INTRODUCTION :

DC motors are widely used in industrial applications. In this regard controling the speed in wide range is another aspects. For this purpose, here is an abstract of the project

Electrical is the most valuable and precious one for this universe. In this
the motor plays an important role. Hence we want to control the motor for our requirements.

The aim of this project is to control the speed of the DC motor. Generally, DC motors are applicable for effective speed control and high starting torque applications like traction, lift, etc.

Basically DC motor speed control is done by voltage control, armature resistance control and flux control methods. But in this project we are control the speed of the DC motor by Pulse Width Modulation (PWM) technique. From this method we can obtain a smooth speed variation with out reducing the starting torque of the motor.

PWM technique also eliminate harmonics.

Direct current (DC) motors have been widely used in many industrial applications such as electric vehicles, steel rolling mills, electric cranes, and robotic manipulators due to precise, wide, simple, and continuous control characteristics. Traditionally rheostatic armature control method was widely used for the speed control of low power DC motors. However the controllability, cheapness, higher efficiency, and higher current carrying capabilities of static power converters brought a major change in theperformance of electrical drives. The desired torque-speed characteristics could be achieved by the use of conventional pulse width modulation controllers (PWM).In recent years PWM were effectively introduced to improve the performance of nonlinear systems. The application of PWM is very promising in system identification and control due to learning ability, massive parallelism, fast adaptation, inherent approximation capability, and high degree of tolerance. A constant-power field weakening controller based on load-adaptive multi-input multi-output linearization technique has been proposed to effectively operate a separately excited DC motor in the high-speed regimes. A single-phase uniform PWM DC-DC buck-boost converter with only one switching device able to produce a controllable DC voltage ranging from zero to more than the maximum value of input dc voltage has been used for armature voltage control method of a separately excited DC motor the drives using poly-phase brushless DC motors fed by a PWM inverter with current regulation.

Dc control using pwm

for the speed control of a DC motor.The purpose of a dc motor speed controller is to take a signal representing the demanded speed, and to drive a motor at that speed. The controller may or may not actually measure the speed of the motor. If it does, it is called a Feedback Speed Controller or Closed Loop Speed Controller, if not it is called an Open Loop Speed Controller.Recently, a brushless DC Motor (BLDC) has been rapidly demanded due topreciseness of industrial technology and increase of various kind of controldevice. Because a brushless DC Motor is suitable as a servo motor because of its high efficiency and excellent control character.

PWM:

“To explain PULSE WIDTH MODULATION technique in brief.”
Pulse Width Modulation (PWM) Basics
There are many forms of modulation used for communicating information. When a high frequency signal has amplitude varied in response to a lower frequency signal we have AM (amplitude modulation). When the signal frequency is varied in response to the modulating signal we have FM (frequency modulation. These signals are used for radio modulationbecause the high frequency carrier signal is needs for efficient radiation of the signal. When communication by pulses was introduced, the amplitude, frequency and pulse width become possible modulation options. In many power electronic converters where the output voltage can be one of two values the only option is modulation of average conduction time.
**1. Linear Modulation**
The simplest modulation to interpret is where the average ON time of the pulses varies proportionally with the modulating signal. The advantage of linear processing for this application lies in the ease of de-modulation. The modulating signal can be recovered from the PWM by low pass filtering. For a single low frequency sine wave as modulating signal modulating the width of a fixed frequency (fs) pulse train the spectra is as shown in Fig 1.2. Clearly a low pass filter can extract the modulating component fm.
**2. Sawtooth PWM**
The simplest analog form of generating fixed frequency PWM is by comparison with a linear slope waveform such as a saw tooth. As seen in Fig 1.2 the output signal goes high when the sine wave is higher than the saw tooth. This is implemented using a comparitor whose output voltage goes to logic HIGH when ne input is greater than the other. Other signals with straight edges can be used for modulation a rising ramp carrier will generate PWM with Trailing Edge Modulation.
**3. Regular Sampled PWM**
The scheme illustrated above generates a switching edge at the instant of crossing of the sine wave and the triangle. This is an easy scheme to implement using analog electronics but suffers the imprecision and drift of all analog computation as well as having difficulties of generating multiple edges when the signal has even a small added noise. Many modulators are now implemented digitally but there is difficulty is computing the precise intercept of the modulating wave and the carrier. Regular sampled PWM makes the width of the pulse proportional to the value of the modulating signal at the beginning of the carrier period. In Fig 1.5 the intercept of the sample values with the triangle determine the edges of the Pulses. For a saw tooth wave of frequency fs the samples are at 2fs.
There are many ways to generate a Pulse Width Modulated signal other than fixed frequency sine sawtooth. For three phase systems the modulation of a Voltage Source Inverter can generate a PWM signal for each phase leg by comparison of the desired output voltage waveform for each phase with the same sawtooth. One alternative which is easier to implement in a computer and gives a larger modulation depth is using space vector modulation

CIRCUIT :

**SPEED CONTROL OF DC MOTOR USING**

**PULSE-WIDTH MODULATION**

Pulse-width modulation (PWM) or duty-cycle variation methods

are commonly used in speed control of DC motors. The duty cycle

is defined as the percentage of digital ‘high’ to digital ‘low’ plus digital ‘high’

pulse-width during a PWM period.



The average DC voltage value for

0% duty cycle is zero; with 25% duty cycle the average value is 1.25V (25%

of 5V). With 50% duty cycle the average value is 2.5V, and if the duty cycle

is 75%, the average voltage is 3.75V and so on. The maximum duty cycle

can be 100%, which is equivalent to a DC waveform. Thus by varying the

pulse-width, we can vary the average voltage across a DC motor and hence

its speed. The circuit of a simple speed controller for a mini DC motor, such

as that used in tape recorders and toys, is shown in Fig. 2.

Here N1 inverting Schmitt trigger is configured as an astable

multivibrator with constant period but variable duty

cycle. Although the total in-circuit resistance of VR1 during a complete cycle is 100 kilo-ohms, the part used during positive and negative periods of each cycle

can be varied by changing the position of its wiper contact to obtain variable

pulse-width. Schmitt gate N2 simply acts as a buffer/driver to drive transistor T1 during positive incursions at its base. Thus the average amplitude of DC drive pulses or the speed of motor M is proportional to the setting of the wiper position of VR1 potmeter. Capacitor C2 serves as a storage capacitor to provide stable voltage to the circuit.

Thus, by varying VR1 the duty cycle can be changed from 0% to 100% and the speed of the motor from ‘stopped’ condition to ‘full speed’

in an even and continues configuration

of BC337A ous way. The diodes effectively provide different timing resistor values during charging and discharging of timing capacitor C1. The pulse or rest period is approximately given by the following equation: Pulse or Rest period ˜ 0.4 x C1

(Farad) x VR1 (ohm) seconds. Here, use the in-circuit value of VR1 during pulse or rest period as applicable. The frequency will remain constant and is given by the equation: Frequency ˜ 2.466/(VR1.C1) ˜ 250

Hz (for VR1=100 kilo-ohms and C1=0.1 µF) The recommended value of in-circuit

resistance should be greater than 50 kilo-ohms but less than 2 mega-

ohms, while the capacitor value should be greater than 100 pF but less than 1 µF.

**CIRCUIT DIAGRAM :**





LAYOUT :

