Topic: Bluetooth Controlled Smart Socket

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Abstract

Electrical sockets are used to connect the Electrical appliances to the AC mains electricity. With the advancements in the technology, IoT based smart plugs, sockets are available in the market. It connects to the Wi-Fi and controls the various appliances connected to the network.

Problem Description

With demand for much smarter homes, it becomes tedious to manufacture electrical appliances with various sensors, microcontrollers and network connectivity. A cost effective solution would be to incorporate these smart features within the Electrical socket and make any appliance “Smart” . Also With this any old appliance can be made smart with the “Plug and Play” feature.

System Overview

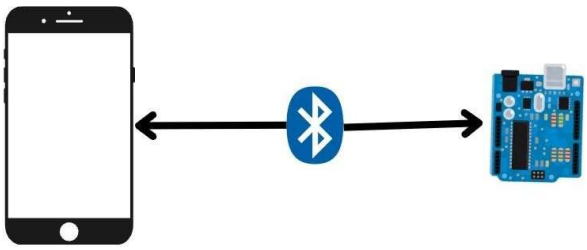

Figure 1: Representation of Smart Socket

The smart socket is a combination of both Hardware and Software components.

Arduino UNO, Bluetooth module, sensor and relay module form the Hardware part. A smartphone app is used to communicate over Bluetooth control the Smart Socket.

The Hardware and Software overview of the system are discussed below.

Hardware Overview

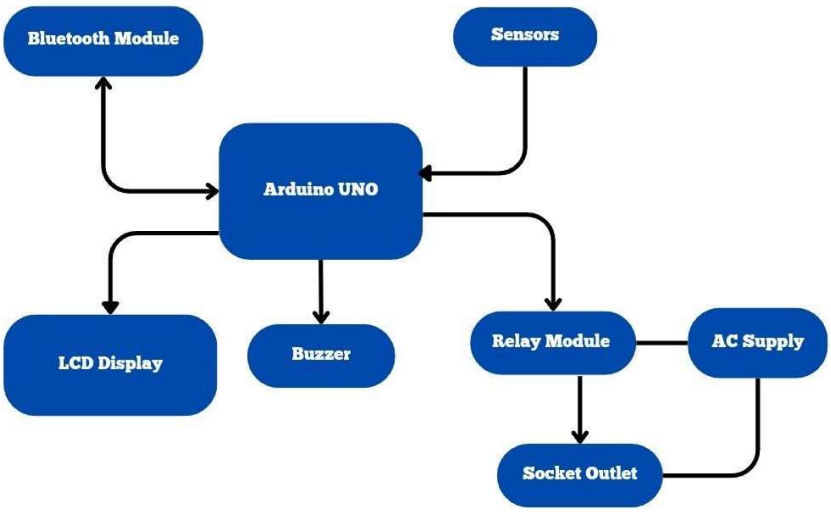

Figure 2: Block Diagram Representation of Hardware

Components Used:

1. Arduino UNO Board
2. HC-05 Bluetooth Module
3. 5V Passive Buzzer
4. 5V Single channel Relay Module
5. DS18B20 Temperature sensor
6. Resistors (1/4W): 4.7KΩ, 2KΩ, 1KΩ
7. **16x2** I^2C Alphanumeric LCD Display
8. Solder less Breadboard
9. 5 pin AC Socket
10. 3 pin AC Plug
11. Jumper wires and stranded wires.
12. 18650 4.2 V Li-ion cell
13. 18650 Li-ion cell holder

Circuit Diagram

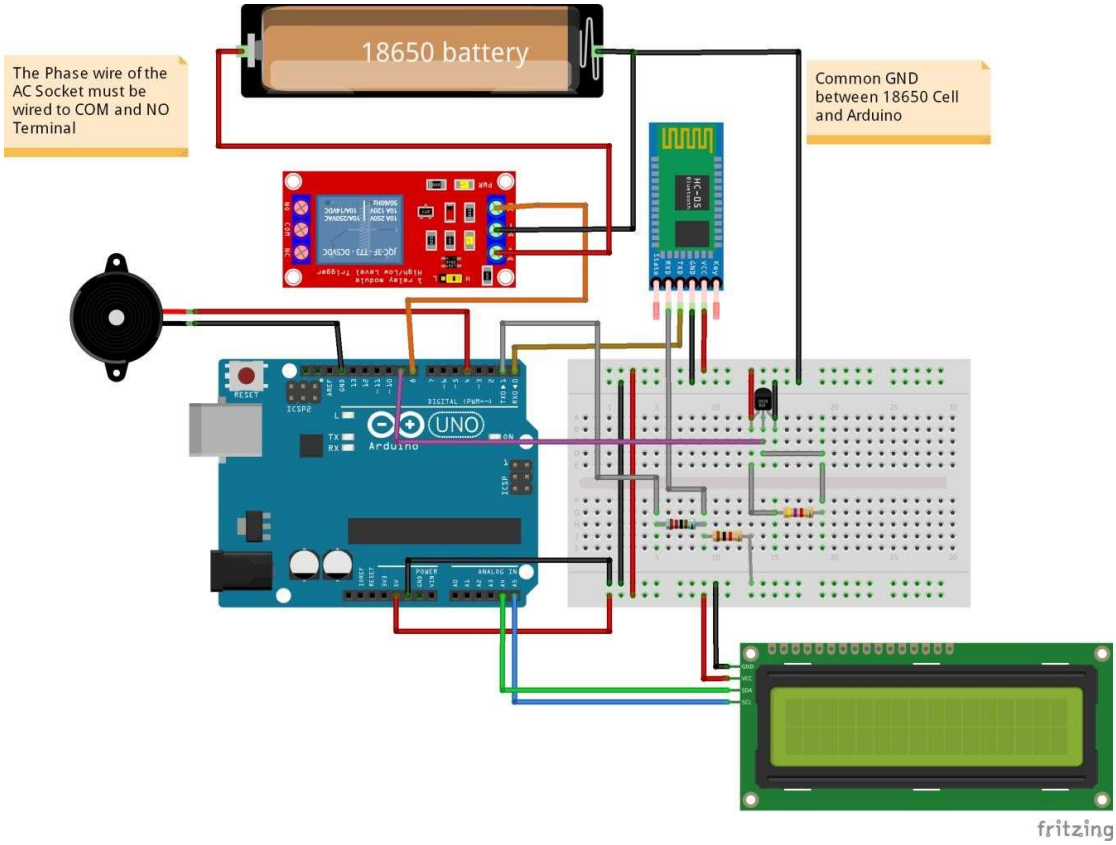

Figure 3: Circuit diagram of smart socket created using Fritzing CAD Software

Software Overview

The app used to control the Smart Socket is built using MIT App inventor.

The UNO board is programmed using Arduino Programming language.

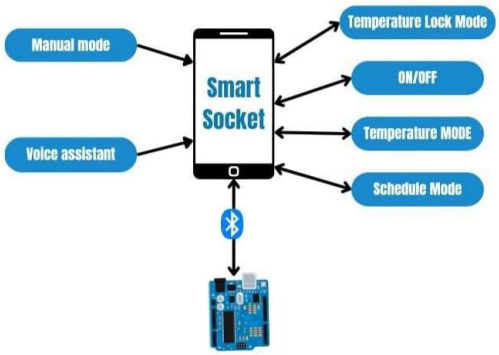

Figure 4: Block Diagram representation of the Smart Socket app

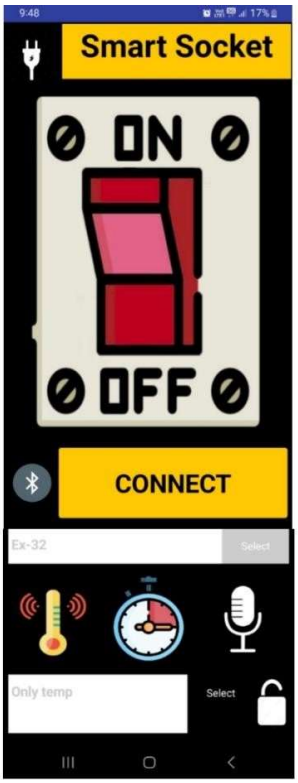

Figure 5: Overview of the Smart Socket App

Features of Smart Socket App:

1. Manual Control Mode
2. Voice Command Mode
3. Temperature Mode
4. Temperature Lock Mode
5. Schedule Mode

User can choose between various modes available and control the appliances via the app

Project Setup

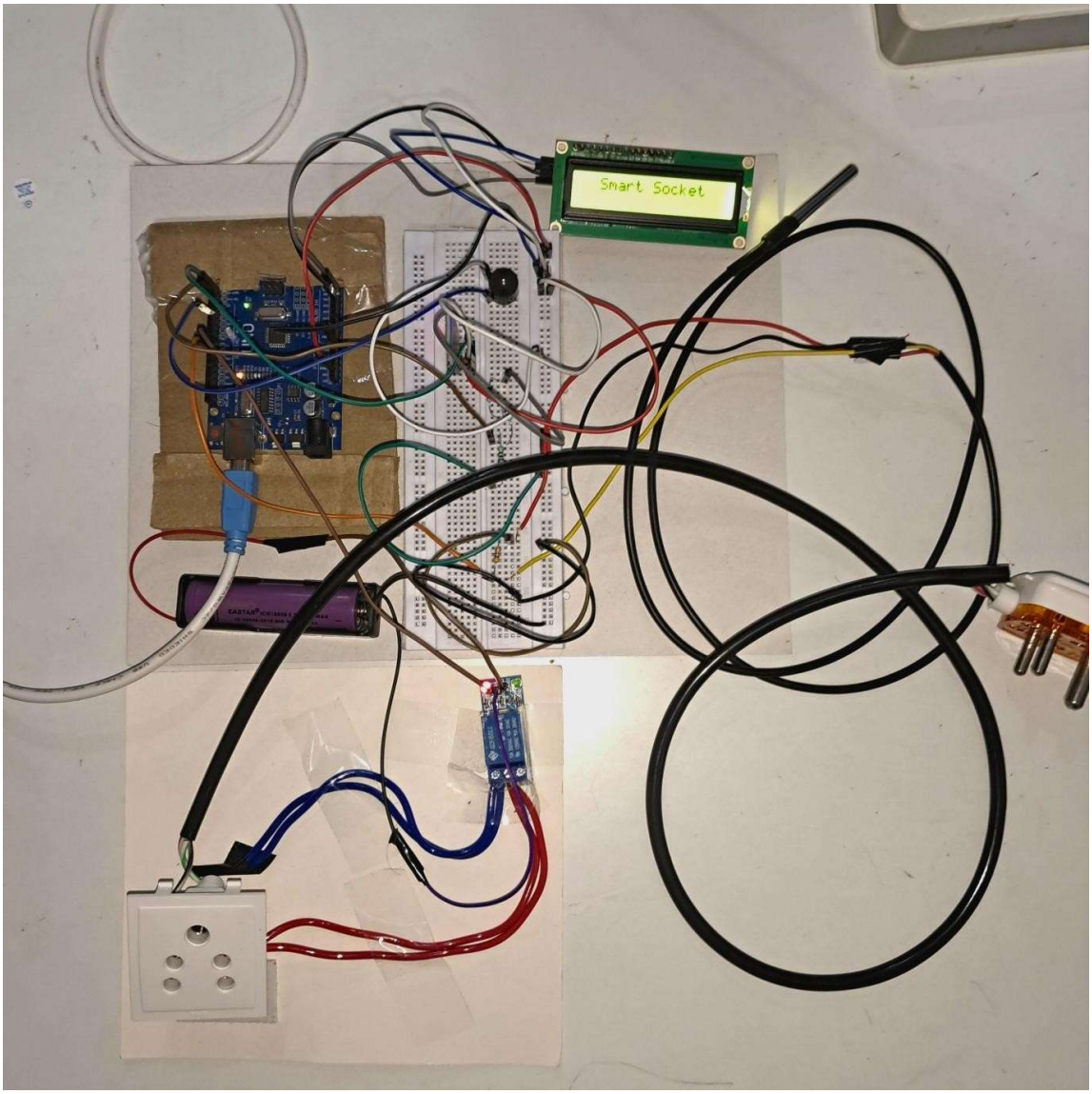

Figure 6: Image of the Smart Socket Project setup

Working

1. The connections are made as per the circuit diagram. The electrical appliance is connected to the smart socket.
2. User opens the app and connects the Bluetooth device.
3. User can manually turn the appliance ON/OFF or though voice commands. The signal sent to the Bluetooth module and the control signal from arduino UNO latches/unlatches the relay.

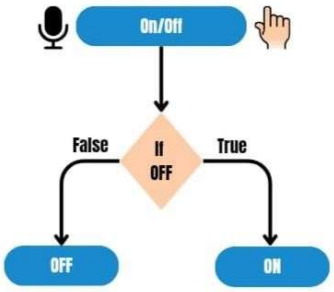

Figure 7: Flowchart representation of Manual/Voice command mode

4. **Schedule Mode** is a feature where time period can be selected varying from seconds to hours. The Arduino latches the relay and waits for the particular time period to elapse, upon which the relay is unlatched.

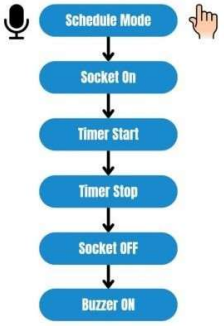

Figure 8: Flowchart representation of the Schedule mode

5. **Temperature Mode** is where a user can select a particular temperature value and use an electrical kettle to heat the water until the specified temperature is reached. During the process temperature of water is monitored continuously and displayed on the LCD display. Once the set Temperature is reached, the Relay is unlatched.

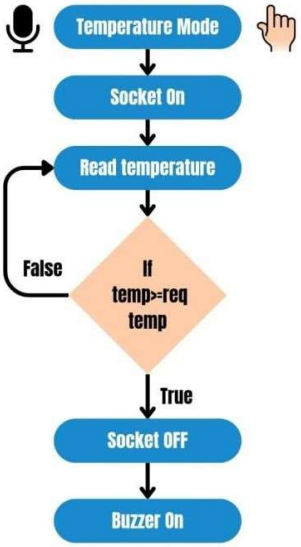

Figure 9: Flowchart representation of Temperature Mode

6. **Temperature Lock Mode** is where user can set a particular temperature value for boiling water for a specified period of time. The temperature is maintained for that specified period of time.

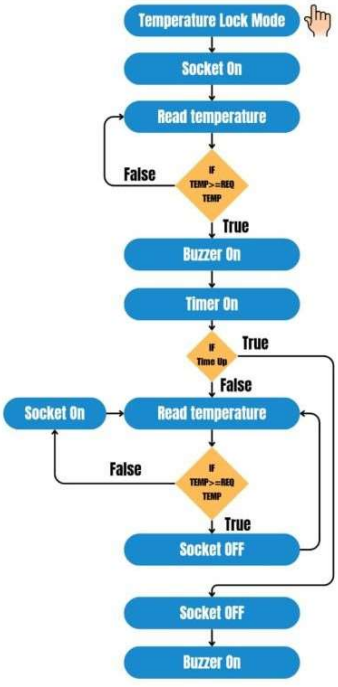

Figure 10: Flowchart Representation of Temperature Lock Mode

Advantages

1. Integrates Manual Mode, Schedule Mode, and Sensor Mode into a single device.
2. In Sensor mode, sensors such as temperature sensor can be used to control electric kettle, water Heater etc.
3. Schedule Mode can be used while charging smaller/mobile device to enhance their lifetime. Also can be used to turn on appliances for a specific period like ceiling fan, lights.
4. Make older appliances Smarter.
5. Doesn’t require Wi-Fi connectivity.

Application

1. One stop solution for home automation needs.
2. Can be used to control low power appliances such as Lights, Fans and high power appliances such as Heater, Electric kettle and Water boiler.