure 1 shows a high level system interface diagram.

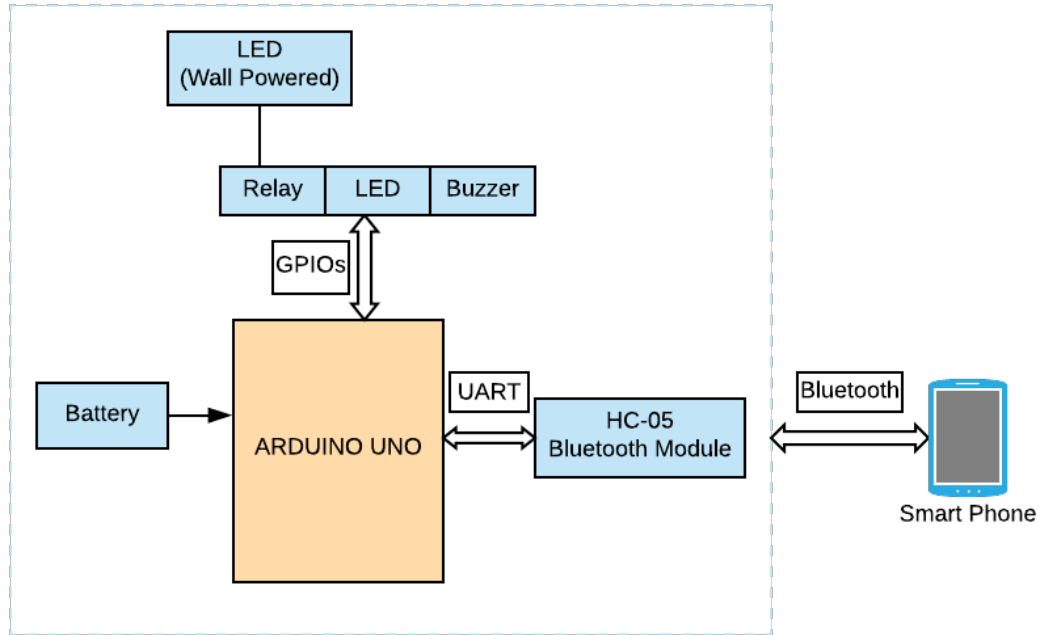


Figure 1: High Level System Interface Diagram

6 Pin Connectivity

Table 2 documents the pin connectivity of Arduino with the different peripherals.

S.No	Arduino	Relay	Hc-06	Others
1	8	SIG		
2	9			LED on breadboard
3	10			Buzzer on breadboard
4	A0		RX (via divider circuit)	
5	A1		TX	

Table 2: Pin Connectivity of Arduino with different peripherals

7 Project Demo and Snapshots

Figures 2, 3, 4, 5 show snapshots of the working prototype.

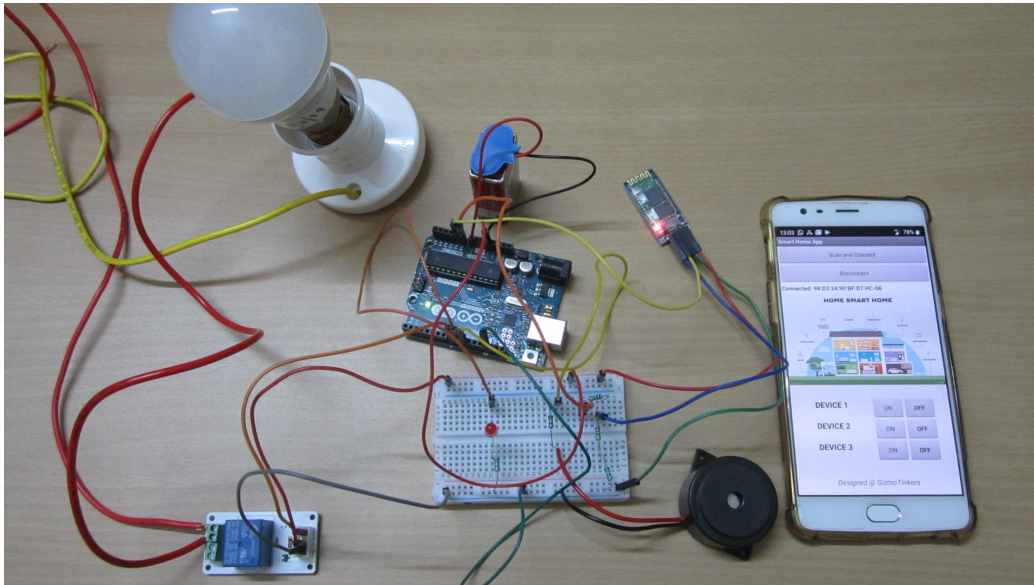


Figure 2: Smart Home Automation Setup Snapshot 1

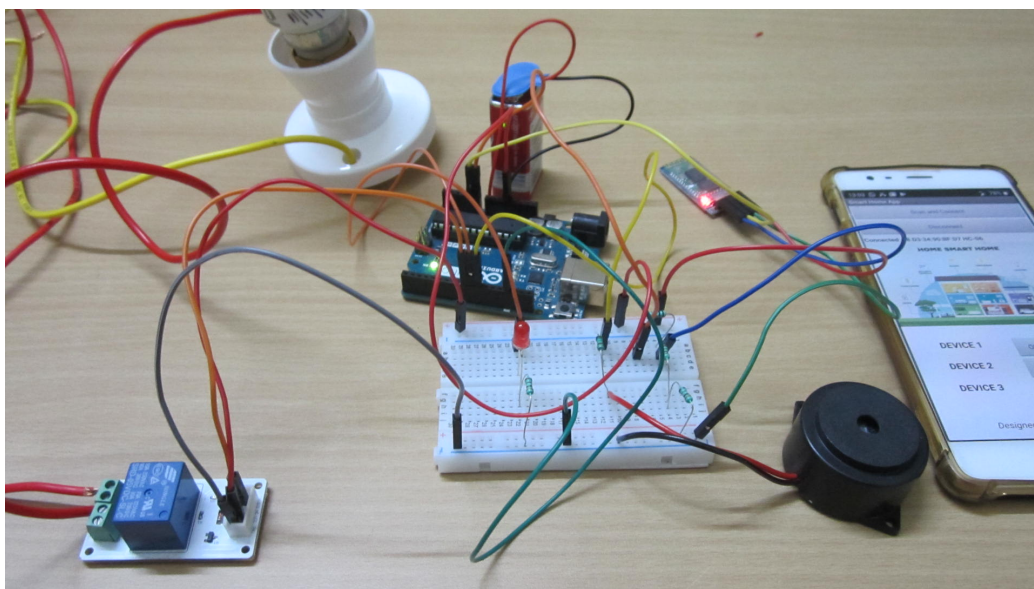


Figure 3: Smart Home Automation Setup Snapshot 2

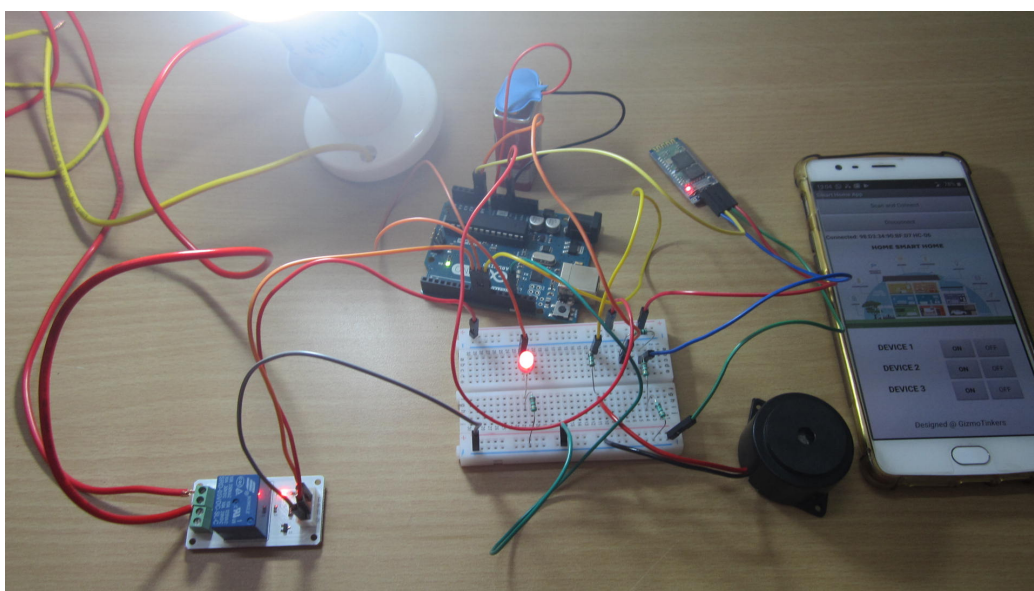


Figure 4: Smart Home Automation Setup Snapshot 3



Designed @ GizmoTinkers

Figure 5: Smart Home Automation Android App

8 Important Notes and Learnings

Important notes and learnings from the project are captured in this section.

1. It is important to ensure that the relay module used is capable of handling the currents being drawn by the connected wall powered device.

9 Contact Information

If you have any questions or need help in building this project, please feel free to reach out by sending me an email at vasu.gupta9@gmail.com