

Managing Home Appliances Using Mobile

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Abstract. This project focuses on the development of a smart home system that allows users to control electrical appliances using a device such as an Android phone via Bluetooth or the internet. Home Automation using Mobile is going to be used for the control of home appliances. It enables you to control home appliances like Bulbs, fans, Televisions, etc with the pressing of your mobile key from anywhere. There is no need for a specific remote for this. The user can control any appliances with this application. So, if you forgot to switch off the lights or other appliances while going out, it helps you to turn off the appliance with your cell phone. This system adapts serial connection of the devices with a Bluetooth module and an ARDUINO microcontroller attached to the main circuit board where the microcontroller will then control the home appliances via a relay circuit. The smart home system will be able to ease the effort of physically challenged individuals in controlling their home appliances such as lamps, fans, air-con, etc... Users can trigger the switches anywhere as long as the device is within the vicinity of the Bluetooth signal in the main panel. Moreover, users can also control the appliances via an internet connection by sending an email to a specified address. With this limitation, users will have no flexibility in controlling their home appliances when they are not at home and this prevents remote monitoring of their home devices.

Keywords: Arduino, Home automation, Bluetooth, Smartphone, Security

1. Introduction

Home automation can provide increased quality of life for a person who might require caregivers. It can also provide a remote interface to home appliances. In this proposed system the implementation of controlling a remote for various home appliances using an android phone. Home automation is the control of any or all electrical devices in our home, whether we are there or away. Generally, when we go out of the house, we switch off the light or the electrical equipment to avoid accidents such as short circuits, firing, etc. but sometimes we forget to switch them off, and we have to come back home to do so. [3][4] So, to avoid any such kind of situation the latest technology coming up worldwide is smart home technology. The rapid growth of wireless communication motivated us to use a mobile phone to remote control household appliances. In this paper, we described a remote appliances control system that can control different household appliances by sending a signal from a mobile phone. This controller is extremely handy at places where we have to control the ON and OFF switching of the devices but no wired connection to that place is available. This is used by old aged people and handicapped to control home appliances from remote places. This article aims to propose a wireless remote control that permits elderly people with physical challenges, in particular, handicapped and disabled people, to command their desired devices without moving around to the nearest control point. This is explained in the Figure 1. [1]

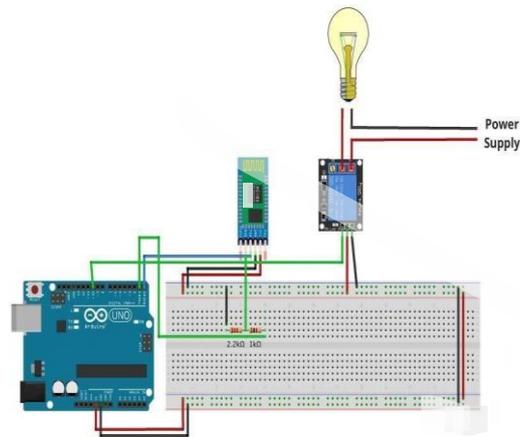


Figure 1: Circuit Diagram of Home Automation

2. Methodology

Home automation describes a system of the networked, controllable device that work together to make your home more comfortable, customized, efficient, and secure. In this device, there are five main parts Arduino, Bluetooth module, Relay drivers, android application, and step-down transformer. Firstly, we provide power to the step-down transformer, which steps down the input voltage and is given to the Arduino with a VIN pin. The Bluetooth module is also connected with Arduino to Rx and Tx pin that provides the information to the microcontroller. The microcontroller reads the information and sends it to the relay drivers which work as switches. In Arduino we upload the program as per requirement then it performs some mathematical and logical operations to control the relay. [2][5]

Android applications are connected to Arduino Bluetooth (HC-05). In figure 1(b) there is one switch that is connected to relay drivers and one relay module is connected to the home appliances. It is shown in the Figure 2.



Figure 2: Mobile android application

3. Block Diagram

This venture centers around the robotization of machines with the assistance of an android application. In this day and age, enhancement is the primary thought process. A block diagram is a drawing illustration of a system whose major parts or components are represented by blocks. These blocks are joined by lines to display the relationship between subsequent blocks. We use block diagrams to visualize the functional view of a system. It uses blocks connected with lines to represent components of a system. The architecture of this device is shown in figure 3.

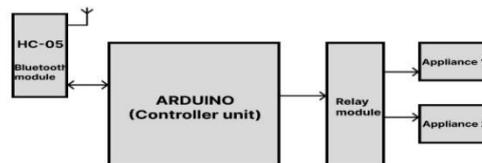


Figure 3: Block Diagram of Home Automation

The user will communicate with the Android application through the Arduino Uno via Bluetooth module. This model is very resilient and gaugeable, with maximum efficiency, safety, and securely added smart home appliances with the least amount of human effort. The Bluetooth signal has the most efficient energy to connect any signal without loss of information with the least harmonics. The home automation system's main part consists of Arduino with a microcontroller. People must have a mobile application with a proper connection. [6][7] It should be used as multi appliances work together. The Arduino board is configured for each home appliance using coding in the microcontroller. With the help of a Microcontroller, we can control the electromagnetic relay which works as a switch to receive a signal from the Arduino through Bluetooth module HC-05. When the signal is transmitted from the transmitter as a datasheet to the relay then the relay works as a switch and controls many appliances of the smart home(multitasking). There are three main parts of this home automation which are given below.

1. Arduino Uno
2. Bluetooth HC-05
3. Relay Drivers

4. Description of Hardware

4.1 Arduino Uno

The Arduino UNO is a standard board of Arduino. Here UNO means 'one' in Italian. It was named UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino. It is considered the powerful board used in various projects. Arduino. cc developed the Arduino UNO board. Arduino UNO is based on an ATmega328P microcontroller. It is easy to use compared to other boards, such as the Arduino Mega board, etc. The board consists of digital and analog Input/Output pins (I/O), shields, and other circuits. The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. The pin description is shown in Figure 4.

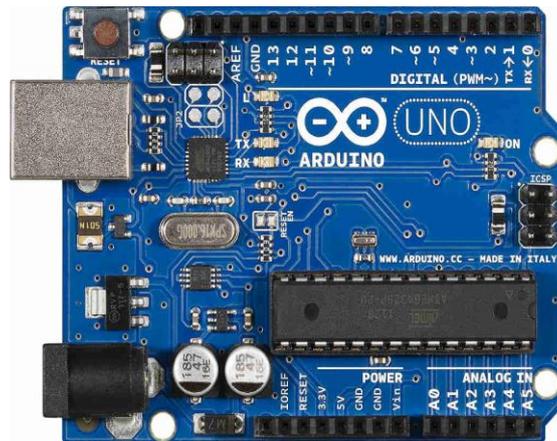


Figure 4: Arduino UNO Board.

It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms. Even relatively inexperienced users can build the breadboard version of the module to understand how it works and save money. The Arduino software is easy-to-use for beginners, yet flexible enough for advanced users.

4.2 Bluetooth Module

Wireless communication is swiftly replacing the wired connection when it comes to electronics and communication. Designed to replace cable connections HC-05 uses serial communication to communicate with the electronics. Usually, it is used to connect small devices like mobile phones using a short-range wireless connection to exchange files. It uses the 2.45GHz frequency band. The transfer rate of the data can vary up to 1Mbps and is in the range of 10 meters. The HC-05 module can be operated within 4-6V of the power supply. It supports the baud rate of 9600, 19200, 38400, 57600, etc. Most importantly it can be operated in Master-Slave mode which means it will neither send nor receive data from external sources. The pin description is shown in Figure 5.

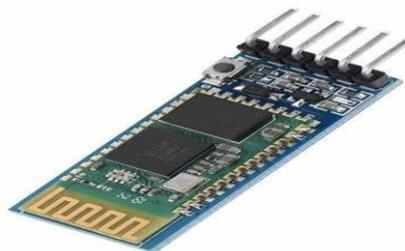


Figure 5: Bluetooth Module

Description of pins

- Enable - This pin is used to set the Data Mode or AT command mode (set high).
- VCC - This is connected to a +5V power supply.
- Ground - Connected to the ground of the powering system.

- Tx (Transmitter) - This pin transmits the received data Serially.
- Rx (Receiver) - Used for broadcasting data serially over Bluetooth.
- State -Used to check if the Bluetooth is working properly.

4.3 Relay Driver

Relay modules (or power relay modules) are ubiquitous electronic components. They are an exceedingly significant component of any home automation project. You will require a relay module if you use a low-voltage microcontroller such as an Arduino to control motors or lighting circuits.



Figure 6: Relay Module

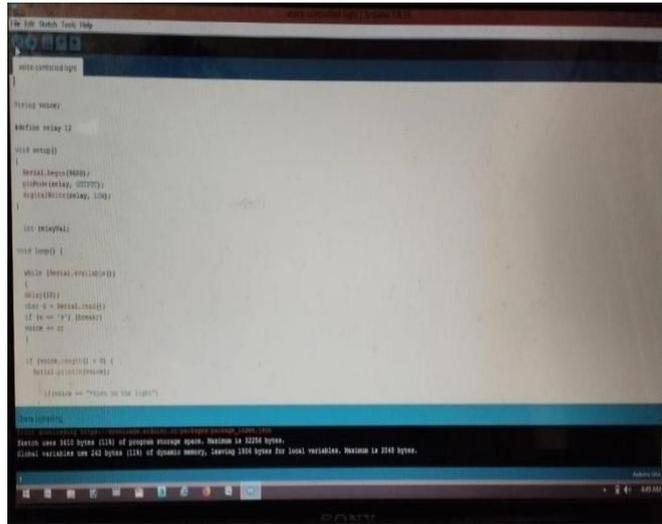
Relay modules do not work like manual light switches. To illustrate, when you switch on a light, you must press a button to connect the two metal contacts within it. Inversely, a relay switch uses electric pulses to turn its internal switch on and off. You power a voltage power current on one side of the circuit that powers an electromagnetic coil that pulls the metal contacts together. Consequently, this allows the current to flow on the other side of the relay. Relay module is shown in Figure 6.

Advantage

- Everything is automated so it is easy to use.
- It is controlled by a mobile application so no extra training is required.
- We can change the controlling system as per our requirement.
- It works on an Arduino-based system so we can easily understand how it works.
- It saves us time.

5. Result

According to the proposed plan, the outcome of this paper leads to the development of home automation. Through this project, an automation system has been created so that we can easily control home appliances like fans, tube lights, AC, bulbs, etc. The result is shown in figure 7,8,9 and 10.



```
int pin Switch, push_btn;
void setup() {
  pinMode(Switch, INPUT);
  pinMode(push_btn, INPUT);
}
void loop() {
  if (digitalRead(Switch) == HIGH) {
    digitalWrite(push_btn, HIGH);
  }
  if (digitalRead(push_btn) == HIGH) {
    digitalWrite(Switch, HIGH);
  }
}
```

Figure 7: Verifying Source code

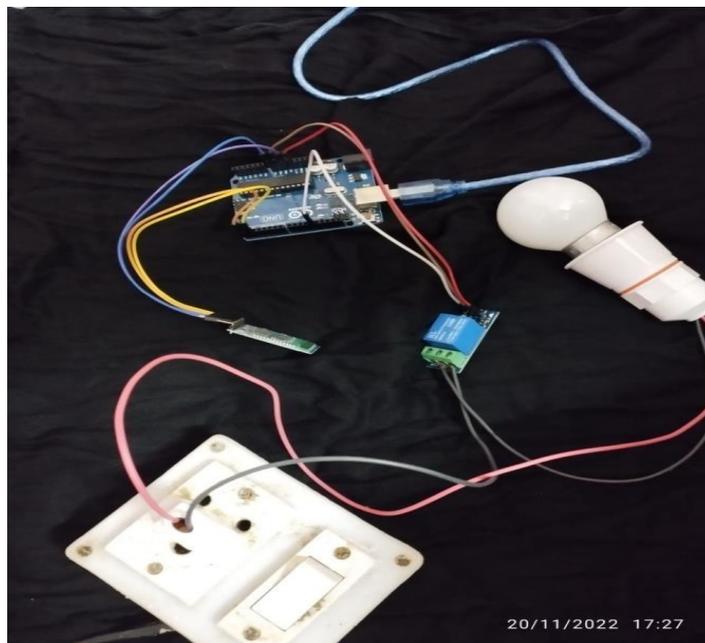


Figure 8: After connection done

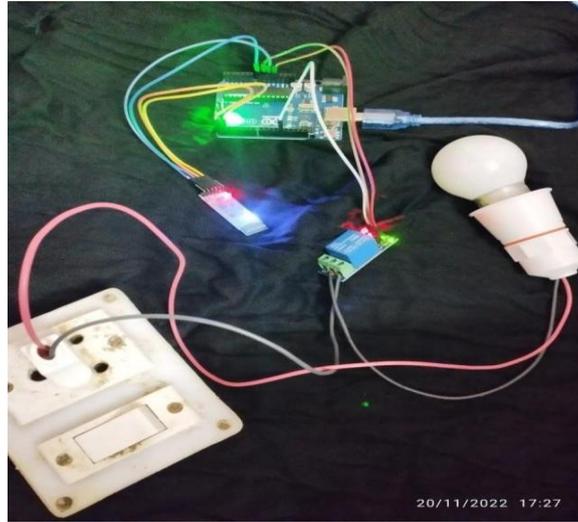


Figure 9: After current passed

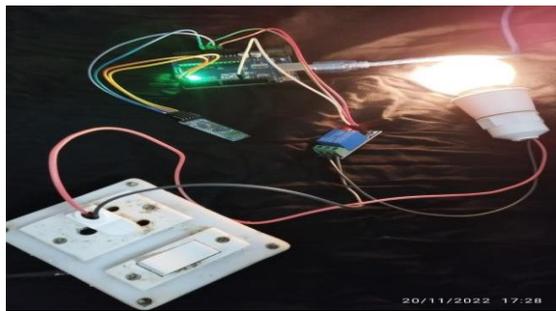


Figure 10: Final Output

6. Conclusion

This is an ongoing project. Our prime objective is to assist handicapped/old aged people. This project gives a basic idea of how to control various home appliances and provide security using Smartphones. This project is based on Android. So, the overall implementation cost is very cheap and affordable for a common person. Looking at the current scenario we have chosen the Android platform so that most people can get the benefit. We have discussed a simple prototype in this project but in the future, it can be expanded to many other areas. We can assist a person with disabilities by enabling them to control their home appliances while they needed most. This android application is having some user-friendly features which ensure the objective of the paper. A purposeful safety and security alert system are also employed to alert the user in tricky situations.

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