

## BILLING AND CONTROLLING OF INDIVIDUAL LOADS OF A COMPOSITE SYSTEM USING SIMPLE ANDROID APPLICATION

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### Abstract

*Now a day, people have smart phones with them all the time. So it makes sense to use these to control home appliances and to regard the electricity bills of individual loads in an integrated system. Presented here is a way to control the electricity bill using a simple android app, by which you can even control electrical appliance. Commands are sent through app via Bluetooth to Arduino Uno. So this project provides not only controlling of electrical appliances it also provides electricity billing of individual loads without physical work. The programming is done in such a way that the units consumed by each electrical equipment are recognised by controller and billing is done to each electrical equipment. When the consumer opens the application then the recorded readings of each equipment are displaced and thus it will be able to control the usage as required to have the control on each equipment individually, arduino smart home automation is used. Arduino Uno is based on ATMEGA 328 microcontroller The app on your smart phone sends the data when you click on button via Bluetooth in the mobile to Bluetooth module HC05 connected with Adriano board thus consumers can have their own savings by reducing the consumption of high consuming electrical equipments.*

### I. INTRODUCTION

The "Home Automation" concept has existed for many years. The terms "Smart Home", "Intelligent Home" followed and has been used to introduce. Due to the advancement of wireless technology, there are several different connections are introduced such as GSM, WIFI, and Bluetooth. Each of the connection has their own unique specifications and applications. Among the four popular wireless connections that often implemented in controlling appliances. It will indirectly reduce the cost of this system. This project forwards the design of controlling and billing system using an android mobile. The home appliances are connected to the input/output ports of Relay along. The android running OS in any phone connected to a network can access the status of the home appliances via an application. It presents the design and implementation of automation system that can monitor and control home appliances via android phone or tablet.

## **II. CIRCUIT AND WORKING OF BILLING AND CONTROLLING OF LOADS USING ANDROID**

The circuit is built around Arduino Uno board, Bluetooth module HC-05 and a 3-channel relay board. The number of channels depends on the number of appliances you wish to control. Arduino Uno is powered with a 12V DC adaptor/power source. The relay module and Bluetooth module can be, in turn, powered using a board power supply of Arduino Uno.

## **III. BLUETOOTH MODULE**

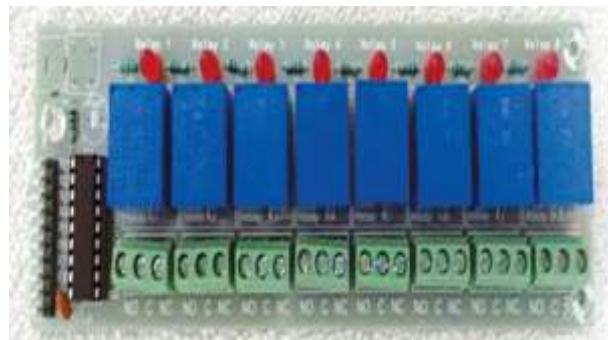
Bluetooth module used in this project is HC-05, which supports master and slave mode serial communication (9600-115200 bps) SPP and UART interface. Using these features it can communicate with other Bluetooth-enabled devices like mobile phones, tablets and laptops. The module runs on 3.3V to 5V powersupply



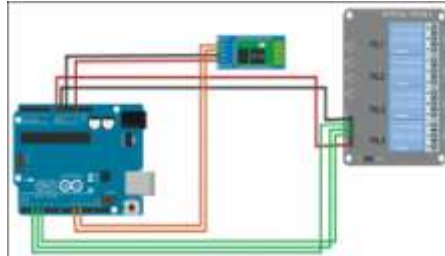
**Fig 1:** Bluetooth module

## **IV. RELAY MODULE**

A relay allows you to turn on or turn off a circuit using voltage and/or current much higher than what Arduino could handle. Relay provides complete isolation between the low-voltage circuits



**Fig2:** Relay module



**Fig 3:** Relay module connection.

on Arduino side and the high-voltage side controlling the load. It gets activated using 5V from Arduino, which, in turn, controls electrical appliances like fans, lights and air-conditioners.

## **V. ARDUINO UNO BOARD**

Arduino is an open source electronics prototyping platform based on flexible, easy-to-use hardware and software. It is intended for artists, designers, hobbyists and anyone interested in creating interactive objects or environments.

Arduino Uno is based on ATmega328 microcontroller (MCU). It consists of 14 digital input/output pins, six analogue inputs, a USB connection for programming the onboard MCU, a power jack, an ICSP header and a reset button. It is operated with a 16MHz crystal oscillator and contains everything needed to support the MCU. It is very easy to use as you simply need to connect it to a computer using a USB cable, or power it with an AC-to-DC adaptor or battery to get started. The MCU onboard is programmed in Arduino programming language using Arduino IDE

Pins 10 and 11 of Arduino are connected to pins TXD and RXD of the Bluetooth module, respectively, as shown in Fig. 6. Pins Gnd and Vcc of the Bluetooth module are connected to Gnd and +3.3V of Arduino board respectively. Pins 2, 3 and 4 are connected to the three relays (RL1, RL2 and RL3) of the relay board. Pins Vin and Gnd of the relay board are connected to pins Vin and Gnd of Arduino board, respectively

## **VI. SOFTWARE**

The software program for controlling using Android app (homeautomation.ino) is written in Arduino programming language called Processing. Arduino Uno is programmed using Arduino IDE software that you can download from arduino.cc. MIT App Inventor software was used to create the Android app (.apk) for this project.

The app on your smartphone sends data when you click on buttons or feed voice commands via Bluetooth in the mobile to Bluetooth module HC-05 connected with Arduino board.

Received data pin TXD of the HC-05 is connected to Arduino. Arduino Uno processes the received data and controls the relay board accordingly.

## VII. CONSTRUCTION AND TESTING

Assemble the home automation circuit as shown in the circuit diagram. Open Arduino IDE and compile the program (sketch). Upload the sketch (homeautomation.ino) to Arduino board. Switch on the power supply to Arduino by connecting it to 12V power source. Pair Bluetooth module with your Android phone. Type password '1234' (default password) of

Bluetooth module. Click Bluetooth Image on the app to connect it with the Bluetooth module. It automatically connects and displays as Connected in the app.



**Fig4:**Authors proto type



**Fig 5:** Connection of appliances

## VIII. CONCLUSION

You are now ready to control the appliances using the app. You can either use on/off buttons or voice commands to control the appliances. You can control more electrical appliances by increasing the number of channels in the relay. For instance, using an 8-

channel relay, you can control up to eight devices. For this, you need to alter the source code by adding input commands and voice commands to control the devices  
Thus this is a simple system to monitor all the appliances with out using the internet by just downloading a simple android application. By which you need not provide much cost to adopt this system. This is the system which provides many advantages like billing of each load per day analysis can be known and can control the appliances. This does not require any human efforts. By using this system even faults in the appliances can be known because of the high billing than usual billing.



**Fig6:Android app design**