

Collision Avider Automatic Braking & Acceleration System for Electric Cars

Lakshay Verma

Amity University Haryana, B Tech(EEE) Final Year, Gurgoan, Haryana, India
lakshayverma1605@gmail.com

Abstract: Now days, road accidents are a major part of causalities due to increased motorist population, long working hours and stressful life. The aim of the proposed project is to reduce these causalities by taking into account the future aspect for electric cars using automatic braking system based on ADC(Analog to Digital Converter) and PWM(Pulse width modulation).The variation in speed of the motor or acceleration in electric cars can be done by changing the resistance of the variable resistor in series with motor but that will leads to lots of heat losses therefore in the proposed system, ADC based system is used to create accelerator of car and then speed of car is varied by taking digital value from this system and provided as a duty cycle of the PWM signals. PWM is very frequently used to change the speed of industrial motor due to accuracy in changing speed and low losses. As another vehicle come nearer either from front or from rear, the proposed system first take the control of acceleration from driver and then immediately apply the brake. Receiver section of the proposed system also interfaced with LCD, which will display the alert messages.

Keywords: PWM (Pulse Width Modulation), ADC (Analog to Digital Converter), Duty Cycle, CVAVR(Code Vision AVR), MCU(Microcontroller Unit), ISIS(Intelligent Schematic Input System), IR(Infra red).

I. INTRODUCTION

This project is mainly focused on safety of the driver with accuracy in acceleration and braking system for electric vehicles with ease. Now a day, life is becoming more and more stressful due to long working hours mainly in the metro cities and increased traffic on the road led to the increase in causalities of road accidents. It is demonstrated that driving performance deteriorates due to these factors. Also reckless and improper driving leads to accidents.

Speed control of dc motor could be achieved using mechanical or electrical techniques. In the past days, large size hardware was required to implement speed control system for dc drives which were mostly mechanical. Pulse width modulation technique is used to reduce the total load without a loss, which normally occurs when a power source is limited by resistive load.

The underlying principle in the whole process is that the average power delivered is directly proportional to modulation duty cycle. If the modulation rate is high it is possible to smooth out the pulse train, using passive electronic filters and recover an average analogue wave [1].

The proposed system is based on MCU which involves detection of object from a specific distance by using IR sensors.IR LED transmits and IR photodiode receives IR signals on interruption from another vehicle and this

corresponds to reduction of duty cycle of PWM signals to zero and activates the automatic brakes. This proposed system also includes the ease of acceleration to the driver. The MCU based accelerator is proposed which make use of ADC with the PWM to change the speed of DC motor more precisely.

II. THEORY

Analog to Digital Converter (ADC) translate along electric signals from data processing purposes. The ATmega16 features a 10-bit successive approximation ADC. The ADC is connected to an 8-channel Analog Multiplexer which allows 8 single-ended voltage inputs constructed from the pin of Port A. The single-ended voltage inputs refer to 0Volt (GND). The ADC contains a sample and hold circuit which ensures that the input voltage to the ADC is held at a constant level during conversion. ADC is used in information processing, computing and data transmission. By converting from analog to the digital world, electronics be use to interface to the analog world around us [6].

IR photodiode works as a photo resister, photocell and photo-conductor. Its value depend upon the amount of light falls on it and this change in resistance value can be measured further using ADC. It works on photo conductivity that is when light falls on the resister, electrons in valance band becomes exited and goes to conduction band. As the light increase its resistance decreases [3].

In Pulse Width Modulation (PWM), the signal frequency is varied in response to the modulation signal. These signals are used for radio modulation because the high frequency carrier signal needs for efficient radiation of the signal. It is used to control the amplitude of digital signals in order to control power supplied electrical devices [5].

PWM is a technique which is used to encoded message for transmission message into pulsating signal. Duty cycle is expressed as the ratio of 'on' time to the regular interval or 'period' of time. A low duty cycle corresponds to low power, as speed of DC motor changes according to change in duty cycle. Duty cycle is measured in percentage and for maximum speed value of duty cycle is 100%.When the signal is high it is said to be "on time" concept of the duty cycle is used. PWM includes a benefit of minimum power loss [1].

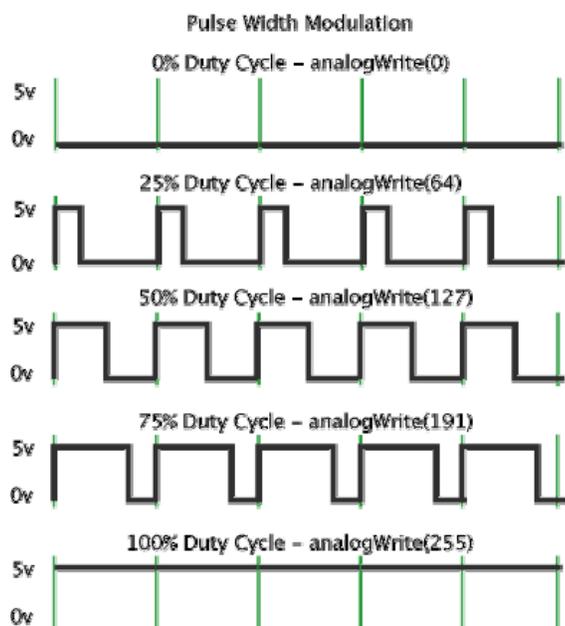


Figure 1. Duty cycle of PWM signal

III. SOFTWARE

CodeVision AVR (CVAVR) generally works on C programming language. It was developed by Pavel Haiduc. It is freeware software designed for both simple and complex programs. Its library instruction can be expendable for further instruction by adding new micro chips .The main reason for having an advantage of this software on others is that t it stores the data in a flash memory rather than storing in the ram of the computer which makes the program faster than other compilers. CVAVR also supports syntax highlighting which is also an advantage as it makes easy for tracking down errors. CVAVR works in a window operating system [2].

Proteus (PROcessor for Text Easy to USe) was the software created by Simone Zanella. The simulation in Proteus software is easy and simple method for identify the errors

included in electrical or electronic circuits by using computers. It enables rapid prototyping of both hardware design and firmware design in software, making it easy to make changes to both.

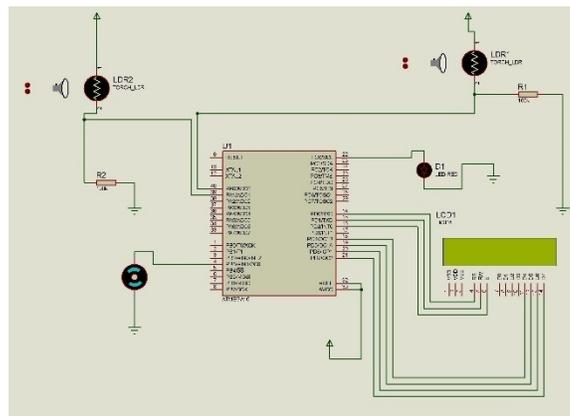


Figure 2. Simulation View of the system

It provides the environment for the design entry and development. Proteus is an application for Virtual System Modeling (VSM) and circuit simulation. Proteus ISIS helps to generate all the electrical and electronic circuits and examine their working [4].

IV. WORKING

The proposed system comprises of two main features first is automatic braking system on incoming of any obstacle and second provides acceleration to the electric car. As the circuit is energized both system activated. In first system, IR sensor starts giving digital value corresponds to distance between vehicles to ADC unit of MCU. The processed analog signal is converted into 10 bit digital value by ADC. A threshold value is set corresponds to minimum distance between two vehicles at which automatic braking system will be activated and message seen on LCD that "Automatic braking system activated". As this system activated, first it will disable accelerator system and then apply brakes. At this time if driver push accelerator, it will not work and car will stop immediately. When the vehicles move away, then the digital value decreases and this value go below threshold, automatic braking system deactivates and accelerator system activate again.

In accelerator system, as the driver push the accelerator, an analog signal is sent to ADC unit of MCU and then its corresponding digital value is processed and converted into a value corresponds to duty cycle of PWM signal which will

increase the speed of the DC motor to run vehicle faster as shown in figure 2&3 and message seen on LCD that “Car Working Normally”.

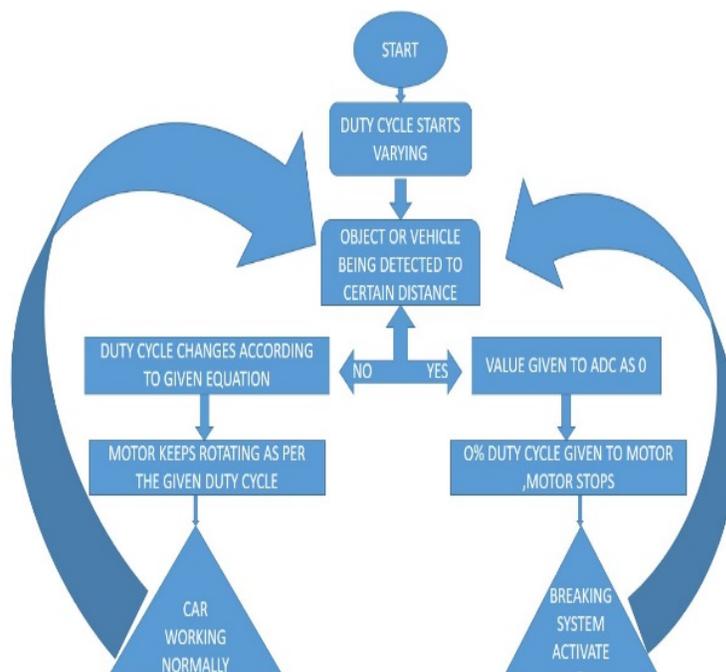


Figure 3. Flowchart of working

V. CONCLUSION

Electric vehicles are growing rapidly as they are becoming forerunner in the vehicle technology and the proposed system gives advantage in changing the speed of the motor which will provide the vehicle acceleration. Automatic braking system is a prototype of having some advancement in the vehicle technology basically for electric vehicle. The proposed system saves money as well as life which are most precious for any person. The proposed system also has lots of future applications and it creates a new revolution in the growth of vehicle as well as electrical technology.

REFERENCES

[1] Amit Kumar Yadav, Annu Kumari Chaubey, “Speed Control of DC Motor Using PWM”, International Journal of Advance Research in Science and Engineering, 2013.

- [2] <https://file.org/free-download/codevision-c-compiler>.
- [3] <https://electricshub.org/light-activated-switch-circuit>.
- [4] <https://blowtech.blogspot.in/3013/09/design-and-simulate-electronic-circuit.html>.
- [5] Soniya.K.Malode, R.H.Adware, “Regenerative Braking System in Electric Vehicles”, International Research Journal of Engineering and Technology, 2016.
- [6] <https://learn.sparkfun.com/tutorials/analog-to-digital-conversion>.
- [7] Divya Thakur, A.P Thakare, “A Review on Implementation of FPGA for Automatic Reverse Braking System”, 2016.
- [8] Von Albrichsfeld, C. and Karner, J., “Brake System for Hybrid and Electric Vehicles”, SAE Technical Paper, 2016.