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SCRUTINY OF COMMERCIAL AUTOMATION SYSTEM TO MONITOR & CONTROL THE LOAD VIA BLUETOOTH

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ABSTRACT

Microcontroller based our system is getting popular and widely used in a lot of houses worldwide. It has tons of advantages to users even more to the handicapped and /or elderly users in which it will make it easier for them to control their appliance. Home automation system can be labeled to two labeled to two medium in which how it is connected and they are either wired or wirelessly connected. The main difference between these two kinds is that home appliances are linked wirelessly a central controller if it a wireless home automation system. On the other hand, the appliances are connected to a central controller if the medium use wired communication method. Wireless system had been introduced in order to dispose of wired communication among home appliances. Adriano based, Bluetooth based home automation will be applied.

Keywords: Microcontroller, Bluetooth system, Arduino, Smart phone, Home automation system, Wireless communication.

I.   INTRODUCTION

1.1 Overview
Microcontroller based controlling technique (Automation) has been around since the war I (1994) in fact, the television remote (a simple home automation system) was patented in 1893. Since then different automation has evolved with a sharp rise after the second world war. It's growth has been through various informal research and design by technology enthusiasts who want a better way of getting things done at home without much effort on their part. Early microcontroller began with labor saving machines. Self-contained electric or gas powered home appliances became viable in the 1990s with the introduction of electric power distribution.

In 1975, the first general purpose home automation network technology was developed. It primarily uses electric power transmission wiring for signaling and control where the signal involve brief radio frequency burst of digital data and remains the most widely available .

Nowadays, everyone cannot be separated from their smart phones. a number of five thousand individuals from USA, UK, South Korea, India, China, South Africa, Indonesia and Brazil took a survey regarding which was done by Time magazine. The result proved most of them is inseparable from their smart phones, eighty four percent allegedly claimed that survive without their smart phones.

Another study shows that seventy-five percent of the market share is of one hundred and six million android smart phone were shipped in the second half of 2012. World-wide and it became the most popular operating system known to man.

Problem Statement:
In the present day commercial and domestic microcontroller based system is becoming essential for the purpose of improving our life condition. Convenience and ease of using home appliances is what home automation is offering. Our project offers a futuristic way of life in which an individual gets to control his entire house using a smart phone, from turning on a TV to locking/unlocking doors; it also offers an efficient use of energy.

But to get or acquire such system installed will cost a lot of money and that is the major reason of why home automation has not received much demand and attention, adding to that also the complexity of installing it and configuring it. Thus it is essential to make it cost effective and easy to configure, if this is granted to people then they will be willing to acquire it in their homes, offices and schools. In other words, a system modification for the home automation is required in order to lower the price of applying it to houses.

Also commercial/home controlling system (Our Project) offers ease of mind and body to handicapped and/or elders in their houses by just one click to do what they want as stated above. A home network program is developed using visual $C++$language. the proposed Bluetooth home network system is composed of server interfaced program and client program. The software controlling the Bluetooth module includes a set of instruction which are necessary to initialize the Bluetooth device after power on or reset , configure it to establish the connection the subsequent exchange of data. The Bluetooth home network is organized when the client Bluetooth modules are connected with server Bluetooth, so this setup is not easily. Despite increased understanding of computer based programming capabilities, consumers will have little understanding of or interest in the technical details.

Objectives:-
* To construct a wireless commercial/home automation system controlled by a smart phone specifically an android device.
* To design and implement a low cost, reliable and scalable home automation system that can be used to remotely switch on or off any commercial/household appliance.
* Using a microcontroller to achieve hardware simplicity, low cost short message service (SMS) for feedback and future improve to voice dial from any phone to toggle the switch state.
* To design a user friendly and a safe system to control home appliances especially aimed to aid the elders and handicapped.
* To save our essential time during to turn on our equipment, which does not allow to go from one working place to switch place.
* To update and consideration in latest technology and make cost effective, power efficient, safely operating system.

Significance:-
This study will be undertaken to create a home automation system at low cost and easy to create, this will benefit both the manufacturer and the client. It will help the manufacturer by making it easy and cheaper to apply it, and it will also benefit the clients by making it cost effective and the most important advantage is that it will make the house a much more convenient place for the clients especially for the elders and the handicapped.

It is also helpful to reduce manpower, energy usage and also for improving the quality and efficiency of any system. Present states of load can be monitored easily by our project. These are most significant points of our project.

Small Introduction of our Project
In our project we will design and implement an efficient load controlling and monitoring system   with an Adriano board and Bluetooth. The system consist of mainly three components i.e. a Bluetooth module (HC-05), Adriano microcontroller and a relay circuit.

In our project Bluetooth is used as a communication channel between android phone and Adriano microcontroller hence it provides attractive user interface.

II.   METHDOLOGY
In this section we will explain the steps or path needed in order to achieve the goal of the project 'MICROCONTROLLER CONTROLLED AND MONITERED LOAD THROUGH BLUETOOTH'.
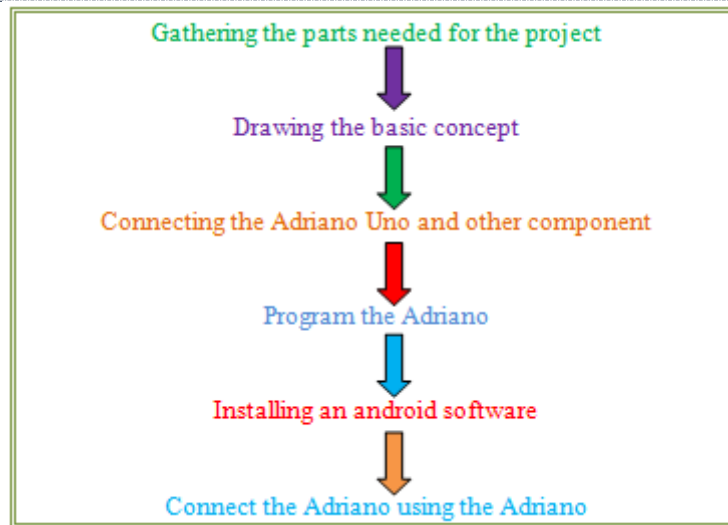
Fig. 1 flow chart for ADRIANO connection

III. WORKING PRINCIPLE

A 230V AC supply is connected to the primary side of a step down transformer.tis transformer step down the 230V AC to 12V AC. The output of transformer is then fed to a Bridge rectifier along with a capacitor; this converts the 12V AC to 12V DC output. This output is then fed to a 5V voltage regulator(IC 7805).From this we get regulated 5V DC supply which is then fed to 5V pin of ARDUINO Uno board and to the VCC pin of 4 Relay Module as shown in circuit diagram.
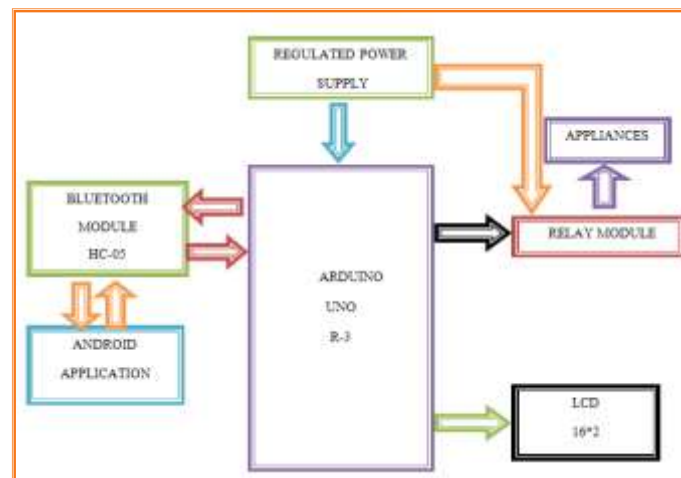
Fig. 2 Bock diagram of the interconnection of elements

Bluetooth Module is connected to ARDUINO Uno Board to serially receive the data sent Bluetooth Terminal App through android. A 16*2 LCD is used to display the ON and OFF status of electronics appliances. The electronics appliances are connected to relays.

Firstly we have to download and install the Bluetooth Terminal app on our phone which gives the feature of operating the appliances by sending signals .When we power ON our project we see that a LED on Bluetooth Module (HC 05) is blinking continuously. To operate it firstly we have to pair the Bluetooth Module with our android phone. After pairing we notice that the LED is now blinking with some delay this shows that the android phone has been paired up with the Bluetooth Module.

Whenever we send data by our android phone, ARDUINO checks for the character send and put the appropriate pins high or low according to the program written on it. These pins control the relays which in turns control the

appliances. The LCD will display the status of appliances that which is ON or OFF. Also on the app we get the status of ON and OFF as shown in fig. 3.1 & FIG. 3.2

Relay as two contacts normally open contact (NO) and normally closed contact (NC).When input to relay goes high it's NO contacts get open and NC contacts get closed.
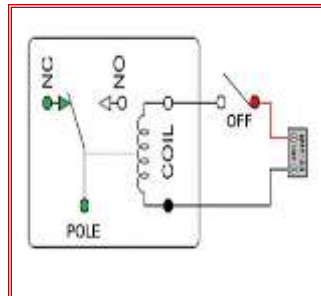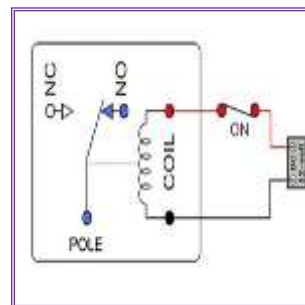

Fig. 3.1 Normally closed (NC) contact

Fig.3.2 Normally open (NO) contact

IV.   CODING AND PROGRAMMING

The Arduino language is merely a set of C/C++ functions that can be called from your code. Sketch undergoes minor changes (e.g. automatic generation of function prototypes) and then is passed directly to a C/C++ compiler.

Steps before programming:-
- Download ARDUINO Software
- The Initial Setup
- setting board
- setting communication port
- Isolating serial communication pins
- USB cable
- Power supply (if needed)

Step-1
ARDUINO microcontrollers come in a variety of types. The most common is the Arduino UNO, but there are specialized variations. Before you begin building, do a little research to figure out which version will be the most appropriate for your project.

Step-2
To begin, you'll need to install the ARDUINO Programmer, aka the integrated development environment (IDE).

Step-3
Connect your ARDUINO to the USB port of your computer. This may require a specific USB cable. Every ARDUINO has a different virtual serial-port address, so you 'll need to reconfigure the port if you're using different ARDUINO.

Step-4
Set the board type and the serial port in the ARDUINO Programmer.

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Step-5

Test the microcontroller by using one of the preloaded programs, called sketches, in the ARDUINO Programmer. Open one of the example sketches, and press the upload button to load it. The ARDUINO should begin responding to the program: If you've set it to blink an LED light, for example, the light should start blinking.

Step-6

To upload new code to the Arduino, either you'll need to have access to code you can paste into the programmer, or you'll have to write it yourself, using the Arduino programming language to create your own sketch. An Arduino sketch usually has five parts: a header describing the sketch and its author; a section defining variables; a setup routine that sets the initial conditions of variables and runs preliminary code; a loop routine, which is where you add the main code that will execute repeatedly until you stop running the sketch; and a section where you can list other functions that activate during the setup and loop routines. All sketches must include the setup and loop routines.

Step-7

Once you've uploaded the new sketch to your Arduino, disconnect it from your computer and integrate it into your project as directed.

General Description of ARDUINO Coding

- Setup: void setup() { }

✓ Any code that lives inside setup()'s curly brackets ({ and }) runs once at the very beginning of your program and then never again.
✓ Never run again until we reset the Arduino, or upload new cade.
✓ The setup() function is useful for setting up initial value for ARDUINO.
- Loop: void loop() { }
✓ Like the setup line before it, this is another required ARDUINO -sketch function. While the setup() function sets your ARDUINO up, the loop() function…loops!
✓ This is where the bulk of your ARDUINO sketch is executed. The program starts directly after the opening curly bracket (}), runs until it sees the closing curly bracket (}), and jumps back up to the first line in loop() and starts all over.
✓ The loop() function will run over-and-over-and-over until the ARDUINO is reset.

- **List of code's used**

1. **#include <Liquid Crystal.h>**
   include the liquid crystal display library code

2. **Liquide Crystal (rs, enable , d4, d5, d6, d7)**

   initialize the library by associating any needed LCD interface pin with the arduino pin number it is connected to.

   LiquidCrystallcd(7, 6, 5, 4, 3, 2);

3. **Pin Mode (pin, mode)**

   Configures the specified pin to behave either as an input or an output.

   Pin Mode (8, OUTPUT);

4. **Serial. begin (speed)**
   Sets the data rate in bits per second (baud) for serial data transmission.

   Serial. begin(9600);

5. *lcd*. **print (data)**
   Prints text to the LCD.

lcd.print ("ARDUINO project");

6. *lcd*. **begin (cols, rows)**
Initializes the interface to the LCD screen, and specifies the dimensions (width and height) of the display.begin() needs to be called before any other LCD library commands.
lcd. begin(16, 2);

7. **digital Write (pin, value)**
Write a HIGH or a LOW value to a digital pin.
Digital Write(12,HIGH);

8. **delay()**
Pauses the program for the amount of time (in milliseconds) specified as parameter.
Delay (100);

9. **Serial. print(val)**
Prints data to the serial port as human-readable ASCII text. Serial. print(" ##PORT 1 ON## ");

10. *lcd*. **Set Cursor (col, row)**

Position the LCD cursor; that is, set the location at which subsequent text written to the LCD will be displayed.
lcd. Set Cursor(1, 1);

11. *lcd*. **display()**

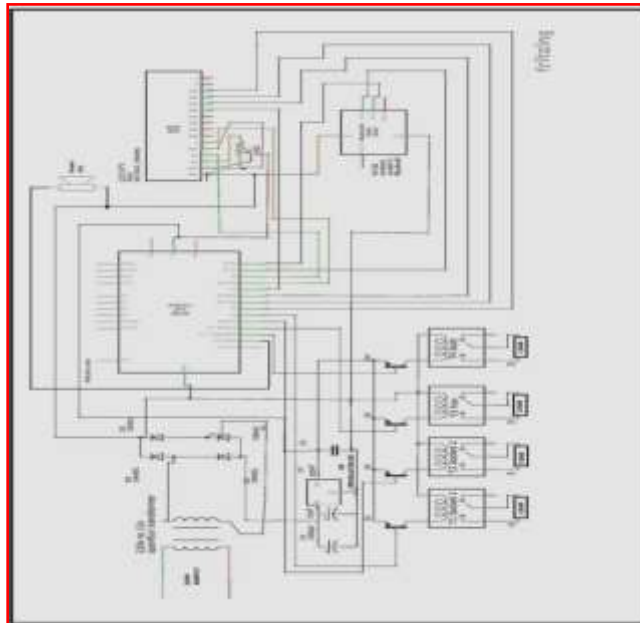Turns on the LCD display, after it's been turned off with no Display().

Fig. no. 4 circuit diagram

V. TECHNICAL SPECIFICATION

Table no. 1 technical specification

Microcontroller	Atmega328
Operating voltage	5v
Input voltage (recommended)	7-12v
Input voltage (limits)	6-20v
Digital i/o pins	14(of which 6Provide pwm)
Analog input pins	6
DC current per I/O Pin	40ma
DC current for 3.3v pin	50ma
Flash memory	32 KB of which0.5 KB used
SPRAM	2KB
EEPROM	1 KB
Clock speed	16 mhz

Pin Connections:
Connecting the Arduino Uno board to the Bluetooth Module:

Table no. 2 pin configuration

BLUETOOTH MODULE (HC 05)	ARDUINO UNO BOARD
VCC PIN	VCC PORT
GND PIN	GND PORT
TX PIN	RX PORT
RX PIN	TX PORT

Connecting the LCD to Arduino Uno board:

Table no. 3 pin configuration

LCD	ARDUINO UNO BOARD
PIN 1 (GND)	GND PIN
PIN 2 (VCC)	5 V PIN
PIN 4	D2 PIN
PIN 6 (ENABLE)	D3 PIN
PIN 11	D4 PIN
PIN 12	D5 PIN
PIN 13	D6 PIN
PIN 14	D7 PIN

Pin 5(R/W) of LCD is ground and pin 3 is ground through a potentiometer in order to adjust contrast.

VCC pin of Relay Module is connected to 5V supply and GND pin of it is grounded. Relay has two contacts normally open (NO) and normally closed (NC) contacts along with a common terminal (COM).Appliances are connected to these contacts.

Table no. 4 connecting the Relay Module to Arduino Uno board:

4 RELAY MODULE	ARDUINO UNO BOARD
IN1 PIN	D8 PIN
IN2 PIN	D9 PIN
IN3 PIN	D10 PIN
IN4 PIN	D11 PIN

The ardiuno uno can be powered via the usb connection or with an external power supply. The power source is selected automatically. The external (non USB) power can come either from ac to dc adapter or battery. The adapter can be connected by plugging a 2.1mm centre-positive plug into the board's power jack.

Power supply:-
The power can operate on external supply of 6 to 20 V. if supplied with less than 7 V, however the 5V pin may supply less than 5V and board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12V.

Fig. 5 electrical Power supply

Description of switching and monitoring system
What is switching??
In electrical and electronics system, switching is the process by which we can make or break an electrical circuit or we can say that switching is the process of controlling, by which we can interrupt the flow of current.

A switch is used to control the circuit operation and user may be able to activate or deactivate the whole or certain parts of the connected circuit.

Types of switching: generally switching can be categorized as
1. Switching through mechanical switches
2. Switching through electrical switches

We will discuss about switching through electrical and electronics switches as we use this in our project, because the mechanical switches are user manually operated, and the electrical switches are faster in response & accurate than mechanical switches and can be switched automatically by an electrical and electronic circuit like microcontroller or microprocessor. There are most widely used electronic switches are TRANSISTOR, MOSFET, and RELAY.

Switching through transistor:
If we apply a large amount of current at the base of transistor then we can run this transistor in deep saturation mode i.e. the transistor can be used as a switch. Shown in fig. no. 6
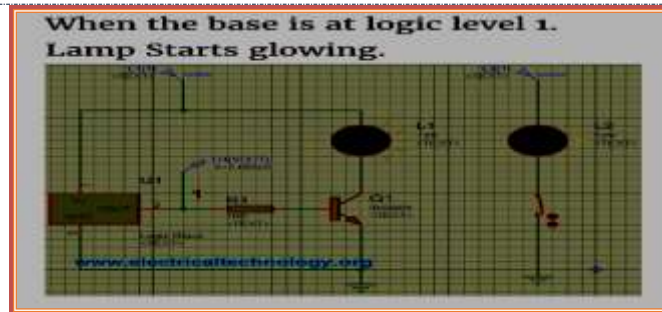
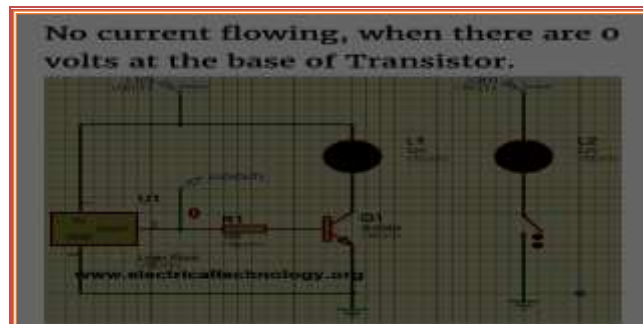*Fig. no. 6* **when the base is at logic 1 lamp starts glowing.**

Fig. no. 7 **no current when no voltage at base of transistor**

Swithing through mosfet :mosfet can also be used for switching purpose at high frequency (MHz). if we apply logic 1 by keeping in mindnthe maximum allowed voltage for the base, then the resistance between drain and source become low and current start flowing in this channel or vice versa.so lamp would not glow,i.e. it would be off when the gate at logic 0, shown in fig no. 8
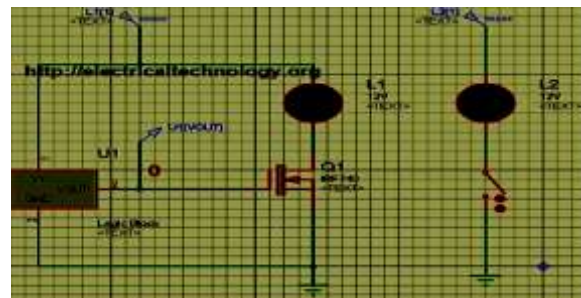

Fig. no. 8 **when the base is at logic 1 lamp starts glowing.**

Switching through relay: relay is an electromechanical device, which consists of an electromagnet. When a current is flowing through the coil, it becomes an electromagnet and this electromagnet can be used for switching purposes. When, we energies the coil, lamp will glow. when we energies the coil ,lamp would not glow, as shown in fig. no. 9.
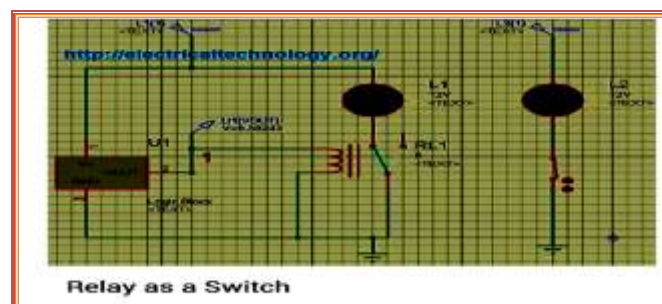

Fig. no.9 When we de energies the coil, lamp would not glow.

What is monitoring??
Monitoring is the regular observation and recording of activities taking place in a project.
Monitoring also involves giving feedback about the progress of the project to implementers of project.
Monitoring is very important in project planning and implementation.
Monitoring can be done by using following devices describe in below:

Monitoring with LED indicators: light emitting diode, is a semiconductor the illuminates when electrical charges passes through it. LEDs are commonly green, amber or red. The LED indicators are used to indicate mode of operation. On many control panels, one finds indicator lights that indicate whether a device is working or not. For the monitoring on the Adriano we might want to consider a transformer.

Fig. no. 10 LED indicator

VI.   CONCLUSION

It can be concluded that OUR PROJECT SYSTEM USING ARDUINO was a success. This system consists of an Arduino-Uno board, a Bluetooth Module, an Android phone, power sockets, home appliances and an android Application (ArduDroid). It is user friendly and it is cost effective.
Also it can be concluded that the objectives of this project has been successfully met and the-y are as follows:
- Constructed a wireless Our Project system controlled by a smartphone specifically an android device.
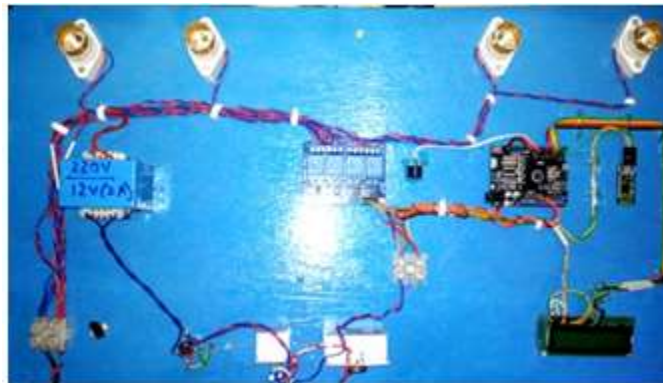- Designed and implement cost effective Our Project system yet an efficient one.

Fig. no. 11 hardware model diagram

- Designed a user friendly and a safe system to control home appliances especially aimed to aid the elders and handicapped.

VII.   RESULTS ANALYSIS AND DISCUSSION

What we have achieve:
Managed to successfully apply the our project system using ARDUINO and it was user friendly and cost effective. User friendly as in anyone can use just a click of a button on an android screen and everything works. And it is cost effective as in it will cost exactly as the project requires (optimum price).

How we can modify our project:

1. We can increase the communication range through wifi module.
2. Loads can also controlled and monitored through GSM for long distance.
3. motor load control and also control its speed.
4. Measure temperature control and it can protect over heating.
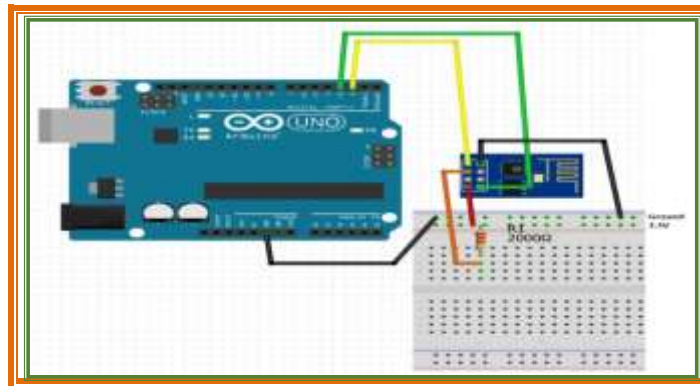
Modify with wifi:-

Fig. no.12 arduino model

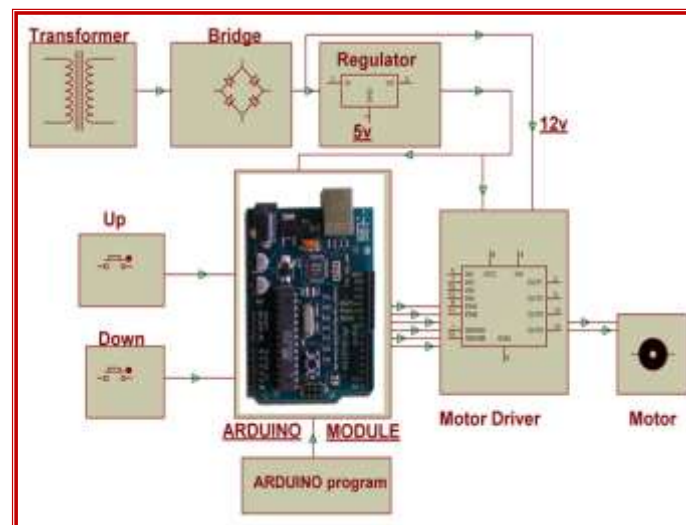**Speed control of dc motor:**

Fig. no. 13 speed control of DC motor

VIII.   FUTURE SCOPE

The project work is complete on its own in remotely switching on and switching off of any electrical appliances not limited to household appliances, and sends a feedback message indicating the new present state of appliances. Both software programming and hardware implementation are as follows:

- Establishing a wireless network communication between the android and the (remote system) automation system, using a microcontroller.
- Create a simple yet reliable commercial/home automation system using Adriano-Uno as a microcontroller that will be the medium between the android and the home appliances.
- To find a suitable app that will work efficiently with the Adriano-Uno board in order to control the home appliances.
- Program the Adriano-Uno board in a way that will let it interact with the android app.
- Control refers to sending command messages to a device to operate the instrumentation and control system devices

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