Home Automation System Using Android via Bluetooth

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ABSTRACT: The main objective of this paper is to develop a home automation system using an Arduino board with Bluetooth being remotely controlled by any Android OS smart phone. As technology is advancing so houses are also getting smarter. Modern houses are gradually shifting from conventional switches to centralized control system, involving remote controlled switches. Presently, conventional wall switches located in different parts of the house makes it difficult for the user to go near them to operate. Even more it becomes more difficult for the elderly or physically handicapped people to do so. Remote controlled home automation system provides a most modern solution with smart phones. In order to achieve this, a Bluetooth module is interfaced to the Arduino board (ATMEGA 328) at the receiver end while on the transmitter end, a GUI application on the cell phone sends ON/OFF commands to the receiver where loads are connected.

KEYWORDS: Android, Arduino Board (ATMEGA328), Bluetooth Module.

I.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 microcontroller based switching circuit. The communication between the cell phone and the microcontroller board is wireless. Additional devices can be connected into the system with little modifications. The phone will be Android OS based phone. The switching circuit will be having microcontroller coding to control the electronics devices like fans and lights etc. 8-bit microcontroller board based on the ATMEGA328 and the HC-05 Bluetooth module is used. It supports wireless serial communication over Bluetooth. The ATMEGA328 can be programmed using the microcontroller's 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 circuit 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 in Bluetooth range area.

II.SYSTEM OVERVIEW

This project has integration of Android mobile technology and embedded system. Android mobile user has to install an application on his mobile handset to control the devices. Then he/she can give command using the buttons on that application. For this you have to turn on the Bluetooth on mobile, so the main wireless controlling technique used in this project is Bluetooth technology. Bluetooth receiver will be connected to the project. This Bluetooth device is connected to the circuit which has a decoder. It sends out a code for respective command sent by user. Then the respective device connected to the circuit will be turned on or off depending on the command given. For example: Turn on motor, Turn off motor. Turn on buzzer etc. Such that by giving commands from mobile you can control home appliances.
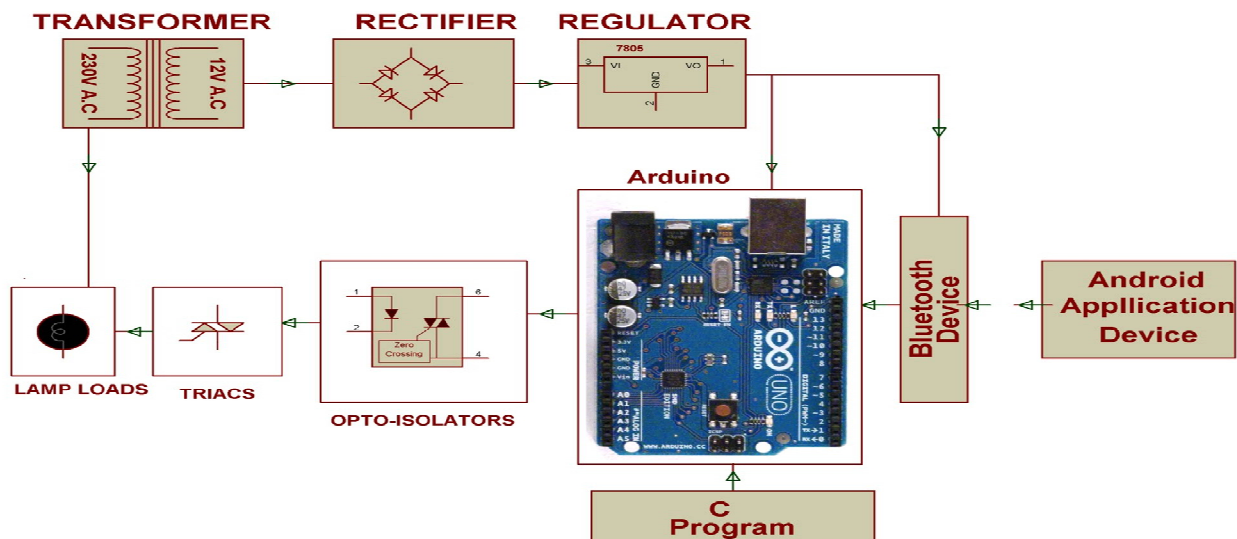

Figure 1.Block Diagram of Home Automation Using Android & Bluetooth

III. HARDWARE DESIGN

This section mainly discuss about the hardware construction of main control board. Fig 1 demonstrates the hardware block diagram in the main control board. PIC Microcontroller 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 Bluetooth module, low cost HC-05 Bluetooth module is chosen to establish the Bluetooth connection between main control board and the GUIs [12]. The hardware section of the primary security is shown in figure 2. To access the main hardware the user has to provide a password which will open the Bluetooth module that is connected in the hardware section. As a central controller PIC microcontroller 16F676 is used. HC-05 Bluetooth module is used here for the purpose of communication with the android system. The existing switch connection is connected and controlled by the Traic & opto coupler circuit inside

main control board. Furthermore, multiple control boards can be installed in home. Bluetooth master device in PC/laptop is mostly able connect up to 7 devices in a Piconet". With these simple and low cost components, the main control board is constructed in pretty small size but still performs the strong functions and features of the system .

Figure 2. Main Control Board Hardware Block Diagram

IV. SOFTWARE DESIGN

Figure 3. Flow Chart of Low Voltage Activating Switches Process[12]

Software design section includes the main functions of the system designed in the PIC microcontroller and the two GUIs (Window and Android application).Fig 3 illustrates the process of the Low Activating Switches in the system. The switches detection function is performed by the microcontroller, PIC. The activating switches are designed by push buttons. Any input switch is pressed, it will interrupt the main function loop of the PIC .Then, the PIC will activate the

relay and toggle the current appliance's switch status. At the moment, PIC also informs the change of switch status to all the GUIs that connected to the main board[12].

V. RESULT AND CONCLUSION

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 android application software has been designed using Eclipse and Android Studio software is used to write and burn the C program into microcontroller. 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 4. Picture of Home Automation System

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