

# Bluetooth based Home Automation

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**Abstract:** With advancement of technology things are becoming simpler and easier for us. Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services. In the scope of industrialization, automation is a step beyond mechanization. Whereas mechanization provided human operators with machinery to assist them with the muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well. Automation plays an increasingly important role in the world economy and in daily experience. Automatic systems are being preferred over manual system. Through this project we have tried to show automatic control of a house as a result of which power is saved to some extent. The past decade has seen significant advancement in the field of consumer electronics. Various “intelligent” appliances such as cellular phone, air conditioners, home security devices, home theatres, etc., are set to realize the concept of a smart home. They have given rise to a Personal Area Network in home environment, where all these appliances can be interconnected and monitored using a single controller. Home automation involves introducing a degree of computerized or automatic control to certain electrical and electronic systems in a building. These include lighting, temperature control, etc. This project demonstrates a simple home automation system which contains a remote mobile host controller and several client modules (home appliances). The client modules communicate with the host controller through a wireless device such as a Bluetooth enabled mobile phone, in this case, an android based Smart phone.

**Keywords:** Automation, Arduino, Internet, Smart phone

## 1. INTRODUCTION

Homes of the 21st century will become more and more self-controlled and automated. Simple devices such as a timer to years, but much more sophisticated mechanisms will soon be prevalent in homes around the world. Imagine walking into your home and being greeted at the door with lights illuminating your path without you ever having to touch light switch, with your favourite music streaming through the speakers in whichever room you enter (because your home recognized that it was you and not some other household member), all while having the peace of mind knowing that your home automation system took care of activating your security system. Furthermore, such a system could allow the user to schedule events to occur at recurring intervals (e.g., turn on sprinkler system at 4:30a.m. every Tuesday and Thursday). This report describes an approximation of such a home automation system that was designed and built as a final project for 6.111 at M.I.T. This system was designed to be flexible and generally programmable, extensible such that adding additional features is relatively simple, and modular and forward-compatible, so that new components can be added without redesigning the entire system. To achieve these goals, the system runs a user-defined program on a special-purpose processor, using real-world sensor inputs as operands

## 2. EXPERIMENTAL METHODS OR METHODOLOGY

This home automation system consists of two main hardware components: the cell phone and the Arduino BT board. The cell phone hosts the Python script which enables the user to access the home appliances and also the control commands for the appliances. This Python script communicates with the Arduino BT board and sets up an ad-hoc communication protocol between the two devices, which allows controlling the behaviour of the Arduino BT board. An off-the-shelf ready made Arduino BT is an 8-bit microcontroller board based on the ATmega168 and the Bluegiga WT11 Bluetooth module [11] is used. It supports wireless serial communication over Bluetooth. This board has 23 digital input and output ports, 16kB of flash memory, 10-bit analog to digital converter, pulse width modulator and extra hardware resources which makes it suitable for the required task. The Arduino BT board can be programmed wirelessly over the Bluetooth connection using the microcontroller’s high-level interactive C language [11]. The Bluetooth antenna in our module picks up the packets sent from the cell phone. Subsequently, these packets containing the appliance status commands are pipelined through ATmega168 microcontroller and the designed analogue circuitry according to the definition of each output. Different home appliances are connected to the digital output ports of the Arduino BT board via relays to provide sufficiently high currents and voltage compatibility. For test purposes, 25W, 240V lamps have been used. Figure 2 shows the relay configuration for each device and Figure 3 depicts the Arduino BT board’s communication with the home appliances. Sending commands from software to turn ON/OFF a device may not guarantee the successful operation of the device as the device may be defective. To solve this problem, a feedback circuit has been designed and implemented

to indicate the device’s actual status after it receives the command (ON/OFF) from the cell phone. Once the command has been sent to turn ON a device, the feedback circuit senses the current and gives an output signal by turning ON a respective led on the switching circuitry indicating that the device is ON. Otherwise, the device is malfunctioning indicating that the command was not executed successfully

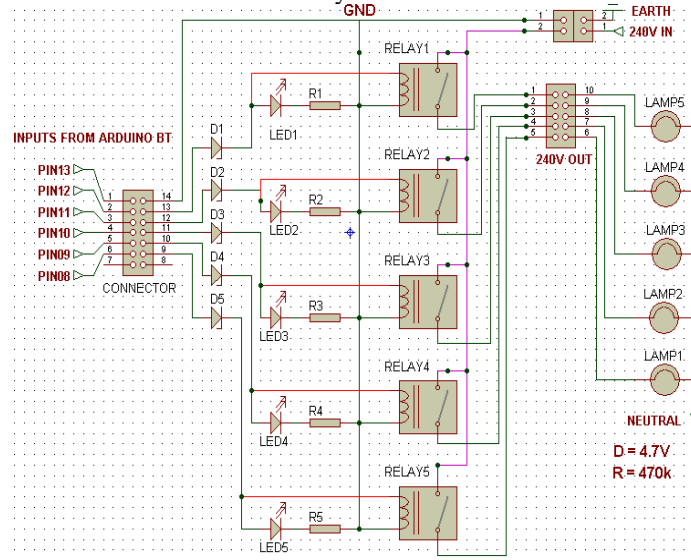


Fig 1. Block diagram of home automation system

### 3 RESULTS AND DISCUSSION

The Bluetooth-based home automation system using an Android phone was successfully implemented. This prototype consists of a controller, power sockets connecting the home appliances to the controller and an Android application (Bluetooth Home) providing the user interface for remotely controlling the home appliances as shown in Figure 2. BluetoothHome is able to control home appliances within the area of the house. The home appliance is turned on/off immediately without any delay when the button is pressed.

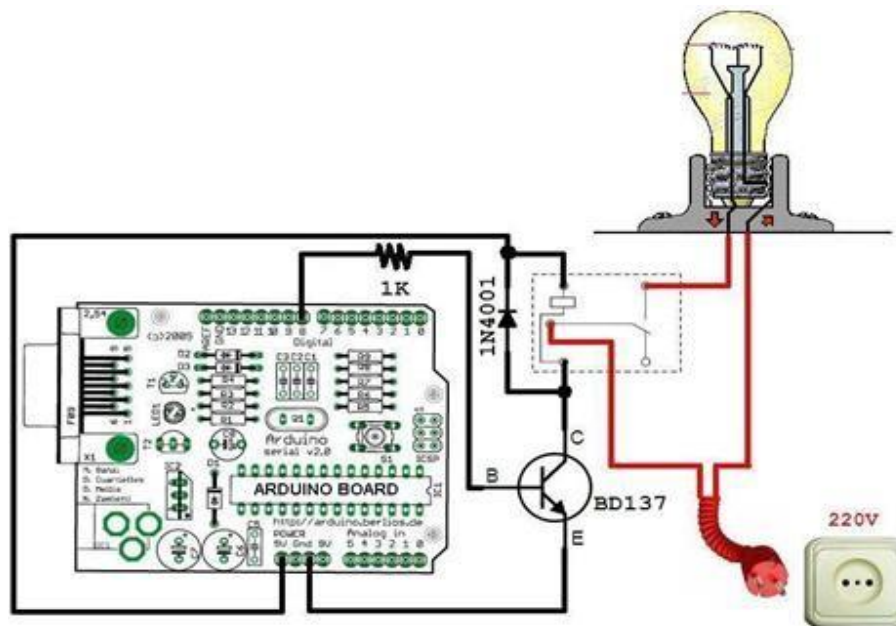


Figure 2. Block diagram of home automation system.

The design and implementation of the Smart Home Automation Controller using Bluetooth for Android mobile phone has been discussed. The purpose of this is to use mobile phone’s inbuilt Bluetooth, Bluetooth serial module for automation of Home Appliances. The different hardware and software section of our system is described. The application program

is tested on various Android mobile phones which are quite satisfactory and responses received from the community in general are encouraging.



**Figure 3. Block diagram of home automation system.**

### CONCLUSION

In this paper we have introduced design and implementation of a low cost, flexible and wireless solution to the home automation. The system is secured for access from any user or intruder. The users are expected to acquire pairing password for the Arduino BT and the cell phone to access the home appliances. This adds a protection from unauthorized users. This system can be used as a test bed for any appliances that requires on-off switching applications without any internet connection. The full functionality of the home automation system was tested and the wireless communication between the cell phone and Arduino BT was found to be limited to

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