DC to DC Converter Using Four Quadrant Operations For Dc Motor

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Abstract

In this paper a four quadrant speed control framework for DC engine has been composed, built and tried. The primary favourable position in utilizing a DC engine is that the Speed - Torque relationship can be changed to any valuable shape. To accomplish the speed control, an electronic system called Pulse Width Modulation is utilized which produces high and low pulses. These pulses change the speed in the engine. For the age of these heartbeats a microcontroller is utilized. As a microcontroller is utilized setting the speed goes according to the necessity is simple which is finished by changing the obligation cycles era in the program. Diverse speed grades and the heading are relied upon various catches. Analysis have demonstrated that this framework is of higher execution.

Keywords--- *PWM, Microcontroller.*

I.INTRODUCTION

Four quadrant speed control framework for a DC engine is outlined in this paper. The engine is worked in four quadrants i.e. clockwise; counter clock-wise, forward brake and turn around brake. It likewise has a component of speed control. The four quadrant task of the dc engine is most appropriate for enterprises where engines are utilized and according to prerequisite as they can pivot in clockwise, counter-clockwise and furthermore apply brakes instantly in both the headings. If there should be an occurrence of a particular activity in mechanical condition, the engine should be halted instantly. In such situation, this proposed framework is extremely proper as forward brake and invert brake are its essential highlights. Immediate brake in both the headings occurs because of applying a turn around voltage over the running engine for a concise period and the speed control of the engine can be accomplished with the PWM pulses produced by the microcontroller.

The microcontroller is utilized from 8051 family. Push catches are accommodated the task of the engine which are interfaced to the microcontroller that gives an information flag to it and thusly controls the speed of the motor through an engine driver IC. Speed control include by push catch task is likewise accessible. This paper can be improved by utilizing higher power electronic gadgets to work high limit DC engines. Regenerative braking for enhancing the power utilization can likewise be joined. [1]

II. METHODOLOGY

Conventional strategy for speed control was that the protection is hung in the rotor circuit or alter the voltage of electrical hardware circuit. This two techniques are simple, however they exist a few inadequacies. The engine speed is difficult to get a low when the heap is light. The bigger the protection, the more noteworthy is misfortunes. Subsequently, another sort of speed control strategy is utilized known as PWM (Pulse Width Modulation) innovation.

By utilizing the PWM innovation, it is anything but difficult to build the effectiveness of framework and also prerequisite of energy to the framework. This paper uses the planning of the microcontroller clock work, yields simple PWM flag to change the obligation cycle as indicated by the quantity of various heartbeats. In an independently energized DC engine, the unfaltering state speed is controlled at any coveted speed by applying the proper extent of voltage, additionally in either bearing just by giving suitable extremity of the voltage. The torque of the engine is straightforwardly relative to the armature current, which thusly relies upon the distinction between the connected voltage V and back emf, E, i.e., $I = (V – E)/R$

In this manner, it is conceivable to create positive or negative torque by controlling voltage, which is not exactly or more than the back emf. Subsequently the independently energized DC engine innately display four quadrant activity.

Pulse Width Modulation:

Pulse width modulation (PWM) is a normally utilized procedure for controlling force to an electrical gadget, made functional by present day electronic power switches. The normal estimation of voltage (and current) encouraged to the heap is controlled by turning the switch amongst supply and load on what's more, off at a quick pace. The more extended the switch is on contrasted with the off periods, the higher the power provided to the heap is. The term obligation cycle depicts the extent of on time to the consistent interim or timeframe; a low obligation cycle relates to low power, on the grounds that the power is off for more often than not. Obligation cycle is communicated in percent, 100% being completely on.

The primary preferred standpoint of PWM is that control misfortune in the exchanging gadgets is low. At the point when a turn is off there is basically no current, and when it is on, there is no voltage drop over the switch. Power misfortune, being the result of voltage and current, is subsequently in the two cases near zero. PWM works too well with computerized controls, which, due to their on/off nature, can without much of a stretch set the required obligation cycle.. PWM has likewise been utilized as a part of certain correspondence frameworks where its obligation cycle has been utilized to pass on data over interchanges channel. The obligation cycle decides the speed of the engine. The coveted speed can be gotten by changing the obligation cycle. The PWM in microcontroller is utilized to control the obligation cycle of DC engine.

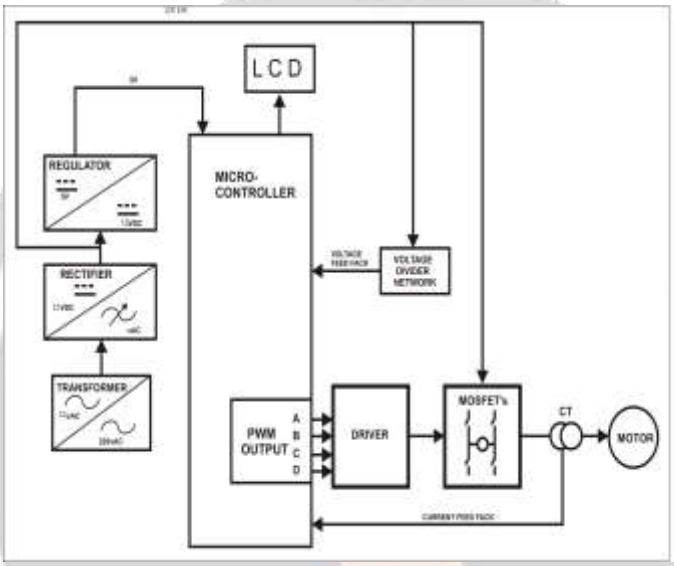

Figure. Block diagram of dc to dc converter using four quadrant operation for dc motor.

From the above block diagram it is seen that 220V AC supply is given to the transformer, the transformer step down 220V AC into 12V AC. But we required 12V DC supply so that's why rectifier is connected in the circuit to convert 12V AC into 12V DC. Single supply of 12V DC is directly given to the MOSFET and another supply is given to the regulator to regulate into 5V DC and this 5V DC supply is given to the microcontroller because microcontroller can work on 5V only. Voltage divider network is used in the system to measure the voltage in the system. Microcontroller give signal to the driver, driver send signal to the MOSFET, MOSFET send signal to the current transformer. Current transformer send signal back to the microcontroller and also send towards the motor to start the system. Finally the output is display on LCD.

III.COMPLETE DRIVE SYSTEM

The general square of the framework is actualized in the proteous programming and the reaction task of the engine is seen. The reaction of the engine associated can be seen outwardly as per the program nourished into the microcontroller and the tasks are conveyed in like manner. It is the most effortless approach to check whether the equipment will get the coveted yield. The progressions can be made to get the coveted yield and the task can be completed in like manner.

IV. HARDWARE DESCRIPTION

The accompanying methods are done for the four quadrant DC engine speed control activity utilizing microcontroller. Here seven changes are interfaced to MC to control the speed of engine in four quadrants. At the point when begin switch is squeezed the engine begins turning in full speed being driven by an engine driver IC L293D that gets control flag persistently from the microcontroller. At the point when clockwise switch is squeezed the engine turns forward way according to the rationale gave by the program from the microcontroller to the engine driver IC. While forward brake is

squeezed a turn around voltage is connected to the engine by the engine driver IC by detecting reverse rationale sent by the microcontroller for a brief span period due to and invert brake switch is squeezed the microcontroller conveys a rationale to the engine driver IC that creates for little time an invert voltage over the running engine because of which quick brake circumstance happens to the motor. PWM change is utilized to pivot the engine at different speed by conveying from the microcontroller a shifting obligation cycle to the empower stick of the engine driver IC. It begins from 100% obligation cycle and diminishes in ventures of 10% when it is squeezed again lastly reaches to 10% obligation cycle and the procedure rehashes. Stop catch is utilized to turn OFF the engine by driving the empower stick to ground from the microcontroller.

V. EXPERIMENTAL SETUP

The useful execution of the four quadrant control of the DC motor is appeared in figure 2. The equipment is planned and the activity has been done in light of the program written in the microcontroller for the four quadrant task of the DC motor and the speed is additionally controlled by utilizing PWM method.

Figure: Experimental Setup

V. CONCLUSION

The equipment for four quadrant dc motor speed control utilizing microcontroller is planned. It is turned out to be worked so straight forward. It is down to earth and profoundly conceivable in monetary perspective and has leverage of running engines of higher evaluations. It gives a tough, solid, proficient and precise method for speed control of a DC motor. The program is observed to be productive and the outcomes with the planned equipment are dependable. The created control and power circuit works appropriately and fulfills the application necessities. The motor can work in all the four quadrants effectively.

VII. REFERENCES

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