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Space Vector PWM Using Motor Speed Controle

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Aim:

Controlling a Prototype electric vehicle by using Space vector modulation (SVM) PWM techniques with respect to Direction control system.

Abstract:

This paper deals with a synthesis of Space Vector PWM control methods applied for an H-bridge inverter feeding a Permanent Magnet Synchronous Machine in Electric Vehicle application. First, a short survey of existing power converter architectures, especially those adapted to degraded operating modes is presented. Standard SVPWM control methods are compared with three innovative ones using EV-drive specifications in the normal operating mode. Then, a rigorous analysis of the margins left in the control strategy is presented for a semiconductor switch failure to fulfill degraded operating modes. Finally, both classic and innovative strategies are implemented in numerical simulation; their results are analyzed and discussed.

Space vector modulation (SVM):

Is an algorithm for the control of pulse width modulation (PWM). It is used for the creation of alternating current (AC) PWM waveforms;

I.INTRODUCTION:

Power converters are increasingly used in automotive applications for many reasons such as power conditioning, power management, and consumption reduction. As for any embedded transportation system, these power converters are subject to severe constraints especially regarding compactness and vehicle integration. More specifically electric vehicles (EVs) require a high degree of availability (continuity of service).

II.POWER ELECTRONIC ARCHITECTURE TOLERANT TO SEMICONDUCTOR FAILURE IN EV DRIVE:

Semiconductors are an important source of failure in traction systems. Investigations have highlighted the failure rate per element in a traction system [14]. Authors assess that the semiconductor failures and their driver auxiliary circuit are the most recurrent in electric automotive.

Space vector modulation:

Space vector modulation (SVM) is an algorithm for the control of pulse width modulation (PWM).[1] It is used for the creation of alternating current(AC) waveforms; most commonly to drive 3 phase AC powered motors at varying speeds from DC using multiple class-D amplifiers.

There are various variations of SVM that result in different quality and computational requirements. One

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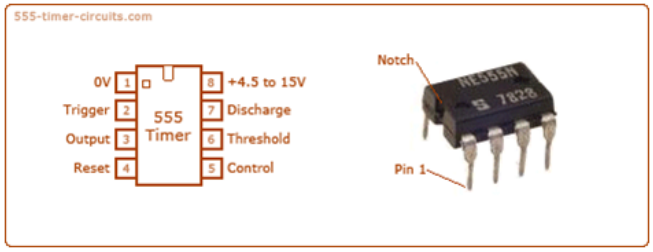
active area of development is in the reduction of total harmonic distortion (THD) created by the rapid switching inherent to these algorithms.

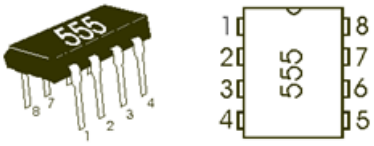
Pulse-Width Modulation:

Pulse-width modulation (PWM), orpulse-duration modulation (PDM), is a modulation technique used to encode amessage into a pulsing signal. Although this modulation technique can be used to encode information for transmission, its main use is to allow the control of the power supplied to electrical devices, especially to inertial loads such as motors. In addition, PWM is one of the two principal algorithms used in photovoltaic solar battery chargers,[1] the other being maximum power point tracking.

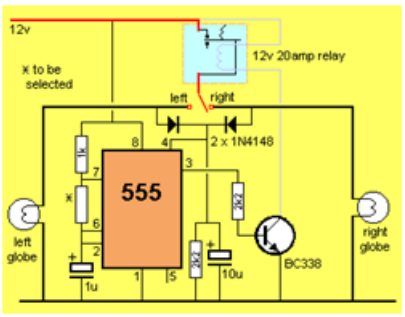
555 timer:

The **555 timer** IC is an integrated circuit (chip) used in a variety of **timer**, pulse generation, and oscillator applications. The **555** can be used to provide time delays, as an oscillator, and as a flip-flop element. Derivatives provide up to four timing circuits in one package.





EXPERIMENTARY CIRCUIT:



The 555 timer IC is an integrated circuit (chip) used in a variety of timer, pulse generation, and oscillator applications. The 555 can be used to provide time delays, as an oscillator, and as a flip-flop element. Derivatives provide up to four timing circuits in one package. Introduced in 1971 by American company Signetics, the 555 is still in widespread use due to its low price, ease of use, and stability. It is now made by many companies in the original bipolar and also in low-power CMOS types. As of 2003, it was estimated that 1 billion units are manufactured every year.

Block diagram in using module:

1) Railway track
2) Tension spring
3) Link mechanism
4) 12v Dynamo
5) 12v/1 Am battery
6) Invertor
7) CFL
8) 555 timer
9) Motor

Relay Direction controle direction with pwn circuit: Description.

A simple DC motor controller circuit using NE555 is shown here. Many control circuits have been published here but this is the first one using NE555 timer IC. In addition to controlling the motors speed its direction of rotation can be also changed using this circuit. A PWM circuit based on timer NE555 is the heart of this circuit.

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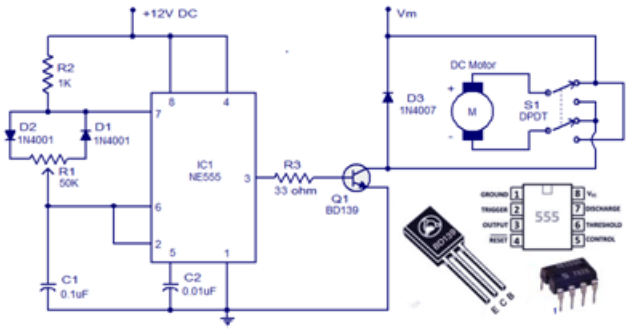
NE555 is wired as an as table multivibrator whose duty cycle can be adjusted by varying the POT R1. The output of IC1 is coupled to the base of transistor Q1 which drives the motor according to the PWM signal available at its base. Higher the duty cycle the average voltage across motor will be high which results in higher motor speed and vice versa. Change of DC motor direction is attained using the DPDT switch S1 which on application just toggles the polarity applied to the motor.



Controller is actually a combination of two circuits

Controller = Driver + Switching circuit

Driver is the actual circuit that drives DC motor and switching circuit decides how DC motor should be driven. So actually, switching circuit is the main circuit that controls the motor. Now there are two parameters of DC motor that can be controlled

1. **Speed**
2. **Direction**

Changing the direction of DC motor is very simple just reverse the supply given to DC motor. For varying speed of DC motor you have to vary the applied DC voltage. One well known method widely used in industries is Pulse Width Modulated (PWM) speed control of DC motor also known as chopper control. In this method PWM is applied to DC motor and as the width of pulse varies average voltage applied to motor varies and so the speed of motor also varies. In this project I have used standard H-Bridge circuit as a DC motor driver and as table multvibrator (using IC-555) as a PWM generator. IC-555 generates PWM with the base frequency of 100 Hz. This PWM is applied to H-Bridge driver through DPDT switch which decides direction of rotation either clockwise or anticlockwise.

Conclusion:

So by using this Space vector modulation (SVM) pulse creation technique is an electric vehicle can secure travels with respect to user interface control.

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