

Home Automation Structure Using Arduino Microcommander and Android Application

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Abstract- In today's technologically advancing era, everyone is busy doing their work, no one likes to waste time going to the switchboards turning various tool on or off. Automation is the ability to program and plan a list of events for the tools on the network. With the increase in the usage of power and the human population, there is a vital need to conserve electricity in every possible way. Home automation Structure makes the operations of various home tool more convenient and saves energy. It involves the automatic commanding of all electrical tools at home or remotely by wireless communication. According to surveys by the consumer company The Shelton Group, Americans are willing to pay more than the actual bill to make their home more energy efficient. Keeping in mind all the above problems, we have created such a Structure using Microcommander, Relay modules, and Bluetooth module through which we can command our homes' lights, fans, and other equipment. The microcommander (Arduino) is fixed to a Bluetooth module which helps the smartphone to send and receive data to the microcommander. The main objective of this project is to automate the maximum home tool to a Bluetooth tool which can be command led by an Android Application.

Index terms- Home Automation, Arduino (Microcommander), Bluetooth Module, Android Application

1. INTRODUCTION

The theoretical idea of home automation system has existed for a long period of time. The art or ability of performing a task through instinct is automation. Automation has been applied to autonomous skills of smart homes and intelligent homes. It has been plunging its way into the common household and livelihood of the people. It turns out to be a boon while assisting the elderly. Their fragility makes them vulnerable to movement. Hence, assisting them to achieve common tasks like controlling the

household appliances on the touch of their smartphones. The bluetooth connectivity of the smartphones enable them to be in complete synchrony with the switch of the appliances. The switch status is synchronized with the complete framework of the existing UI switch statuses. This project aims to build such a framework with minimal effort and maximum efficiency with simplicity of establishment.

2. TECHNOLOGY USED

Arduino Board:-

Arduino Uno is the most popular board in the arduino board family. It is a microcontroller based on ATmega328P. It comprises of the components like Power USB, Voltage Regulator, Arduino Reset, Analog Pins, Main Microcontroller, ICSP Pins, TX and RX LEDs, Digital I/O and AREF. You can simply connect it with a computer with a USB cable or power it with a AC to DC power adapter.



Figure 1:-Arduino Board

Bluetooth Module:-

HC-05 is a Bluetooth SPP (Serial Port Protocol) module. It can be used for Master or Slave configuration, making it the great solution to wireless communication. It has 6 pins which includes

ENABLE, Vcc, GND, TXD and RXD, STATE, and BUTTON SWITCH.

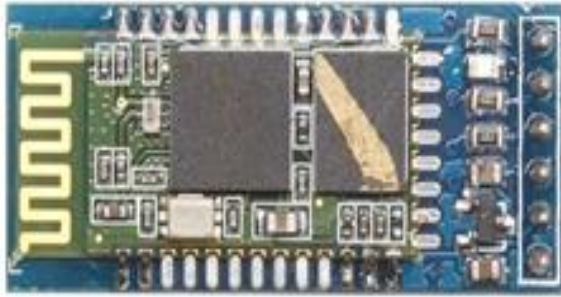


Figure 2:-Bluetooth Module

Relay Module:-

The relay module uses SRD relays to control high-voltage electrical devices (maximum 250V).It can be used to control the lighting and other equipments. It can be controlled directly by a wide range of microcontrollers and can be controlled through the digital I/O port, such as solenoid valves, lamps, motors and other high current or high voltage devices.

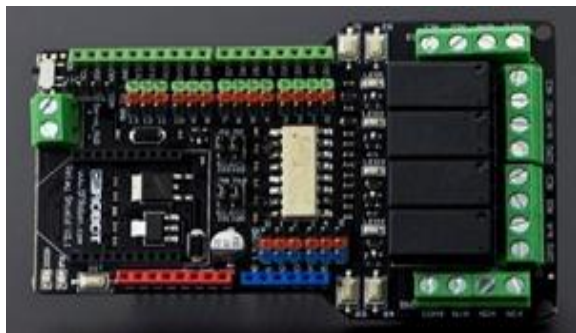


Figure 3:-Relay Module

3. SOFTWARE REQUIREMENTS

Eclipse:-

Eclipse provides IDEs and platforms for nearly every language and architecture. Eclipse Oxygen is used to build an application which connects to the Bluetooth Module and behaves as a remote control for the Arduino Uno.

Arduino:-

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. The environment is written in Java and based on Processing and other open- source software. This software can be used with any Arduino board.

We have used this software to make all our ideas real by coding them into Arduino UNO.

B-Lazy Application:-

- To Control all these features from an Smartphone, an Android application has been created.
- This application uses in-built Bluetooth in Smartphones to send signals to the Arduino board that turns on the specified machine or equipment.
- On start up the app will first ask user permission to turn on Bluetooth.
- Second screen contains a “Paired Device” button which will enlist all paired Bluetooth device.
- Third screen shows a panel which has the MAC address and a progress bar.
- Last screen has all specified buttons to turn on and off, machines and equipment.

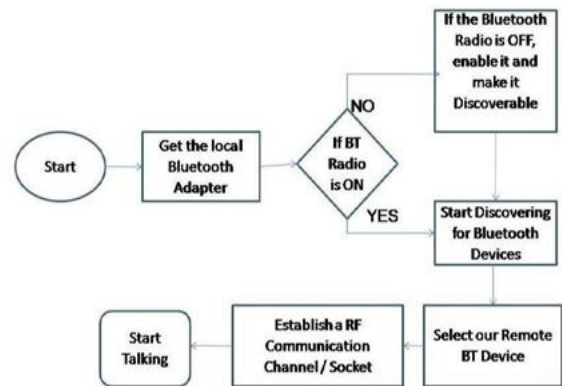


Figure 4:Flowchart for establishing Bluetooth connection

4. SYSTEM WORKFLOW

The android application is introduced into the subsequent smartphones with bluetooth connectivity and latest android variant. We have created such a system using Microcontroller, Relay modules and Bluetooth module through which we can control our home’s lights, fans and other equipment.

The structural framework of the system is as follows:-

1. The android application is readily available in the Google Play Store of the smartphone.
2. Connect to the appropriate connection in the available devices option in the application.
3. Once the matching is done, the client will send signals to the framework structure (ON/OFF).

4. The analog signals are converted to electrical signs by the framework which in turn forwards them to the electrical appliances.
5. The machines respond in a binary manner (ON=1 and OFF=0), informing the client of its current state.
6. After performing the task the client can either initiate a new task or call off the connection.

The association between the equipment's should be possible in the accompanying way:

1. The bluetooth module is introduced in the arduino board with the help of bread board. While the controlling code of the bluetooth module is integrated with the arduino IDE.
2. Likewise the relay board is integrated with the arduino using the bread board which in turn acts as the controlling code of the appliances.
3. The android application acts as an interface between the framework and the client enabling him to control the electrical appliances with the help of his/her smartphone.

5. BENEFITS

1. Home appaliences can be controlled remotely.
2. HAS is useful for debilitated people.
3. No requirement for web association/connection.

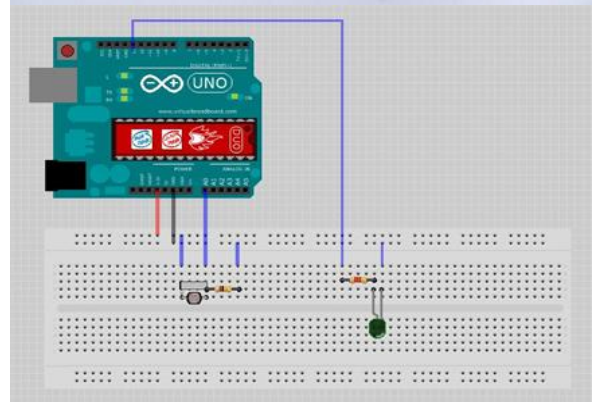
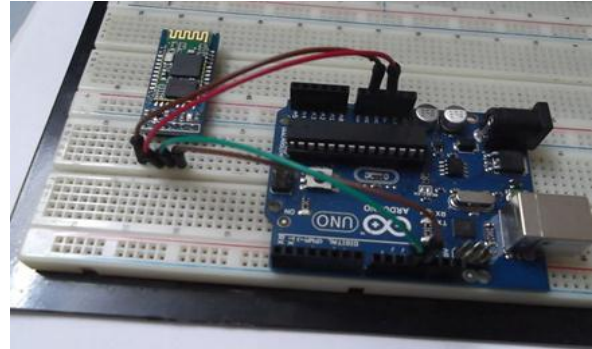
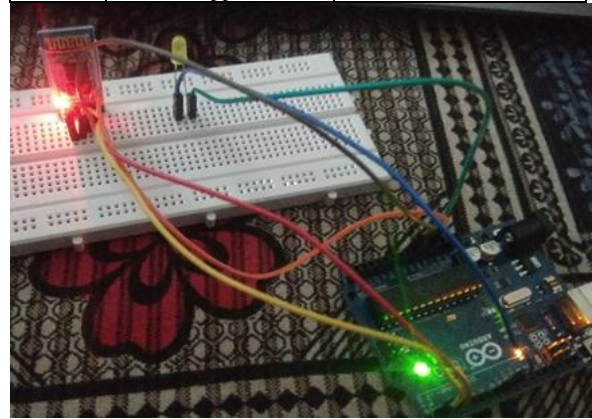
6. FUTURE WORK

1. It is a low cost, secure, ubiquitously accessible, auto-configurable, controlled solution for automation of homes has been introduced.
2. This system helps in controlling home appliances using Bluetooth technology.
3. The basic level of home appliance control and monitoring has been implemented.
4. The system is extensible, and more levels can be further developed using GSM Module so that appliances can be controlled remotely from anywhere.
5. Moreover temperature sensor can be installed to monitor and control temperature remotely.
6. Many more innovations are already live such as Internet Refrigerator and Smart Wiring.

7. RESULTS

Table 1

Tasks	Results	Remarks
IR Sensor	Working in an adjusted diameter. Potentiometer is used to adjust the distance.	Light turns ON when an object comes near and turns OFF when there is no object nearby.
LDR Sensor	Successfully connected with arduino.	Light adjust itself according to the darkness in the room.
HC-05	Bluetooth module is connected with Arduino and can be detected by an android application.	All devices including sensors can be controlled through an android application.



8. CONCLUSION

Conclusively, the framework is not only sturdy and efficient, but also affordable and inexpensive. The salient features of the project include not only the absence of internet connectivity being replaced by bluetooth connectivity but also the appliances being easily controlled by the client. Hardware requirements like the arduino board and bluetooth, relay modules are extensively available in the market.

It is not only cost effective but has numerous futuristic applications too. This framework stands apart from the rest currently in use due its scalability and robustness. It includes minimal number of connections to incorporate the server-user environment. The current technology advancement confines its applications to a limited domain but the future might hold something else as well.

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