WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Four Quadrant DC Motor Using Arduino

Prof. Dr. Vijay G. Neve[1], Durgesh V. Jagtap [2], Kunal Wabhitkar[3], Nikhil Gophane[4] , Harshav Khobragade[5]

[1]Professor,ElectricalEngineeringDepartment,J.C.O.E.T.,Yavatmal

[2,3,4,5] Students, B.E Electrical Engineering, J.C.O.E.T., Yavatmal

ABSTRACT

The primary drawback of dc motor is; it rotates for a while when supply is disconnected. This isn't always required in lots of applications. So four quadrant operation of dc motor is used. We are the use of arduino uno board for this operation. In 4 quadrant operation on the spot breaking of motor is feasible, so we're using four quadrant dc motor control for the task. In such a situation, this proposed machine may be very apt as forward brake and reverse brake are its crucial functions. Instantaneous brake in both the guidelines takes place because of making use of a reverse voltage across the jogging motor for a short period and the rate manage of the motor may be achieved with pwm pulses generated by the arduino board. Arduino development board is used for this operation. Push buttons are furnished for the operation of the motor which are interfaced to the arduino that provides input sign to it and in flip controls the rate of the motor through a motor motive force ic. Velocity manage characteristic by using push-button operation is also available on this mission.

Keywords :DC motor, Arduino,Power supply block, L293D Motor driver IC, Speed control, PWM

1.INTRODUCTION

Dc machines play a totally essential role in industries and in our every day life. The great benefit of dc machines is they provide without difficulty controllable traits. This paper is designed to develop a 4 quadrant pace manage system for a dc motor the use of arduino. In this paintings the idea of four quadrant pace control i.E. Clockwise motion, anticlockwise movement, immediately forward braking and immediate opposite braking of a dc motor with the assist of arduino through motor driving force (l293d) has been proposed. We're the usage of 220v 9 ampere dc motor for four quadrant operation. Velocity control of motor is carried out using pwm technique. Arduino board with atmega 328 microcontroller is used to carry out the operation of four quadrant operation. Four switches are supplied as input to the arduino uno board for 4 quadrant operation. By urgent preferred operation dc motor operation could be validated. Igbts are used in h bridge to perform dc motor. It calls for gate motive force circuit so we are the usage of tlp 250 gate driving force ic's for every igbt. Pulses from arduino is given to enter of gate driver ic and output of gate driver is given to gate of igbt. Gate of igbt is brought about by way of arduino. For every quadrant separate switch is provided so it is easy to perform the dc motor as per required quadrant. Pulses from arduino is of 5v dc, given to pin three of tlp 250 ic. The energy supply for this is constructed by means of using 230v to 12v transformer. 4 diodes are used to shape a bridge rectifier and a filter capacitor to filter the output. Ic 7805 is used to provide 5v regulated deliver. Tlp 250 require 12v supply for secondary side, which is derived from 7812 regulator ic. This 12v pulses are given to gate of igbt.

LITURATURE REVIEW

[1] Manoj Kumar Swain , Bibhuti Nemalpuri , Deepak Kumar Das , Aieshwarya Nath "Four Quadrant DC Motor Speed Control Using Arduino" International Journal of Modern Trends in Engineering and Research, Volume 04, Issue 03, April 2017, DOI : 10.21884/IJMTER.2017.4091.R1G7S.

The project is designed to broaden a 4-quadrant velocity-manipulate machine for a dc motor. The motor is operated in four quadrants: clockwise, counter clock-wise, forward brake and opposite brake. It additionally has a characteristic of pace manipulate. The 4-quadrant operation of the dc motor is nice ideal for industries in which motors are used in line with the requirement. They could rotate in clockwise, directions and also you will practice brakes right now in each the guidelines. In case of unique operation in industrial surroundings, the motor desires to be stopped straight away. In such ascenario, this

proposed gadget is very apt as ahead brake and opposite brake are its imperative capabilities. Immediate brake in each the guidelines happens because of making use of a opposite voltage across the jogging motor for a quick period and the velocity manipulate of the motor can be executed with pwm pulses generated through the arduino board. Arduino improvement board is used for this operation. Push buttons are furnished for the operation of the motor that are interfaced to the arduino that provides input signal to it and in turn controls the speed of the motor thru a motor driving force ic. [3]

[2] K.Dhivya Dharshini and S.Arockia Edwin Xavier "Analysis of microcontroller Based Four Quadrant Speed Control System for a DC Motor" International Journal of Current Engineering and Scientific Research (IJCESR), Volume 02, Issue 02, 2015 ISSN (PRINT): 2393-8374, (ONLINE): 2394-0697.

Brushless dc (bldc) motor drives have become more popular in commercial, traction applications. This makes the manage of bldc motor in all of the four quadrants very important. This paper deals with the digital control of 3 segment bldc motor. The motor is controlled in all the four quadrants with none loss of electricity; in fact strength is conserved throughout the regenerative length. The digital controller dspic30f4011, which is very advantageous over other controllers, because it combines the calculation functionality of virtual sign processor and controlling functionality of % microcontroller, to obtain precise manage. [5]

WORKING

HARDWARE REQUIREMENTS

- Transformer
- Bridge rectifier
- Voltage regultor
- Arduino
- LCD display
- Bluetooth
- L293D
- DC Motor

In this assignment step down transformer is used. After that bridge rectifier and regulator circuit is used for purchasing constant voltage. Pace manage circuit is used. The system could be very useful for commercial operation for the reason that industries normally require dc cars to operate in all 4 quadrants for various operational cases. Our gadget allows to function vehicles in all four quadrants. Properly maximum business situations dc vehicles are required to run in clock sensible as well as anticlockwise motions as and while required. Some eventualities additionally need the motor to be stopped in its movement. At such instances our front braking and opposite braking mechanisms are used. The immediate braking in any direction takes place with the aid of making use of a opposite voltage throughout the walking motor in a small length. .The device is on aurdinouno and standing of the device is displayed on lcd. Method and analysis which is performed in your research work should be written in this section. A simple strategy to follow is to use keywords from your title in first few sentences.

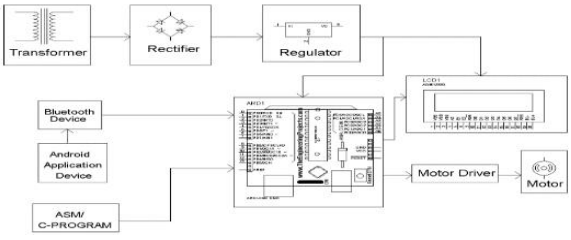

Fig 1:Block Diagram

Four Quadrant Operation of DC Motor:The motor is operated in four quadrants: clockwise, counter clock-clever, ahead brake and opposite brake. Motor movement converts the electric energy into mechanical power and it produces forward movement, as a result it known as as motoring action, whereas braking action converts mechanical power to electric strength which gives forward braking motion, it is termed as generator. There are four feasible modes or quadrants of operation the usage of a dc motor that's depicted in determine three. While dc motor is working within the first and 0.33 quadrant, the furnished voltage is greater than the back emf that is forward motoring and reverse motoring modes respectively, but the course of modern glide differs. While the motor operates in the second and fourth quadrant the fee of the lower back emf generated by means of the motor have to be greater than the provided voltage which are the forward braking and reverse braking modes of operation respectively, here once more the course of current go with the flow is reversed.

Pulse Width Modulation

Pulse width modulation (pwm) is the term used to describe using a digital signal to generate an analog output signal. Pwm is one of the effective strategies used in control structures these days. That is typically used to control the average strength to a load in a motor speed control circuit. It's far used in wide variety of software which incorporates: pace manage, power control, size and communication. Pulse-width modulation (pwm) is a typically used technique for controlling power to an electrical tool, made sensible with the aid of contemporary electronic strength switches. The primary gain of pwm is that power loss within the switching gadgets is very low.

RESULT

The realistic implementation of the 4 quadrant manage of the dc motor is shown in parent five. The hardware is designed and the operation has been accomplished based upon the program written in the arduino for the four quadrant operation of the dc motor and the speeda is also controlled via using pwm approach which instant brake state of affairs is carried out to the motor. The venture version is provided with 230v ac deliver from the circuit. The 230v deliver is given to the number one of the transformer which offers 12v output. This 12v ac supply fed to bridge rectifier, which converts it into 12v dc. This 12v dc is given to voltage regulator which gives 5v dc

CONCLUSION

The hardware for the four quadrant dc motor pace manipulate the usage of arduino is designed. It is proved to be operated so easy. In the proposed model, we've got used arduino which generates pwm signal. The pwm method has been used to govern the velocity of dc motor. By means of variant in obligation cycle, applied voltage varies therefore velocity of dc motor may be controlled. The waveform of input pulse given to dc motor has been taken for specific values of duty cycle and it's been found that speed of dc motor is without delay proportional to obligation cycle, i.E. As the on time responsibility cycle increases the rate of dc motor also increases. The waveform of input pulse of dc motor has been taken for ahead and reverse braking mode and it has been located that amplitude of waveform became high for very brief duration and after that amplitude becomes 0. Inside the experimental end result it has been found that some harmonics are took place. It's miles due to one-of-a-kind nonlinear digital additives inclusive of diodes, transistors and so forth. Gift in the prototype evolved version. This task is practical and fantastically viable in financial factor of view and has an advantage of strolling vehicles of higher rankings. It offers a reliable, long lasting, correct and efficient way of speed control of a dc motor. The arduino application is determined to be simple, green and the results with the designed hardware are promising. The evolved manage and power circuit features properly and satisfies the application necessities. The motor is capable of function in all the 4 quadrants efficiently. Regenerative braking is likewise finished.

REFERENCES

[1] Manoj Kumar Swain , Bibhuti Nemalpuri , Deepak Kumar Das , Aieshwarya Nath “Four Quadrant DC Motor Speed Control Using Arduino” International Journal of Modern Trends in Engineering and Research, Volume 04, Issue 03, April 2017, DOI : 10.21884/IJMTER.2017.4091.R1G7S.

[2] K.Dhivya Dharshini and S.Arockia Edwin Xavier “Analysis of microcontroller Based Four Quadrant Speed Control System for a DC Motor” International Journal of Current Engineering and Scientific Research (IJCESR), Volume 02, Issue 02, 2015 ISSN (PRINT): 2393-8374, (ONLINE): 2394-0697.

[3] International Journal for Scientific Research and Development, ISSN (ONLINE): 2321- 613.

[4] Keil Embedded Development Tools, 8051 Development Tools.

[5] Barr Group, The Embedded Systems Experts

[6] “DS1103 PPC Controller Board”, Germany: dSPACE, July 2008. Janice Gillispie Mazidi. “Books on Microcontroller: 8051 microcontroller and embedded systems”

[7] Muhammad Ali Mazidi and Janice Gillispie Mazidi, “The 8051 Microcontroller and Embedded Systems, Pearson Prentice Hall Publication”.