HOME ELECTRICAL DEVICES CONTROLLING USING SMART PHONE ANDROID APPLICATION

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ABSTRACT
The remote appliances control system based on the Android smart phone GUI is designed on Android Smartphone. A user logs into the smart Android phone interface, and clicks the buttons gently to send message commands from the GUI which will be transmitted to home information center through the GSM network. Then the AVR ATmega processor recognizes the specified command, and controls the home appliance switches in the wireless radio frequency manner to achieve remote control of appliances ultimately.
This seminar focuses on the design of Android terminal, the communication between PIC and GSM module, the realization of the wireless module device's driver, the difficulty in supplying the appropriate low-voltage DC for MCU and wireless module just by a single live wire. The users can manipulate appliances anytime, anywhere, letting our houses become more and more automated and intelligent. This work demonstrates a simple solution which consists of an Android phone, controller circuit and load which can be any home appliances.

INTRODUCTION

Over the past few years, there have been so many inventions in the field of consumer electronics such as cellular phone, air conditioners, home security and alert devices, home theaters etc. All the appliances can be easily controlled by a single controller, using a simple network in a home environment (Al-Ali et al, 2004). As a result of our busy environment in homes and offices, the market is going towards the android based electrical appliance control networking system and Bluetooth is an ideal solution for this purpose (Greichen, 1992).
This work demonstrates a simple solution which consists of an Android phone, controller circuit and load which can be any home appliances. At home, we generally operate (switch ON/OFF) all the electrical and electronics appliances such as fan, light bulbs, air conditioner, and so on through switches of the regular switch board. This manual switching of any home appliance is an inconvenient method for the physically disabled, sick, elderly people or even for normal youth when frequent switching operation is required. Thus, this conventional manual switching method has to be overcome by an easier method of switching (Mohammed et al, 2014). This can be done using an advance switching method like a switching control for electronic home appliances with the help of your Android Operating System (Shiu, 2014).
A Bluetooth technology is a high speed low powered radio communication wireless technology link that is designed to connect phones or other portable equipment together. It is a specification (IEEE 802.15.1) for the use of low power radio communications to link phones, computers and other network devices over short distance without wires (Kanma et al, 2003). Wireless signals transmitted with Bluetooth cover short distances, typically up to 30 feet (10 meters).
It is achieved by embedded low cost transceivers into the devices. It supports on the frequency band of
2.45 GHz and can support up to 721 Kbps along with three voice channels (Ramlee et al, 2013)). This frequency band has been set aside by international agreement for the use of industrial, scientific and medical devices (ISM).rd-compatible with 10 devices (Sriskanthan et al, 2002).

This work serves the purpose of aiding the aged, sick and handicapped people in controlling the operations of electrical appliances right there on their seats. It limits their mobility especially for the disabled but carry out the desired goal with a level of comfort. It provides an average user the comfort of enjoying the use of electrical appliances at home and in offices without the interruption of work and switching OFF or ON electrical devices and appliances with a tap on their Android phones.

LITERATURE SURVEY

Home automation or domestic robotics (domotics) is a combination of automation technologies and computer science. High affordability and connectivity through smartphones and tablets has increased the popularity of home automation in recent years . The life quality of the elderly and disabled can be improved by using home automation.

Radio frequency (RF) is one of the techniques used in the home automation network to control and monitor home appliances. Home automation consists of electronic programmable controls for home appliances using wired or wireless communication.

A smart home controller connects the entire house in a home automation system This acts like a centralized control of household systems, such as sprinkler units and inside temperature monitors. With this centralized control unit, a person does not need to leave the couch to turn on/off home appliances, which is convenient for users.

Home automation is designed to introduce convenience and efficiency to a home. People living with physical handicaps may rely on the features of a home automation system to accomplish mundane tasks that might otherwise be difficult or impossible.

MATERIALS AND METHODS

This paper was implemented using the hardware and software approach. This was achieved by using a Bluetooth module (HC-06) to communicate between the hardware system and the smartphone as shown in fig. The software part was based on an android application created using MIT App Inventor 2, which is an easy to use online platform used to develop the android application. The entire system was controlled by on two devices, namely the microcontroller and a wireless network know as Bluetooth. The system architecture composed five major sections namely, microcontroller unit, notification unit, relay and triac unit, communication channel, and power supply unit as shown below. The input, which can either be a voice prompt or a graphical user interface (GUI) command but not both, serves as input to the mobile smartphone through the Android application. The received command is transmitted using the Bluetooth, which is inbuilt in the mobile smartphone.

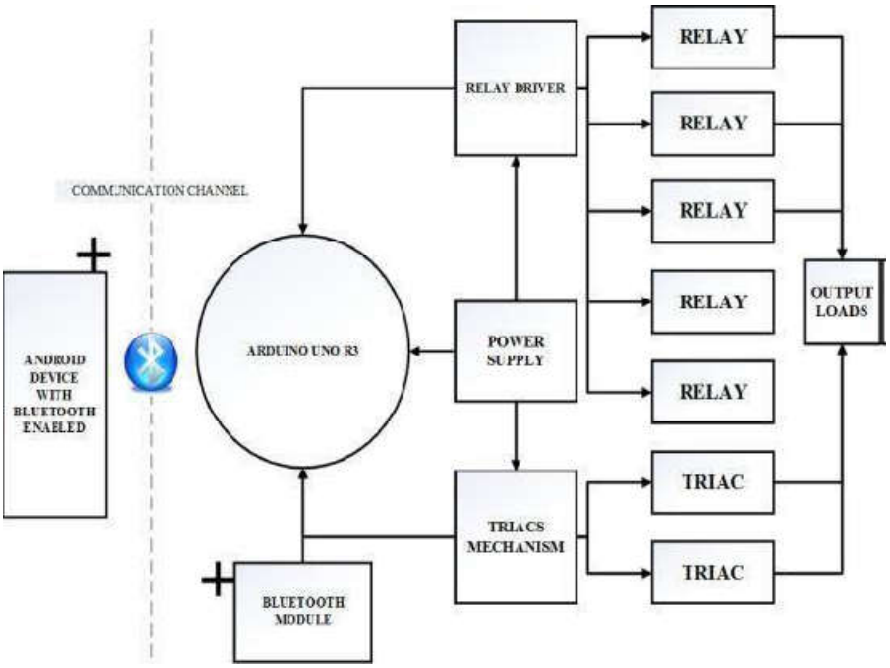


Fig.1. Block Diagram of the System Architecture

SYSTEM ARCHITETURE

SYSTEM OVERVIEW

The system is composed of android mobile terminal, GSM network, home information center and wireless switch. And the architecture of the system is shown in Fig.2.1 at any moment; the GUI in phone allows the user to manually control any of applications in the room. First of all, the action listener should be set for each button which will be clicked to send message command via the GSM network. After reading and parsing the commands, PIC processor controls the wireless module to send the address and data codes to achieve remote control of appliances ultimately.

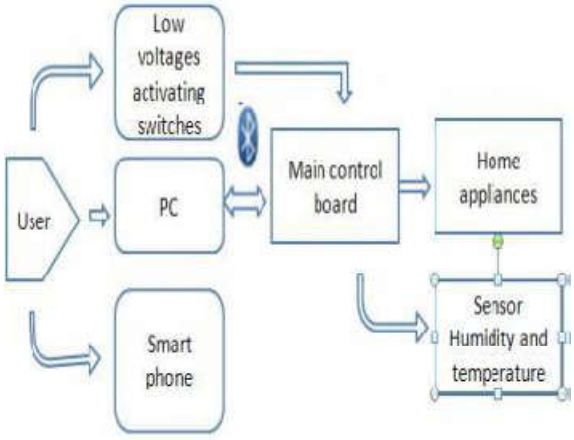


Fig.2. Functional Block Diagram of the System

The terminal based on android phone is designed, which contains GUI design, user management and message command sending event. After entering the lighting control interface, users send predefined commands just by touching the appropriate button or the light bulb icon. The user management includes user registration, login, user information storage and its security. The user registration is to create a legitimate user, and give him the appropriate permissions. The current user ID and the message command will be sent to the home information

center together. Meanwhile, the user ID must be registered in the home information center, so that the center can identify it effectively. Once the user reveals his information or loses cell phone, he has to cancel the valid ID in the home information center to prevent illegal users from operating appliances, aiming at improving the system security. Because the user name and password are simple data types, user information can be stored by the Shared Preferences class, which stores private primitive data in key-value pairs.

HARDWARE DESIGN

This section mainly discuss about the hardware construction of main control board. Fig 4.2 demonstrates the hardware block diagram in the main control board. PIC Microcontroller, PIC18F2550 is chosen due to its capability to perform the both serial and USB features to establish the Bluetooth and USB connection to the GUIs. For the sensor, HSM-20G Sensor Module is chosen because it is the low cost 2-in-1 combination of humidity and temperature modules. For the Bluetooth module, low cost Cytron Bluebee Bluetooth module is chosen to establish the Bluetooth connection between main control board and the GUIs.

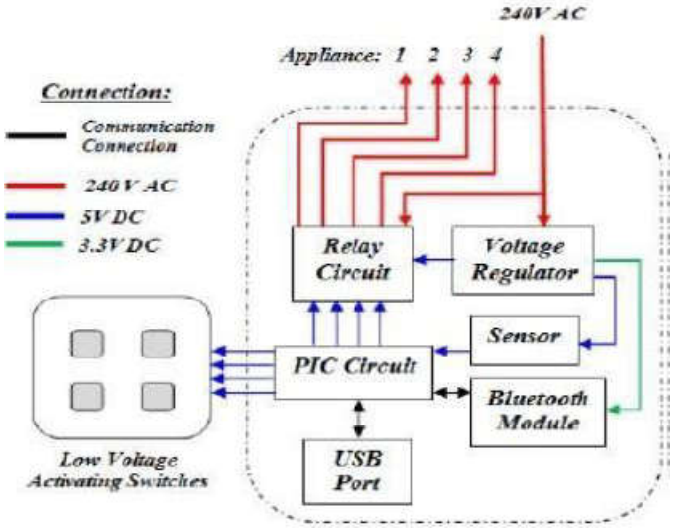


Fig.3. Main Control Board Hardware Block Diagram

The electrical current is directly connect to the main control board whereby it separates the regulator and relay circuit. The voltage regulator is constructed by common reliable regulator circuit which consists of transformer, rectifier and regulator. 5V and 3.3V DC output is regulated in order to fulfill the voltage needs of the specific components in the main control board. Moreover, the low voltage activating switches will replace the existing switches.

SOFTWARE DESIGN

A show that the Bluetooth module and Android Smartphone connection flowchart, which show that transfer of data from Android application to Bluetooth Module after which is compare to programming code of AVR Microcontroller. First check Bluetooth position of Android SmartPhone (Bluetooth is ON or OFF). If Bluetooth of android SmartPhone is ON then it check the surrounding Bluetooth Module and if Bluetooth Connection is off then user have to start the Bluetooth condition from OFF to ON of Android Smartphone. Then Smartphone search for the surrounding Bluetooth Module. After searching the Bluetooth Module it start pairing between Bluetooth Module and Android Smartphone. And if paring is occurs then hardware initialize the serial port. And Then PCB Hardware gets ready to receive the data (Character) which is send by the Android Application software.

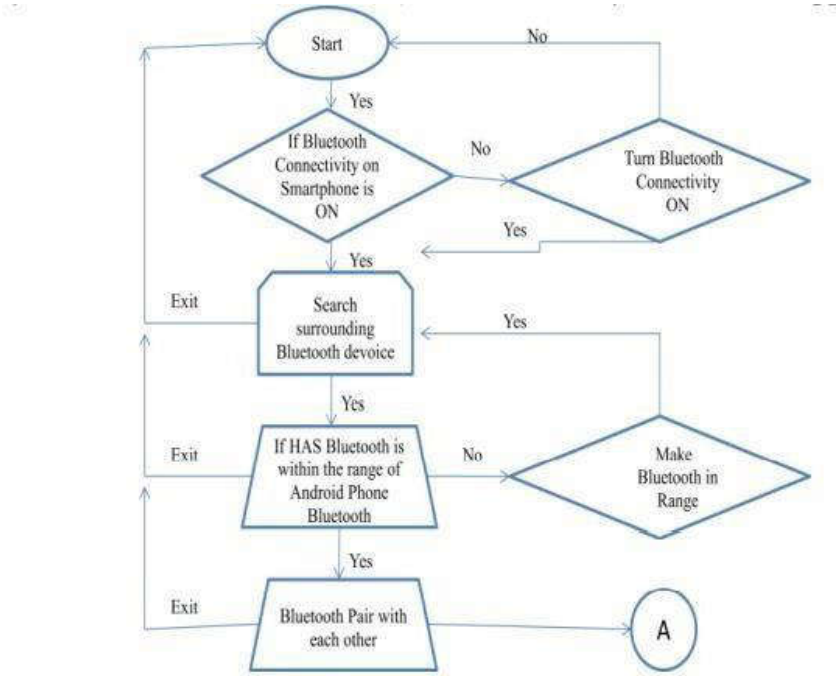


Fig.4. A Flowchart for Bluetooth Module and Android Smartphone connection flowchart

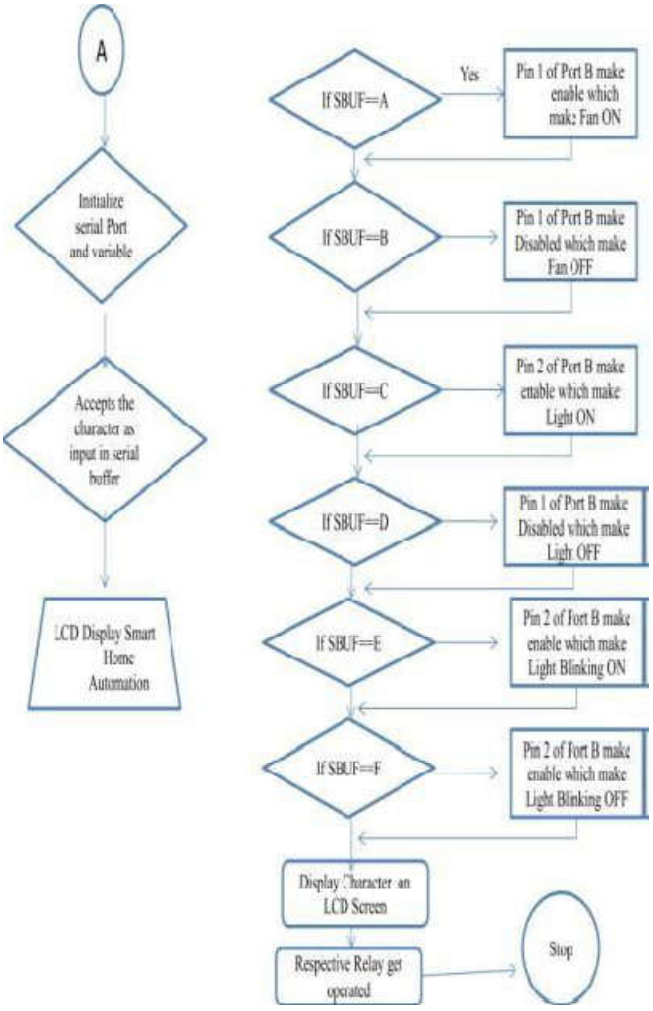


Fig.5. B Flowchart for relay control using Bluetooth Module

When the application software send the Text character to the microcontroller then this character get compare with the internal bourn code of the ATmega controller and accordingly the respective relay get ON and OFF. the passion of relay is depending on receiving character. if A or B is received by Bluetooth Receiver then Light is ON for turning On the UI button and Light OFF for Turning OFF the UI button. This is applicable for the entire button on the UI. Depending on the Button press respective character get send by Android.

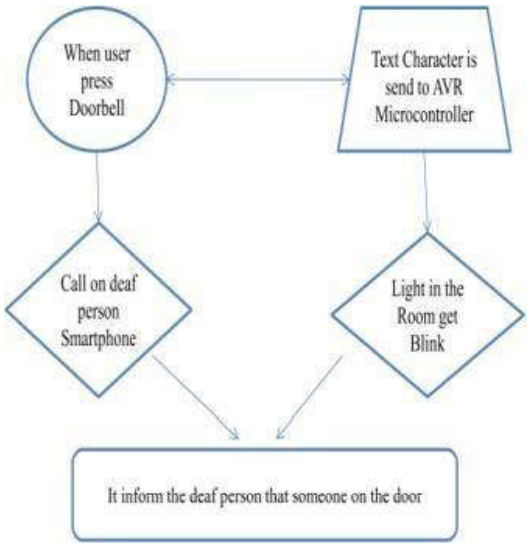
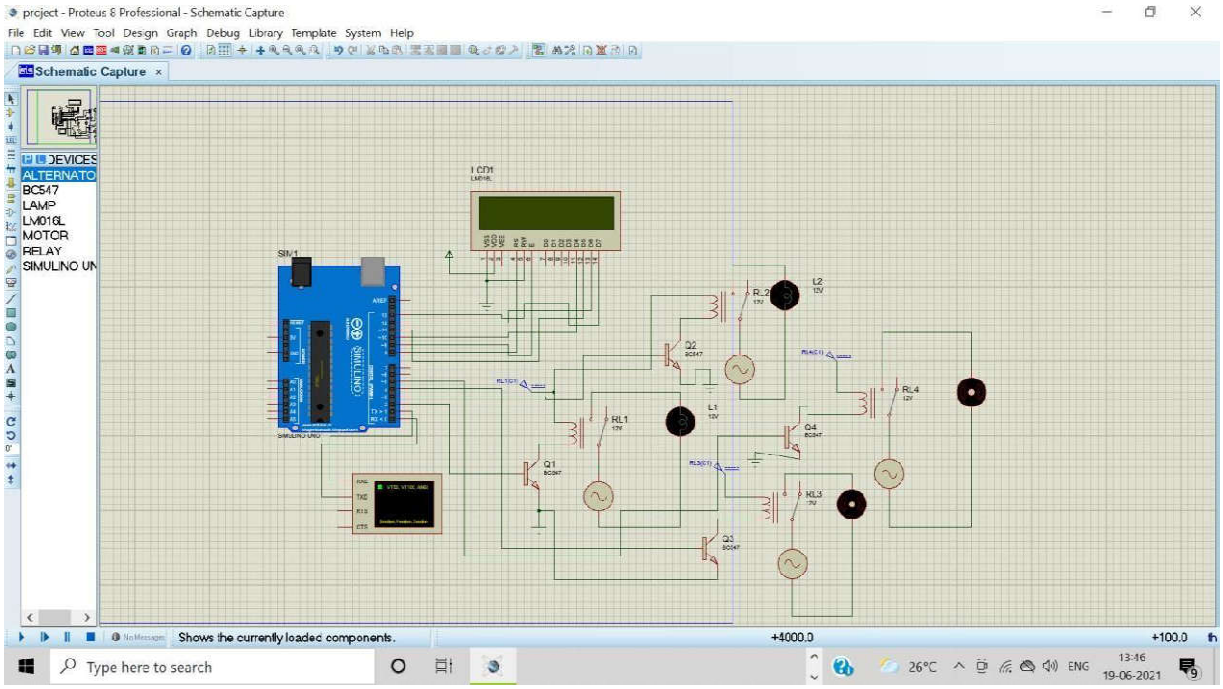
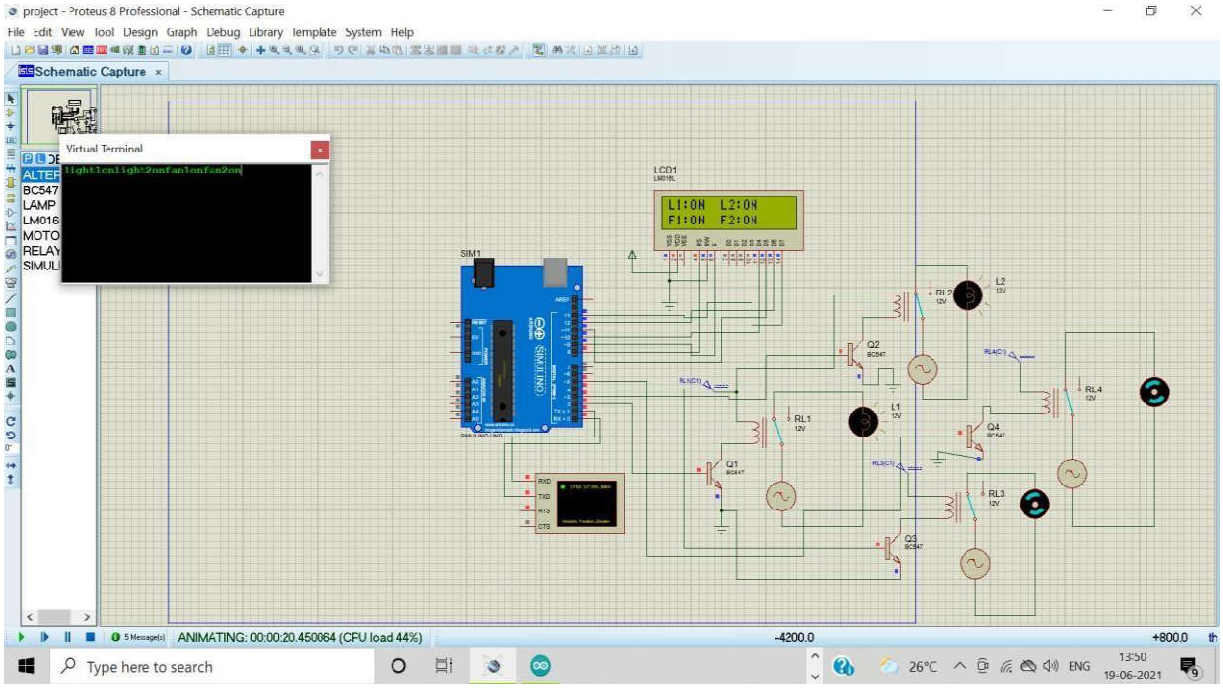


Fig.6. C GSM System Flowchart

After pressing the button of the doorbell (push Button) GSM system call on SmartPhone of deaf person as well as send character to AVR Microcontroller and depending of send character respective relay get on and off (Blinking)this two things inform that deaf person that is someone on the door or someone knock the door.

Results:





CONCLUSION

By designing the Android user interface and Home information centre, home appliance control system based on the Android phone can be designed. It has combined android client, network transmission, and wireless switch, home information center to form a complete system, and the whole system works normally. Identifying message commands and wireless encoding are the two major tasks for home information center. Android phone have advantages such as humane interface, customizable and extendible applications and android phone is easy to carry so on. By constantly improving the control function, android phone allows us anytime, anywhere to control any device, and finally realizes the highly intelligent home.

FUTURE SCOPE

This project can be further developed by integrating it with the internet to monitor your home while sitting in a remote area. By doing this, one can keep an eye on his or her home through an internet connected to the user‟s mobile phone or PC or laptop. This will not only improve the security of your home in this modern day world but will also assist in conservation of energy like if you left any home appliance switched on by mistake, then you can check the status of the appliance on the graphical interface made on your mobile and can switch it off using the internet connectivity.

The users can manipulate appliances anytime, anywhere, letting our houses become more and more automated and intelligent. At present, the PC is used as the remote control terminal for most home control systems [however, there are some problems in the PC monitor terminal, such as its great bulk, inconvenience to carry, high cost, and limited monitoring range and so on. Therefore, it‟s a good choice to design a terminal based on phone.

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