



DC MOTOR SPEED CONTROL USING CHOPPER

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ABSTRACT

This task is builds up a speed control system for DC motor utilizing two quadrant chopper. A chopper circuit is utilized allude various kinds of electronic switching device and circuits utilized in power control and signal applications. It is switching device that converts fixed dc input to variable dc output straightforwardly. It additionally is utilized to intrude on one signal heavily influenced by another signal. At present DC motor drives are cost than AC drives. This undertaking is execute minimal effort and effective speed control system for DC motor utilizing two quadrant chopper technique. In this two quadrant chopper took care of dc drive circuit switching component fully on or fully off, it misfortunes are low circuit can give high efficiency. By utilizing PWM the switches ,turn on at consistent hacking frequency for the alluring output. Two quadrant chopper drive for the DC motor speed control the armature is energized by factor dc supply through two quadrants. The system is gives different activity to control forward, reverse and braking. The voltage is given to the PWM [pulse width modulation method] the speed of DC motor is straightforwardly proportional to armature voltage and conversely proportional to flux. The flux is steady. At the point when the signal is to Thyrsistor 1, at the time the motor will rotating in forward direction. At that point it is offering signal to Thyrsistor 2, at the time the motor will rotating in reverse direction. By operating of two Thyrsistor, it can work the drive motor as braking. It has one controlled current source on the DC source side and controlled voltage source on the motor side. This will build the efficiency and life of the motor



1. INTRODUCTION

An electrical drive comprises of electric motors, its power controller and energy transmitting shaft. In present day electric drive system power electronic converters are utilized as power controller [1, 2]. Electric drives are fundamentally of two kinds: DC drives and AC drives. The two sorts contrast from one another in that the power supply in DC drives is given by DC motor and power supply in AC drives is given by AC motor [3, 4].

DC drives are generally utilized in applications requiring customizable speed control, continuous starting, great speed guideline, braking and turning around. Some significant applications are paper plants, moving factories, mine winders, lifts, printing squeezes, machine apparatuses, footing, material plants, earthmovers and cranes [5, 6]. Fragmentary horsepower DC motors are generally utilized as servomotors for following and situating. For mechanical applications advancement of superior motor drives are extremely fundamental. DC drives are less expensive and less perplexing than AC drives. DC motors are utilized widely in customizable speed drives and position control system. The speed of DC motors can be changed above or beneath evaluated speed [7, 8]. The above appraised speeds are controlled by field flux control and speed underneath evaluated speed is controlled by armature voltage. DC motors are generally utilized in industry due to its ease, less perplexing control structure and wide scope of speed and torque [9, 10]. There are different strategies for speed control of DC drives – armature voltage control, field flux control and armature resistance control. For controlling the speed and current of DC motor, speed and current controllers are utilized. The primary work of controller is to limit the error and the error is determined by contrasting output esteem and the set point [11, 12]. This postulation basically manages controlling DC motor speed utilizing Chopper as power converter and PI as speed and current controller. For a long time the motor controller was a container which gave the motor speed control and enabled the motor to adjust to varieties in the load. Plans were frequently lossy or they gave just rough augmentations in the boundaries controlled [13].



Present day controllers may consolidate both power electronics and microprocessors empowering the control box to take on a lot more assignments and to carry them out with more prominent exactness. These undertakings include:

- Controlling the dynamics of the machine and its reaction to applied loads.
(Speed, torque and efficiency of the machine or the situation of its moving components.)
- Providing electronic recompense.
- Enabling self starting of the motor.
- Protecting the motor and the actual controller from harm or abuse.
- Matching the power from an accessible source to suit the motor necessities (voltage , frequency, number of phases). This is an illustration of "Power Conditioning" whose object is to give unadulterated DC or sine wave power free from harmonics or obstruction. In spite of the fact that it very well may be an integral piece of a generator control system, all the more by and large, power molding could likewise be given by a different free standing module operating on any power source [14, 15].

This task is builds up a speed control system for DC motor utilizing two quadrant chopper. A chopper circuit is utilized allude various kinds of electronic switching device and circuits utilized in power control and signal applications. It is switching device that converts fixed dc input to variable dc output straightforwardly [16, 17]. It likewise is utilized to interfere with one signal heavily influenced by another signal. At present DC motor drives are cost than AC drives. This undertaking is actualize minimal effort and effective speed control system for DC motor utilizing two quadrant chopper strategy.

In this two quadrant chopper took care of dc drive circuit switching component fully on or fully off, it misfortunes are low circuit can give high efficiency .By utilizing PWM the switches ,turn on at steady hacking frequency for the attractive output [18, 19].



Two quadrant chopper drive for the DC motor speed control the armature is energized by factor dc supply through two quadrants. The system is furnishes with different activity to control forward, reverse and braking. The voltage is given to the PWM [pulse width modulation method] the speed of DC motor is straightforwardly proportional to armature voltage and conversely proportional to flux. The flux is steady [20, 21]. At the point when the signal is to Thyrsistor 1, at the time the motor will rotating in forward direction. At that point it is offering signal to Thyrsitor 2, at the time the motor will rotating in reverse direction. By operating of two Thyrsistor, it can work the drive motor as braking. It has one controlled current source on the DC source side and controlled voltage source on the motor side. This will build the efficiency and life of the motor [22, 23].

2. Methodology:

An electrical DC drive is a blend of controller, converter and DC motor. Here this task is utilizing chopper as a converter. The basic guideline behind DC motor speed control is that the output speed of DC motor can be differed by controlling armature voltage keeping field voltage consistent for speed underneath and up to evaluated speed. The output speed is contrasted and the reference speed and error signal is then taken care of to speed controller. In the event that there is a distinction in the reference speed and the criticism speed, Controller output will fluctuate. The output of the speed controller is the control voltage E_g that controls the activity obligation cycle of converter. The converter output gives the necessary voltage V to take motor speed back to the ideal speed. The Reference speed is given through a potential divider since it is straightly identified with the speed of the DC motor. Presently the output speed of motor is estimated by Tacho-generator. The tacho voltage we will get from the tacho generator contains ripple and it won't be impeccably dc. In this way, we require a channel with an addition to take Tacho output back to controller level.

The controller utilized in a shut loop model of DC motor gives an exceptionally simple and regular procedure of keeping motor speed at any ideal set-point speed under changing load conditions. This controller can likewise be utilized to keep the speed at the set-point esteem when the set-point is increase or down at a characterized rate. In this shut loop



speed controller, a voltage signal is gotten from the Tacho-generator appended to the rotor which is proportional to the motor speed is taken care of back to the input where signal is deducted from the set-guide speed toward produce an error signal. This error signal is then taken care of to controller to make the motor run at the ideal set-point speed. On the off chance that the error speed is negative, this implies the motor is running sluggish so the controller output ought to be expanded and vice-versa .There are various kinds of controller accessible and its determination is additionally a significant work .Some of the controllers which are most broadly utilized are – proportional controller ,on–off controller, integral controller, derivative controller and PID controller. In proportional controller error speed is proportional to the deliberate output. This controller has the limited utilize and can never drive the motor to run precisely at the set point speed. In this manner an improvement is needed for rectification in the output. [10] discussed about E-plane and H-plane patterns which forms the basis of Microwave Engineering principles. In PI controller, the proportional term does the work of quick remedy and the integral term sets aside limited effort to act and makes the steady state error zero. In derivative methodology further refinement is finished. This controller will permit the pace of progress of error speed to apply an extra remedy to the output drive. It very well may be utilized to give a quick reaction to unexpected changes in motor speed. In basic PID controllers it turns out to be extremely difficult to produce a derivative term in the output that has any significant effect on speed of motor. It tends to be sent to diminish the fast speed swaying brought about by high proportional increase. In this way, in numerous controllers, it isn't utilized. The derivative activity causes the noise (irregular error) in the primary signal to be enhanced and reflected in the controller output. Subsequently the most appropriate controller for speed control is PI type controller. The figure 1 shows the block diagram.

show unit as shown in figure 2.

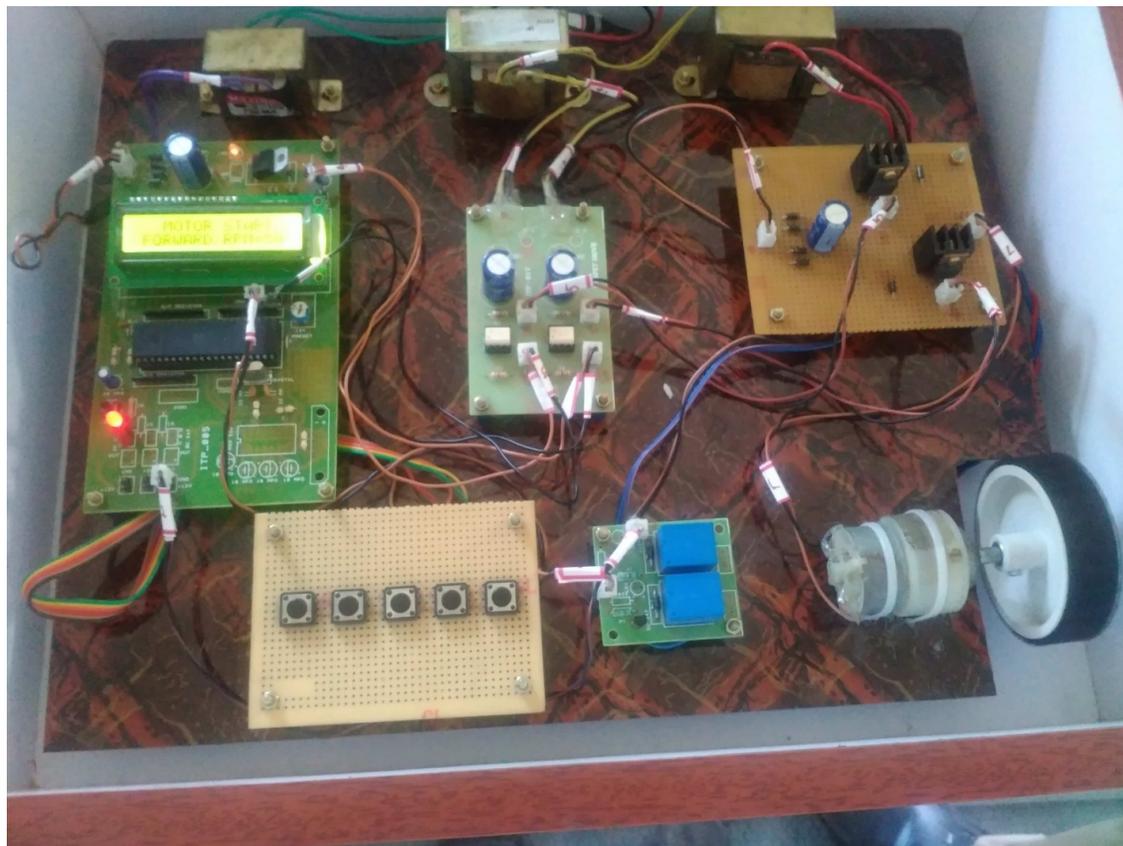


Figure 2: Working Model

3. CONCLUSION

This venture is to plan and execute the speed of a dc motor has been successfully controlled by utilizing Chopper. At first a worked on shut loop model for speed control of DC motor is thought of and necessity of current controller is considered. At that point a summed up displaying of dc motor is done After that a total format of DC drive system is gotten. At that point planning of current and speed controller is finished by fluctuating reference speed condition. The outcomes are additionally examined and broke down under previously mentioned conditions. The model shows great outcomes under all conditions utilized during model.



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