Design and Fabrication of Compact Sized Electrical Signal Controller through Smartphone

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ABSTRACT

Technology is a never ending process. The world is moving fastly towards automation. People have less time to handle any work so automation is simple way to handle any device or machine will work to our desire. This paper aim is to develop and design a Home automation using Arduino with Bluetooth module. Home automation system gives a simple and reliable technology with Android application. Home appliances like fan, Bulb, AC, automatic door lock are controlled by Home automation system using Arduino Uno with Bluetooth module. The paper mainly focuses on the monitor and control of smart home by Android phone and provide a security based smart home, when the people does not present at home. This paper motive is controlled home appliances in smart home with user friendly, design at low cost, simple installation.

Keyword: - Arduino Uno, Home automation, Bluetooth Module, Smart phone.

1. Introduction

Now days everyone has smart phone and wants to control everything from smart phone. Everyone knows how to control mobile phone so it easy to use and understand[1]. Lights, fan, switches, refrigerator are controlled through Bluetooth based using arduino. The designing of home automation are going to become simpler and more popular because most of people uses smart phone now days[9]. In this device we are using Arduino which is most commonly used device for automation. Arduino is a hardware which is used to connect computer and the project model so that we can control it by using Arduino code accordingly[3]. Arduino is a microcontroller it is just like human brain it processes information and then it perform some Logical and mathematical operation on that information. Arduino is connected with the Bluetooth module which receives the information from user. Arduino also connected relay, which receives information from Arduino and perform the operation as switch. Bluetooth technology is Wireless radio transmissions in a short distance providing a necessary technology to create intelligence and controllability. This generates personal area network in home environment, where all these appliances can be interconnected and monitored using a microcontroller with Arduino using smart phone[1].

2. Methodology

Home automation describes a system of networked, controllable device that work together to make your home more comfortable, customized, efficient and secure[2]. In this device there are five main parts Arduino, Bluetooth module, Relay module, android application and USB charger. Firstly we provide power to the USB charger, it the input voltage and given to the Arduino with VIN pin. The Bluetooth module is also connected with Arduino to Rx and TX pin that provides the information to the microcontroller. Microcontroller reads the information and send to the relay module which work as

switch. In Arduino we upload the program as per requirement then it performs some mathematical and logical operation to control the relay module[5].

Those all parts are connected as shown in figure 2(a).

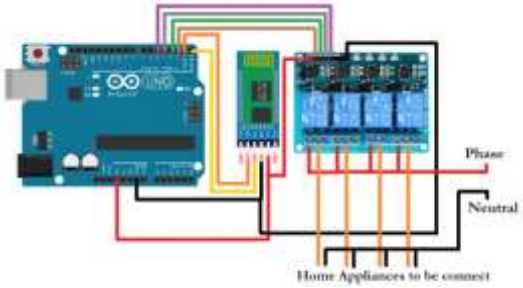

Fig2 (a)-circuit diagram of home automation.

Android applications are connected to the Arduino Bluetooth (HC-05[6]. In the figure 2(b) there are ten switches which are connected to Bluetooth module and four relay are connected to the home appliances[1].

Fig2 (b)- Mobile Android Application

3. Architecture of the Device

In this project .The user will communicate to Android application through the Arduino Uno via Bluetooth module[4]. This model is very reliable, maximum efficiency, safety and securely added smart home appliances with least amount of human effort. The Bluetooth signal having most efficient energy to connect any signal without loss of information with least harmonics .Home automation system main part consists of Arduino with microcontroller[5]. The people must have mobile application with proper connection. It should be used as multi appliances works as together[8]. The Arduino board is configured for each home appliances using coding in microcontroller. By the help of Microcontroller, we can control the electromagnetic relay which works as a switch to receive a signal from the Arduino through Bluetooth module HC-05[3]. When the signal transmit from transmitter as datasheet to relay then the relay works as

switch and control many appliances of smart home (multitasking)[7] .There are three main parts of this home automation which is given below.

1. Arduino Uno
2. Bluetooth HC-05
3. Relay Module.

4. Description of Hardware

I. Arduino Uno:-

The Arduino UNO has power pins, communication channels, programming part enabled in it for use and various utilizations[5]. The power pins are Vin, 5v, 3.3v and ground. Vin is responsible for transmitting input voltage to the Arduino board (5v supply) through USB cable, laptop or regulated power supply[4]. It can supply regulated and desired voltage by using this particular pin. 5v is the controlled supply which can power the microcontroller and rest of components present on the board[7]. The device ATMEGA328P comprises of 32kb memory out of which 2kb is used up by SRAM and 1kb is utilised by EEPROM. The highly efficient Atmel 8-bit AVR RISC microcontroller has about 32kb of ISP flash memory with various capabilities such as 22 general purpose working registers, read-while-write methodology, three flexible counters, internal interrupts, external interrupts, USART (serial compilation), SPI serial connection. Because of well design in the form of Arduino it is easy to understand[3]. In Arduino we use high level of programming language like C language, C++ language etc. It is easy to understand and user friendly language[6]. It has much advantage like multitasking, automation, time domain etc. Arduino Uno fig4 (a) is given below.

Fig 4(a) - Arduino Uno

II. Bluetooth Module HC-05:-

Bluetooth module HC-05 is used for wireless communication between Arduino Uno and smartphone[4]. HC-05 is a slave device and it can operate at power 3.6 to 6 volt[9]. It has 6 pins: state, RXD, TXD, GND, VCC and EN. For serial communication connect TXD pin of Bluetooth module[3]. Bluetooth module is used to connect the microcontroller with android application. Bluetooth receive the information from user and send to the microcontroller (Arduino Uno)[6]. It is simple to use Bluetooth Serial Port Protocol(SSP)[7].The Bluetooth of serial port module is Advanced Bluetooth v2.0+Enhanced data Rate at 3Mbps modulation with 2.4 GHz radio receiver with BB(base band)[4].The Bluetooth of Rx and TX pins are connected to the Arduino pins of TX and Rx respectively . HC-05 module is a simple to utilize Bluetooth SPP (Serial Port Protocol) module, intended for straightforward remote sequential association setup. It utilizes CSR Blue canter 04-External single chip Bluetooth framework with CMOS innovation

and with AFH (Adaptive Frequency Hopping Feature)[3]. It has the impression as little as 12.7mmx27mm.The figure 4(b) of Bluetooth HC-05 module is given below.

Fig 4(b) - Bluetooth HC-05.

III. Relay Module:-

4 Channel Relay Board is a simple and convenient way to interface 4 relays for switching application in our project[6][4]. Relay is an electromagnetic switch which is used to defer two circuits electrically and connect magnetically[5]. When Arduino transmit the signal then relay module receive signal and start its work[2]. They are frequently used to interface an electronic circuit (working at low voltage) to an electrical circuit which works at extremely high voltage[7]. For instance, a hand-off can make a 5V DC battery circuit to switch 230V AC mains circuit[4]. In this way a little sensor circuit can drive, say, a fan or an electric knob. A transfer switch can be separated into two sections: information and yield[6]. The info area has a loop which creates attractive field when a little voltage from an electronic circuit is connected to it[1]. This voltage is known as the working voltage. Generally utilized transfers are accessible in various arrangement of working voltages like 6V, 9V, 12v, 24V and so on. In a basic hand-off there are three contactors: ordinarily shut (NC), regularly open (NO) and normal (COM). At no info express, the COM is associated with NC. At the point when the working voltage is connected the transfer curl gets charged and the COM changes contact to NO[2]. Diverse transfer setups are accessible like SPDT and DPDT which have distinctive number of changeover contacts. By utilizing legitimate blend of contactors, the electrical circuit can be turned on and off. Relay circuit shown in fig4(c).

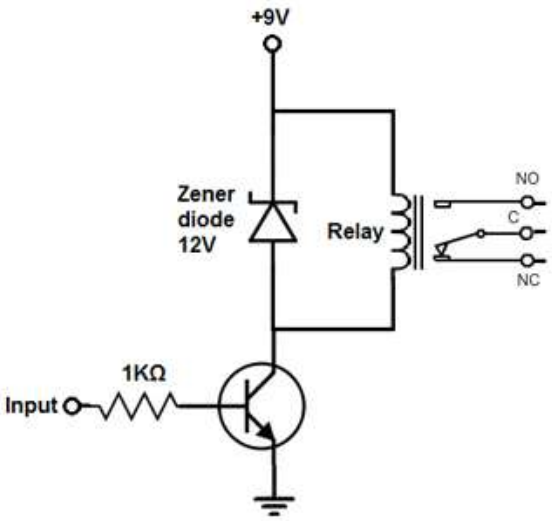

Fig 4(c) Relay circuit diagram

So as to drive the hand-off, we use transistor and just less power can be utilized to get the transfer driven[6]. Since, transistor is an intensifier so the base lead gets adequate current to make increasingly current stream from Emitter of Transistor to Collector[4]. In the event that the base once gets control that is adequate, at that point the transistor leads from Emitter to Collector and power the transfer. When the power is transmit to the relay works as a switch due to electromagnetic effect so that we can switch ON or OFF our home appliances.

Fig 4(d)- Relay module

5. Advantage

- Everything is automated so it is easy to use.
- It is control by mobile application so no extra training is required.
- We can change controlling system as our requirement.
- It works on Arduino based system so we can easily understand how it works.
- It saves our time.
- Every home appliance can control by one android application.
- Easy installation and user friendly.

6. Result

According to the proposed plan the final outcome of this paper leads to the development of a home automation. Through this project, an automation system has been created so that we can easily control home appliances like as light, fan, tube light, AC, bulb, etc[9]. One of the objectives of this project is also to get us a smart automation and low cost project[4]. In this paper we have also provided information about Arduino Uno, Bluetooth controller and relay module. And the information about their work is given. Along with the component of home automation, its advantage has also been discussed[7]. The system is easy and secured for access from ant user or intruder. Final outcome of the project is given below in fig 5(a)(b).

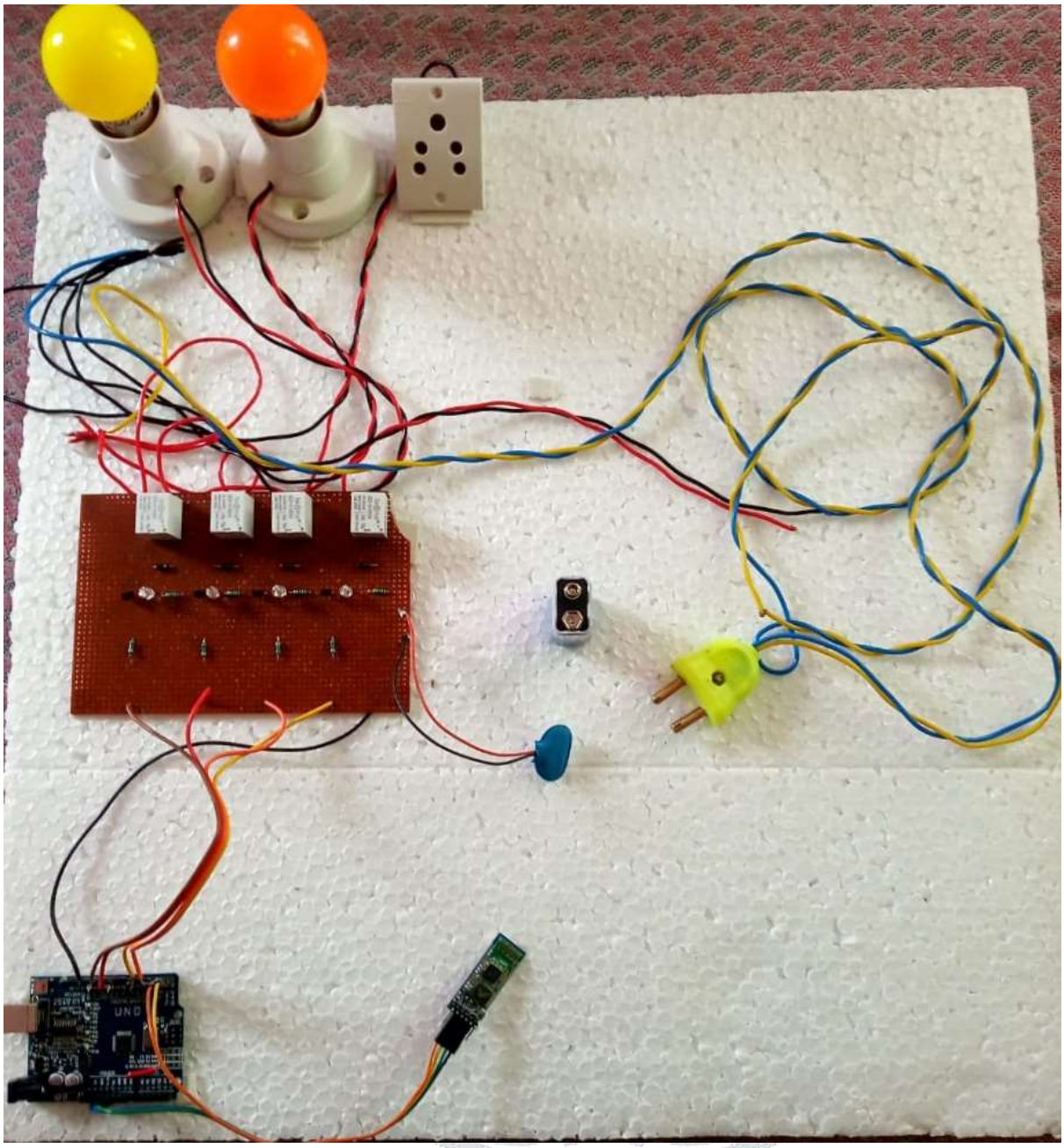

Fig 5(a) - Arduino with relay module

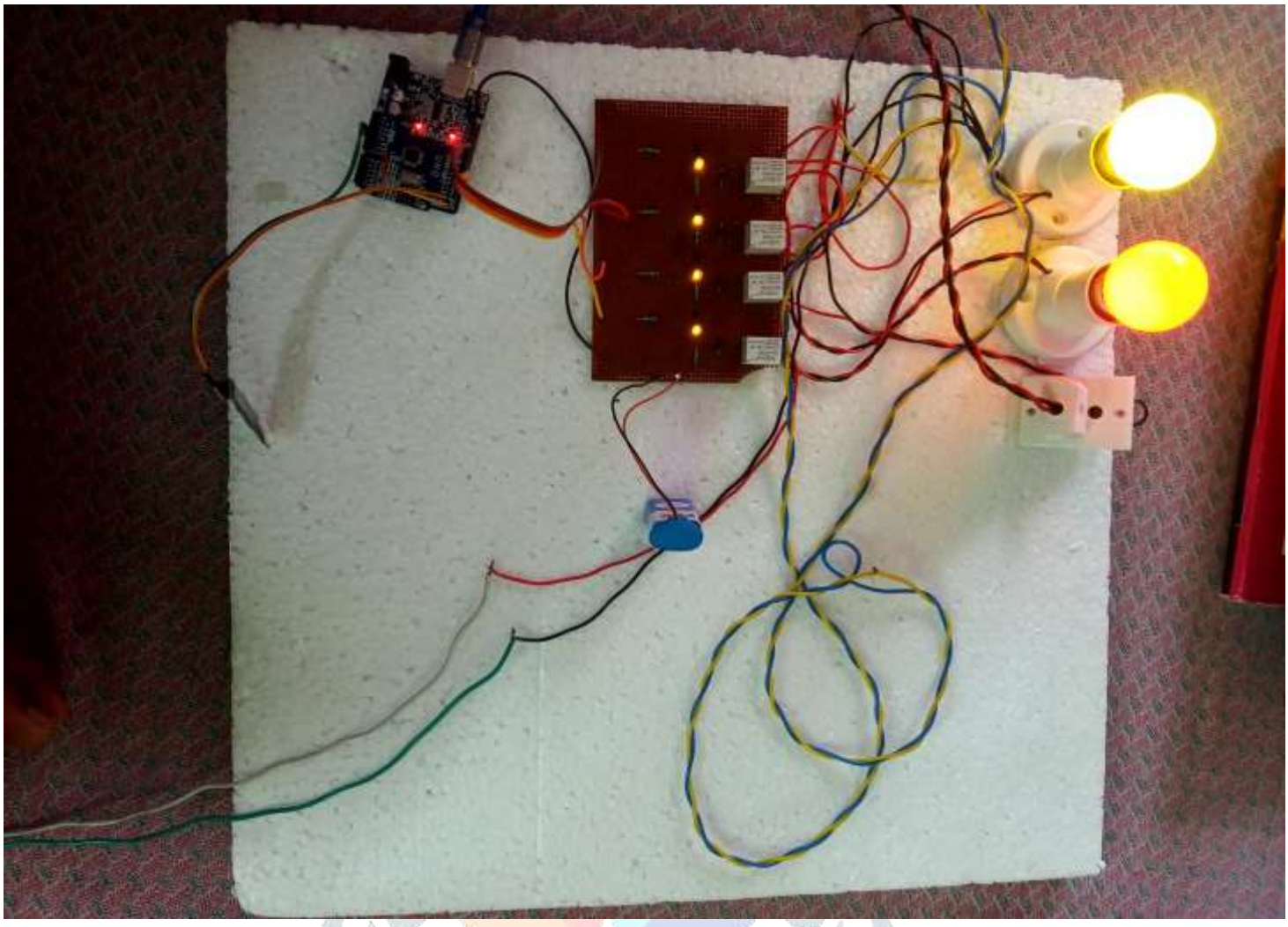

Fig 5(b) - Arduino with relay module and Bluetooth module

7. Conclusion

It can be concluded from the above discussion that Home automation is a special kind of device which controls home appliances with using extra effort. And in this paper, we demonstrated how the home automation is made, discussed about methodology and what its application can be. And in the future, on the new technology can be included which reduces human effort, which is being researched, we also talked about it. And we've created a that type of device which is compact in size, low cost, more capacity, long life and more distant signal receivers . The need of this research paper is to create a device which saves the electricity and improve human life style.

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