Bluetooth Based Device Automation System Using Cellphone

Nupur K. Sonawane.
BE Computer, Sandip Institute
of Engineering & Management,
Nashik, Maharashtra, India

Payal D.Waghchavare.
BE Computer, Sandip Institute
of Engineering & Management,
Nashik, Maharashtra, India

Kajal A.Patel.
BE Computer, Sandip Institute
of Engineering & Management,
Nashik, Maharashtra, India

ABSTRACT

The technology is a never ending process and these technologies will tend to improve the quality of any product. To be able to design a product using the current technology which is beneficial to the lives of others is a huge contribution to the society. This paper

presents the design and implementation of a low cost ,tangible as well as flexible and secure cell phone based device automation system. The design is based on a stand alone Arduino BT(ATMega 238) board and the home appliances are connected to the input/ output ports of this board via relays. The communication between the cell phone and the Arduino BT board is wireless due to which the system can be used by any person who can operate an android phone. This system is low cost and scalable that allow variety of devices to be controlled with minimum changes to its core.

Keywords

Arduino BT Board, Bluetooth, Electronic Devices, Smartphone, Web Server.

1. INTRODUCTION

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. 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 theaters, 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. This project demonstrates an automation system which contains a remote mobile host controller and several client modules (eg. Office, 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. Although automation today is not a new thing but most advanced home automation systems in existence today require a big and expensive change of infrastructure. We have proposed an automation system that can control appliances like TVs, Fan, Tube lights from an android mobile using Bluetooth. In this a low cost secure cell phone based, flexible automation system is introduced. Devices are connected to the Arduino BT board. The communication between the cell phone and the Arduino board is wireless. Additional devices can be connected into the system with little modifications. The phone will be Android. The Arduino will be having microcontroller coding to control the electronics devices like fans and lights etc. Arduino is an 8-bit microcontroller board based on the ATmega328 and the Bluegiga WT11 Bluetooth module is used. It supports wireless serial communication over Bluetooth. This board has 32 digital input and output ports. The Arduino BT board can be programmed wirelessly over the Bluetooth connection using the microcontrollers high-level interactive embedded C language. The Bluetooth antenna in our module picks up the packets sent from the cell phone. Subsequently, these packets containing the device status as commands are pipelined through ATmega328 microcontroller and the designed analogue circuitry according to the definition of each output. Different home or office 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 will be used.

We send commands from an application which is developed in phone to turn ON/OFF a device. A feedback circuit has been designed and implemented to indicate the devices 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.

We can also operate the appliances of Home or Office from long distance that is out of Bluetooth range area. This can be done with the help of Web Server. We will simply log in to Website having all the device names included in it. And can make it ON/OFF. This will send the signal to web server which will at home then it will pass the signal to Arduino BT board and the devices will perform the expected operation.

There is another concept Timer. The Timer will allow us to switch ON any device for specific time. After that time, device will automatically switch OFF as per user's requirement. So that the user can operate it from any location.

2. IMPLEMENTATION

A. Android :

For this home automation and security system we are targeting Android platform since it has huge market and open source. Android is a software stack for mobile devices that includes an operating system, middleware and key applications. Android Applications are made in a Java-like language running on a virtual machine called 'Dalvik' created by Google. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform

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using the Java programming language. Accessory mode is a feature of Android OS since version 2.3.4 Gingerbread and above.

B. Arduino BT Board :

The Arduino BT is a microcontroller board that was originally based on the ATmega168, but now is supplied with the 328.In this paper we use Arduino BT board board that is based on ATMega 328 board[6]. It supports wireless serial communication over bluetooth but not with any other device i.e bluetooth head set or other audio devices. The important feature of this board is it have 20 I/O pins (6 with ADC function and 6 PWM pins).
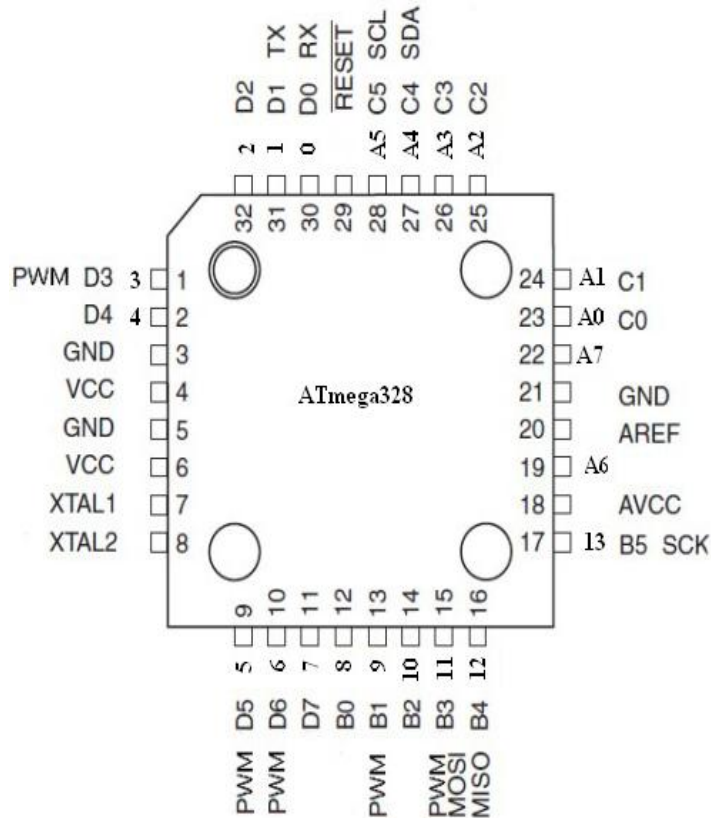
Fig. 1(a) Arduino BT Board

C. Linux Based Web Server :

LINUX is an operating system. It is the most secured operating system. We will need a server to be kept at house to operate the devices from outside the house. Therefore we are providing an operating system i.e. Linux which is more secured. Other person cannot make any changes by going wrong way.

3. BLOCK DIAGRAM :

The above architecture consist of two android mobile phones, ArduinoBT controller, Devices connected to it and WebServer.

For controlling devices of home or office, firstly Bluetooth connection of mobile and Arduino BT board will be done. The devices will be connected to Arduino BT board using relays. The person who want to switch ON/OFF particular device will send the signal from Mobile(1) to Controller through Bluetooth. Then as per requirement the controller will operate devices.

Secondly, if the person is not at home/office still want to operate the devices then can operate them using Web Server. The user will simply have to login to the website where he/she will be able to see the connected devices and their status. Then as per their need the devices will be operated.

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The person will log in, then the request will be send to server which will be at home. The server will forward it to mobile. Mobile and controller will be connected through Bluetooth and then devices will be operated.
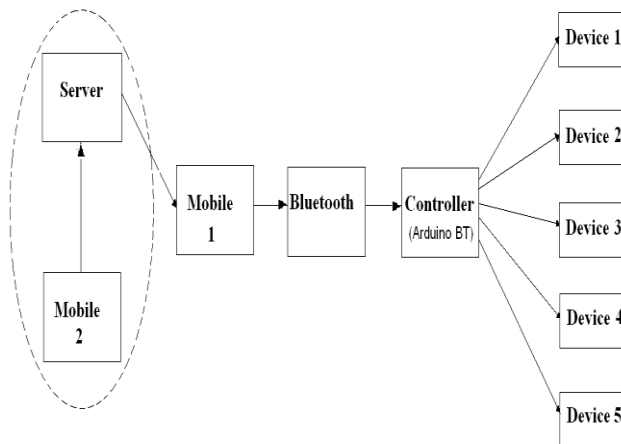

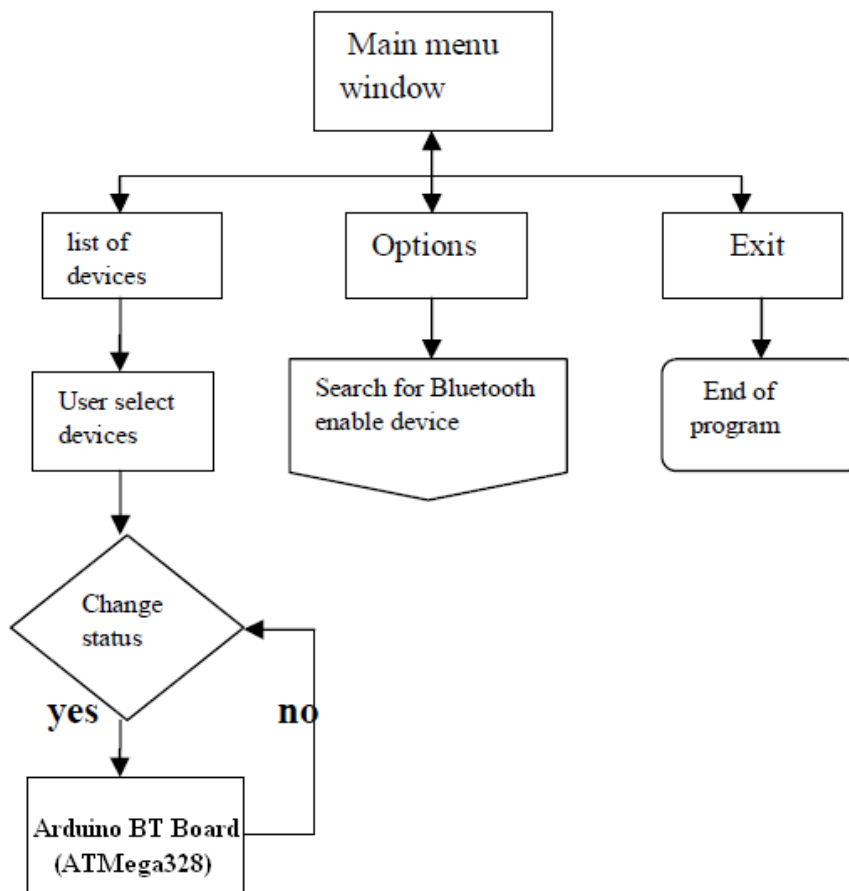Fig. 2(a) Block Diagram
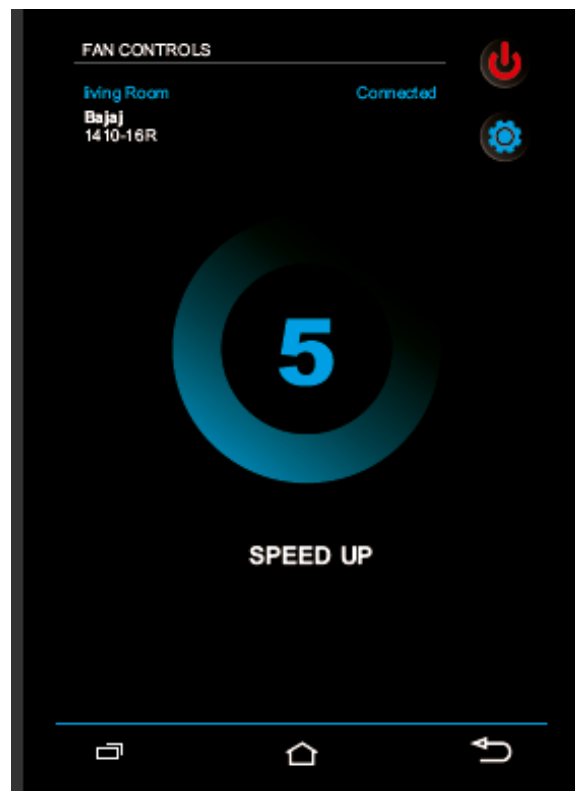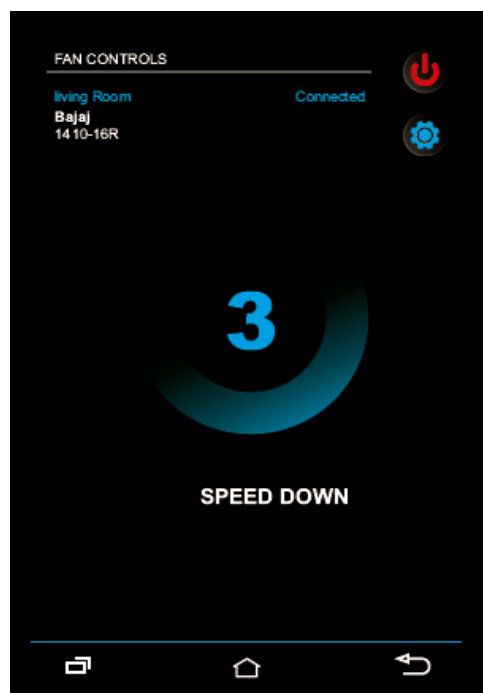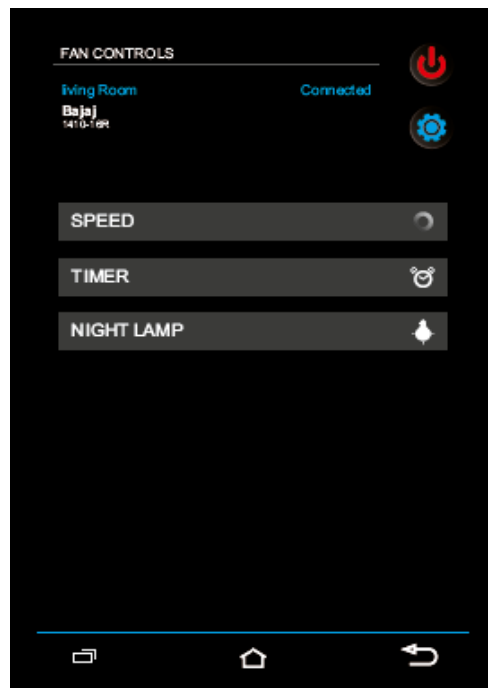
4. SOFTWARE DEVELOPMENT :

A.Flowchart:

Fig.3(a) Flowchart

B.Graphical User Interface (GUI) :

By using the GUI, we are able to customize the application to include a variety of user interface elements such as choice groups, lists, text boxes, alert messages and command buttons. Figure illustrates some designs for the graphical user interface.

5. CONCLUSION :

In our project, our prime objective is to assist handicapped/old aged people. This project gives basic idea of how to control various home appliances using Android phone. This project is based on Android and Arduino platform both of which are FOSS(Free Open Source Software). So the overall implementation cost is very cheap and it is affordable by a common person. Looking at the current scenario we have chosen Android platform so that most of the people can get benefit.

The design consists of Android phone with home automation devices. User can interact with the android phone and send control signal to the Arduino which in turn will control other embedded devices. We have discussed a simple prototype in this project but in future it can be expanded to many other areas.

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