WIRELESS SPEED AND DIRECTION CONTROL OF DC MOTOR USING RF TECHNOLOGY

CH.Srivardhan Kumar[1]

Associate professor Department of EEE

G.Manasa [2]

Department of EEE MLRIT, HYD

A.Tharun [3]

Department of EEE MLRIT, HYD
MLRIT, HYD
manasa.golipally5555@gmail.com@gmail.com
tarun.adepu99@gmail. com
srieee@mlrinstitutions.ac. in

Laxmi Prasad [4]
MLRIT, HYD
Prasadrendla10 @gmail.com

Rohit Shastry [5]
MLRIT, HYD
rohitshastry1712@gmail.com

Abstract : Wireless speed and direction control of DC Motor .The purpose of this project is to control the dc motor using radio frequency technology i.e, wireless.We can use this in paper mills , rolling mills,excavators etc for moving the objects from one place to another using conveyer belt.There are many traditional methods to control dc motor like armature control,field control and flux control methods etc.But controlling the dc motor manually requires a huge equipment,so here we are making it wireless.The speed can be controlled by Arduino Nano i.e inbuilt with ATmega328P micro controller which is same as Arduino UNO.Direction is controlled by H- Bridge,it is a DC-DC converter.

Keywords : H-BRIDGE,AURDINO NANO,RF TECHNOLOGY,DC MOTOR.

1. Introduction :

To control the dc motor in simple,easy and reliable manner we are using radio frequency technology in this project.When we connect battery to the panel and switch on the switch we will get a red led light on the transmitter module by this we can know whether the battery is working or not.The battery is of 12V it is converted into 5V DC Voltage by the help of 7805 voltage regulator.We use controlled rectifier to convert fixed dc voltage into variable dc voltage.The input is given through transmitter module using binary codes. Receiver will receive the code,through the program which is written in Embedded C is dumped into the Arduino Board and hence the motor runs and shows the direction(i.e., Clockwise or Anti-Clockwise direction)in the LCD display.
The main motto of this project is to make the motor run accurately and precisely with the given input.

Literature survey:
As a part of the literature survey there are some others who worked on this project through which we started our project based on their references

1."PWM Based Automatic Closed loop Speed Control Of DC Motor", International Journal of Engineering Trends and Technology, vol.3,pp.110- 112.In this paper,they used a Micro controller to control the dc motor and an H-Bridge to control the motor direction.The AT89S51 micro controller is employed. The AT89S51 is a CMOS 8- bit micro controller with 4K bytes of In-System Programmable Flash memory that is low-power and high-performance. The device is built using Atmel's high-density non-volatile memory technology and supports the industry-standard 80C51 instruction set and pin out. Theon-chip Flash allows the program memory to be reprogrammed in-system or with a standard non-volatile memory programmer.

2.Ankesh N.Nichat,Sheikh Kadir Ali,Yogesh D.Solanke,Amit use Radio frequency Technology to control the speed and direction of a DC motor wirelessly.M.Dodke published a paper titled "International journal of Engineering trends and Technology.

3.Wireless Dc Motor Speed and Directional control using RF(2017).This paper is similar to other papers but they used 8051 series micro controller.It can be implemented using matlab in industries.

In our project we are using Arduino Nano which is inbuilt withATmega328P micro controller to control the speed of the dc motor,the operation is very easy and budget friendly.We write the Embedded C program and dump into Arduino to make the motor run and give the direction.

2.Theoretical Analysis:

The Standard 130 type Dc motor is used in this project.The main functions in this project are Radio Frequency technology,working of aurdino nano,dc motor and H-Bridge.

2.1 RF TECHNOLOGY:

An RF module(radio frequency module) is a small electronic device which is used transmit and/or receive signals between two devices.In this project transmitter and receiver are two parts,we connect them together with the battery to work.

Transmitter is used to send the signal and make the motor work in between when the transmitter gives signal using binary codes with the help of Arduino board motor will run and give the direction. Transmitter consists of 7805 voltage regulator to convert 12V battery into 5V DC Voltage and Capacitor filter to control the ripples in voltage.

In receiver we have Arduino nano inbuilt with micro controller,H-Bridge,DC Motor, Lcd display, capacitor filters, resistors, Decoder,Encoder.

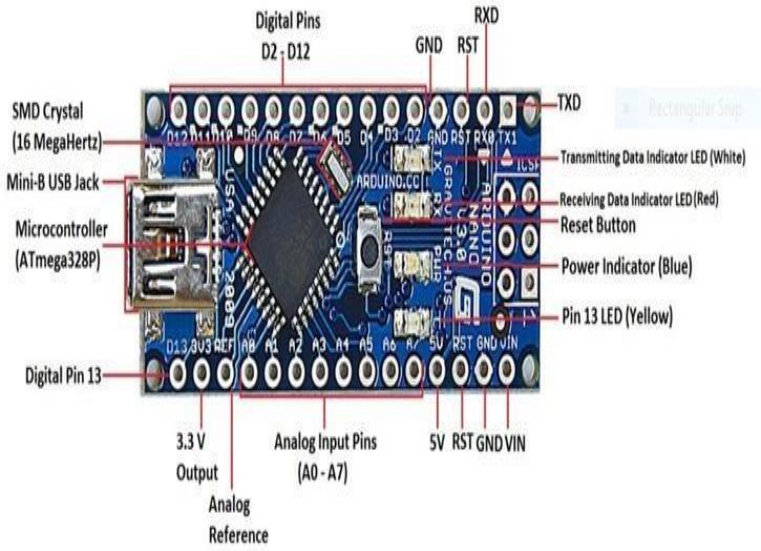
An RF transmitter module is a small PCB sub- assembly capable of transmitting a radio wave and modulating it to carry data. Transmitter modules are typically implemented in conjunction with a micro controller, which provides data to the module that can be transmitted.

An RF receiver module receives and demodulates the modulated RF signal. RF receiver modules are classified into two types: super heterodyne receivers and super regenerative receivers. Super regenerative modules are typically low-cost, low-power designs that extract modulated data from a carrier wave via a series of amplifiers. Because their frequency of operation varies, super regenerative modules are generally imprecise.

AURDINO NANO:

Arduino Nano functions similarly to the Arduino Duemilanove, but in a different package. The Nano is inbuilt with the same ATmega328P micro controller,same as the Arduino UNO.The main distinction is the UNO board is available in PDIP(Plastic Dual-In-line Package) form with 30 pins,where as Nano board is available in TQFP (Plastic quad flat pack)with 32 pins.The extra 2 pins of Arduino Nano serve for the ADC functionalities,the UNO has 6ADC ports but Nano has 8 ADC ports.The Nano board doesn't have a DC power jack as the other Arduino boards,but instead has a mini USB port.This port is used for both programming and for the serial monitoring.The fascinating feature

in Nano is that it will choose the strongest power source with its potential difference,and the power source selecting jumper is invalid.



2.2 DC MOTOR :

The features of dc motor are the following: Standard 130 Type DC motor
Operating Voltage: 4.5V to 9V Recommended/Rated Voltage: 6V Current at No load: 70mA (max) No-load Speed: 60 rpm
Loaded current: 250mA (approx.) Rated Load: 10g*cm
Motor Size: 27.5mm x 20mm x 15mm Weight: 17 grams

2.3 :H-BRIDGE :

H-Bridge is used to control direction of dc motor.H-Bridge is a DC-DC converter.We are using 4 transistors and they are connected in bridge manner. Diodes are also connected across the transistors to stop the reverse current.We are using transistors instead of any other semi conductors because they are easy,safe and reliable to use.We have four transistors connect together but only two works once.When transistors S1 and S4 are switch ON then the motor rotates in Clockwise Direction.When the transistors S2 and S3 are switch ON motor moves in Anti-Clockwise Direction.

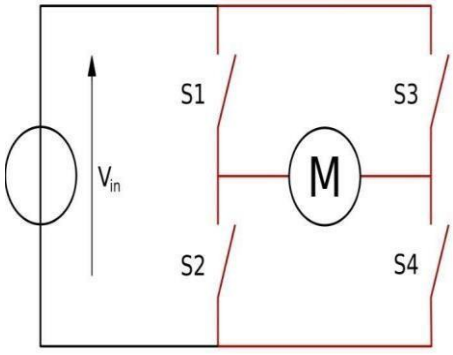
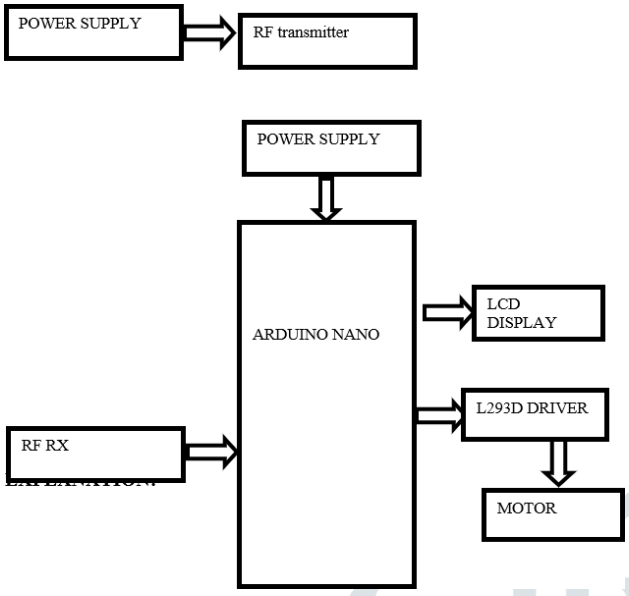


Fig 2.4.1:H-Bridge

3.Block Diagram and Explanation

Block Diagram:



The power supply is connected to the transmitter and when the switch is ON the led glows in red to indicate that the battery is under working condition.

The transmitter is connected through receiver using battery connections.The power supply is of 12V then it changes to 5V with the help of 7805 voltage regulator,then after converting the voltage power supply will go to the aurdino board.Then we can give the input in transmitter using binary code starting from 0-8 in numbers.First four binary codes will make the motor to rotate in clockwise direction and next four binary codes will make the motor to rotate in anti-clockwise direction.When we give the first input the receiver will receive and send the information to the Arduino board which is inbuilt with micro controller and program is also written in that so the motor can rotate.But motor should rotate and give direction at the same time so the connection from Arduino and h-bridge are given to motor so that motor will rotate in any one direction and speed can be measured also.Now from motor the connections are given to LCD Display by that we can see in which direction the motor is rotating and the percentage of speed also.So based on the pulse we give the speed and direction of the motor is controlled.

4.RESULTS AND ANALYSIS:

The constant 5V voltage source is used to gives the supply to the whole assembly. The one point of that supply is connected to the rectifier bridge, which is used for the polarity protection. Other terminal of supply is connected to the 7805 voltage regulator it can been regulate the voltage, across that regulator two capacitor are connected for smoothening purpose. The RF 433 Transmitter uses to generate the radio waves for communication between these whole assembly. The range of the radio waves is about 3 KHz to 300 GHz. The RF 433 Receiver uses to received the radio waves. The encoder is used to convert the parallel input signal of 4 push button into the serial output. The decoder is decode that signal and gives to the microcontroller. Aurdino nano is used to control the duty cycle of the pulse and simultaneously the terminal voltage is vary and also the speed will be vary. The Aurdino consist of 4 port out of this the port 0 is used for given input signal in terms of digital form either 0 or 1.When pin 2.1 having a signal1 then the transistor Q1 is ON then transistor Q4 will ON ,motor will rotate in clockwise direction . When port 2.2 is having signal 1 then transistor Q2 is ON then transistor Q3 will On and motor rotates in anticlockwise direction. Hence direction control is achieved. For adjusting the duty cycle the speed will control from aurdino.

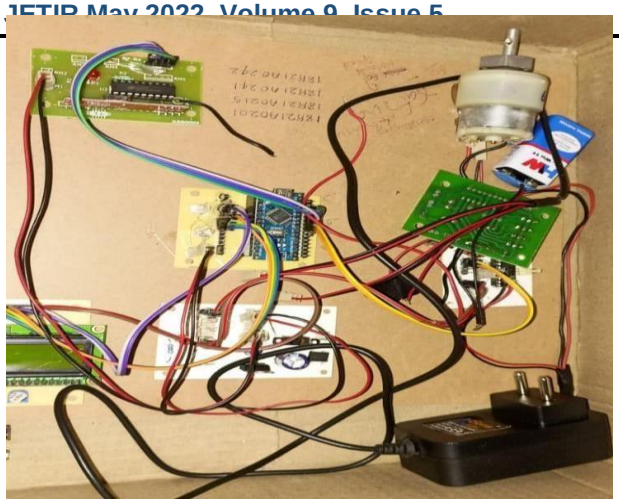


Fig:4.1:Transmitter, and receiver of speed and direction control of dc motor.

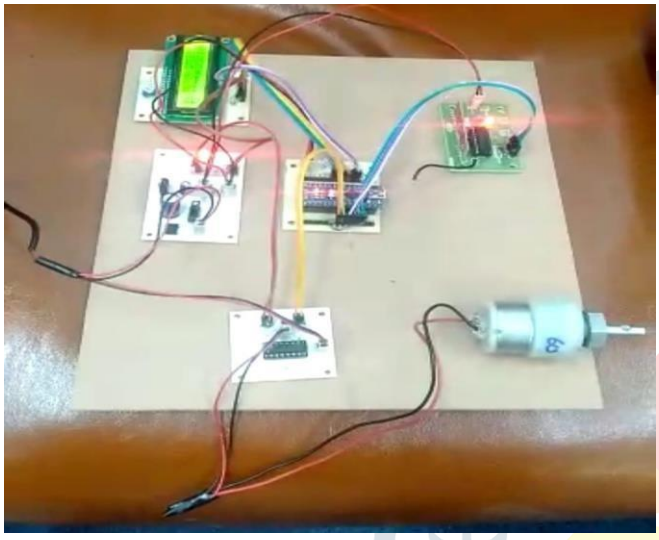


Fig 4.2:Working

5. Conclusion:

The speed and direction control is achieved by using radio frequency technology.Hence the motor is controlled by Arduino inbuilt with micro controller and the speed is controlled by using H-Bridge by giving the pulses using binary codes with help of push buttons in transmitter.The percentage of speed and direction of motor are displayed on the LCD Display according to the input we give.

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