UNIVERSITI TEKNIKAL MALAYSIA MELAKA

VEHICLE SPEED CONTROL SYSTEM USING WIRELESS COMMUNICATION TECHNOLOGY

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor's Degree in Electronic Engineering Technology (Telecommunication) (Hons.)

by

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DECLARATION

I hereby, declared this report entitled "Vehicle Speed Control System Using Wireless Communication Technology" is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Telecommunication) (Hons.). The member of the supervisory is as follow:

………………………………

(NORAIN BINTI RAHIM)

ABSTRAK

Kini kemalangan selalu berlaku di saat pemandu sibuk memandu dengan laju sehingga tidak sedar bahawa kelajuan itu adalah di tempat yang salah ia ini tempat yang sepatutnya tidak boleh melebihi kelajuan tertentu. Dengan kelajuan kereta yang dipandu oleh pemandu tadi akan mengakibatkan kemalangan berlaku dan juga boleh mengakibatkan pemandu dikenakan hukuman denda dengan membayar wang saman kepada pihak polis. Jadi, untuk mengelakkan hal ini dari berlaku, sebuah projek khas dicipta iaitu "" dengan menggunakan RF sebagai alat untuk komunikasi antara kereta dan juga papan tanda diatas jalan iaitu jalan yang berbahaya dan zon perlahan. Malah, projek ini juga menggunakan arduino UNO, L298N modul kawalan motor, LM393 pengesan kelajuan dan juga LED dan Buzer untuk memberi isyarat kecemasan. Semasa kelajuan kereta melebihi tahap yang ditetapkan maka LED dan Buzer akan berkelip dan berbunyi sekiranya kelajuan kereta itu di dalam zon yang berbahaya iaitu zon yang diletakkan RF untuk memberi isyarat. Akhir kata, projek ini berjaya apabila kereta didalam zon bahaya, LED akan berkelip manakala buzer pula akan berbunyi dan pemandu akan mula memperlahan keretanya.

ABSTRACT

Nowadays, accident always occurred once driver are busy driving rapidly until not aware that the speed is in above speed limit at the speed. With speed of vehicle driven by driver just now will cause an accident occurred and also could result in driver to get a fine by paying summons money to police. So, to prevent this case from happen, a special project created namely "Vehicle Speed Control Using Wireless Communication" by using RF as tool for communication between vehicle and also above signboard road which is road that in dangerous and slow zone. This project using an arduino UNO, L298N motor driver module, LM393 speed sensor and also LED and Buzzer to give emergency signal. During speed of vehicle that exceed level of speed, the LED and Buzzer will blink and sound if the speed of vehicle now are in zone that is dangerous where this zone are placed by RF transmitter module to send a signal to any RF receiver module. Finally, this project managed to success when the vehicle are inside on the area of danger zone which is in high speed, LED will blinking be warned by buzzer and driver will start alert and will slow down the car.

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DEDICATION

Special dedicated to my beloved parents, family members and friends.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

AC	-	Alternating Current
AVR	-	Aboriginal Voices Radio
DC	-	Direct Current
ECU	-	Electronic Control Units
GND	-	Ground
GPS	-	Global Positioning System
GSM	-	Global System for Mobile
IR	-	Infrared
I/O	-	Input / Output
LED	-	Light Emitting Diode
LCD	-	Liquid Crystal Display
MAX	-	Maximum
P	-	Proportional
PWM	-	Pulse Width Modulation
RAM	-	Random Access Memory
RF	-	Radio Frequency
RFID	-	Radio Frequency Identification
Rx	-	Receiver
Tx	-	Transmitter
USB	-	Universal Serial Bus
Vcc	-	IC Power Supply pin
Vin	-	Voltage In
ZCD	-	Zero Crossing Detectors
%	-	Percentage

CHAPTER 1

INTRODUCTION

This section basically described the introduction of vehicle speed control system using wireless communication technology. It will start by brief explanation about background of the project. Then, the problem statement that lead an idea to the project and also the objectives of the project that aimed to be achieve are establish in order to overcome the problem statement. This section also will provide a work scope of the project and also the overview of this thesis which is will be contains of few chapter.

1.1   Background

Nowadays, there a lot of accidents occurred due to human negligence because of bad roads. It makes a driver sometimes inattentive with vehicle speed despite of many signs in place to warn the speed limit and a dangerous area. Government also puts in every road a sign board as reminder to driver for always follow the specified speed limit. However, not all sign board that prepared will be seen by driver and this will cause accident occurred although only minor accidents.

In this project, the system will operate when vehicle enter a danger zone where the driver needs to disaccelarate vehicle. The signals from vehicle can be detected by RF Receiver where transmitted by RF Transmitter which is placed in the zone. When the signal received, it will be decoded by the microcontroller and warning the vehicle through a Light Emitting Diode (LED) and a Buzzer. According the signal received, microcontroller will control limit the speed of DC Motor.

1.2   Problem Statement

Most of the vehicles are used in very high speed when it enters to a danger zone which is zone that speed is under 90 km/h. The accident can happen in many ways when the vehicle is in g-high speed and without aware the surrounding and also will be waste of money by pay for a penalty if passing through a road with a speed track.

1.3   Objective

The objectives of this project are:

i.   To study on how to make the vehicle speed automatically decelarate.
ii. To analyse the signal by using wireless communication.
iii. To develop a system that allows the vehicle to get the signal from the transmitter.

1.4   Scope of work

This project focuses is on developing a low cost vehicle speed control based on RF technology and microcontroller system. From the overall vehicle speed control; this project is only limits obstacle detection and display LED Blinking and Buzzer as Warning Message. For this project, RF signal will only use to turn on the control unit so that it can be detect by the LED so the motor speed will automatically decelerate.

In this project, RF Transmitter is implementing at the danger zone to detect when the vehicle speed is higher than a specified speed limit. Then RF Receiver will be implementing in the microcontroller to receive a signal from Transmitter and to notify a control unit which is Arduino. C Language is implementing to the Arduino to turn on a system that will decelerate the motor speed and after that a signal is sent to the receiver part to turn ON the LED and Buzzer.

1.5   Thesis Layout

Chapter 1 provides an introduction about vehicle speed control using wireless communication technology.

Chapter 2 discusses the theoretical concept behind the component and the system for the project.

Chapter 3 explains of design concept of system used and the method used which are Planning, Implementing and Analysed.

Chapter 4 shows the results that collected from the project stimulation.

Chapter 5 states the conclusion can be made according to the overall system that was design in the project and also future work.

1.6   Summary

In conclusion, this chapter consist of the introduction of the vehicle speed control using wireless technology which is consist of the background, problem statement, objectives and project scope of the project.

CHAPTER 2
LITERATURE REVIEW

This section basically will be described about previous study based on this project. It provides a study of hardware used by others researchers in order to use it on this project. Firstly, this section will discuss about the previous project research and will be followed by the hardware use for the project.

2.1   Previous Project Research

There are several researches that related to the project of this thesis which are in term of wireless technology and also the function of the system. However there are several different between the research which are uniqueness and the method used.

According to Mishra, *et al*., October 2012, a sensor system is built for infrastructure to vehicle; 12V, communication which can transmit the information provide by active signal placed on the road to adapt the vehicle speed and to prevent collision. Furthermore, Radio Frequency Identification (RFID) is used to tag the warning signal placed in the dangerous portions of the road. In their research, they used two parts which is Transmitter and Receiver in the transistor when press the micro switches key given some input to micro, the micro check the key input whose key press and data sending after the process encoded the input by RF Module. For this system, all is based on the frequency modulation.

Compared to another journal research by (kameswari, *et al*., December 2011), they used Electronic Control Units (ECU) which is it characterized by:

      i.   Many analogue and digital I/O lines (low and high power)

     ii.   Power device interface/control

    iii.   Different communication protocols (CAN, KWP-2000)

    iv.   Large switching matrices for both low and high power signals

     v.   High voltage tests

    vi.   Intelligent communication interface adapters (standard or custom)

   vii.   Automatic fixture recognition and software sequence enable

  viii.   Power simulation devices

Furthermore, microcontroller is used to interface with pedal position sensor, vehicle speed sensor, ECU and the wireless module. It processes the frame and imposes the speed limit on automobile. In their process, when the accelerator pedal is moved to increment the speed, microcontroller calculated the speed that would be reached on the new pedal position if speed higher than a speed limit, then it denies excess speed and give appropriate signal to ECU as shown on Figure 2.1. kameswari, *et al*., December 2011.
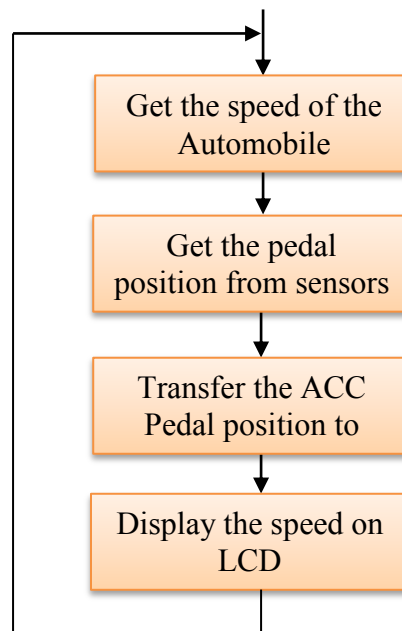

Figure 2.1(a): Flowchart scheme of operation in Normal Mode (kameswari, *et al*., December 2011).
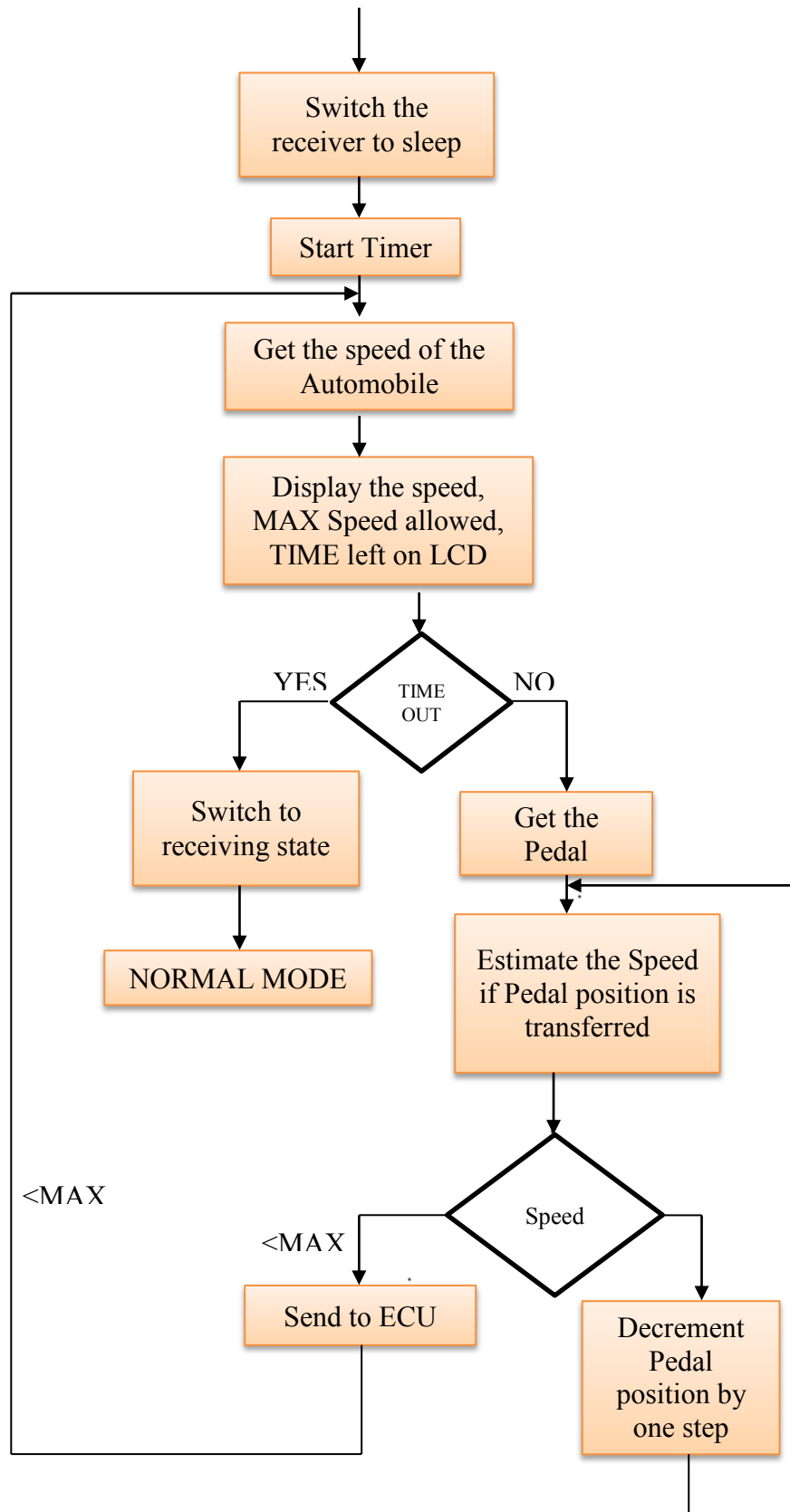
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Figure 2.1(b): Flowchart Schematics Operation in Active Mode (kameswari, et al., December 2011).

Furthermore, according to Thomas, *et al.*, May 2014, DC Motor is used a Pulse Width Modulation (PWM) technique which it's normal to control by an accelerating units. PWM is actually width of the output pulse that is varied by varying a DC voltage reference which is given as one of the inputs to comparator. They also said that microcontroller is a low power device that can produce 5V of output where it need to isolated using Opto-Coupler (TLP250) which is used low power signal as an input and it produces corresponding high power signal as an output. They applied two methods for speed control DC motor which is closed loop and open loop.

According to B.V.V.Satayanarayan & Kona, 2014, LPC 2148 microcontroller is based on ARM7TDMI-S CPU which the ARM 7 has a characteristics which is it have 2 port for interfacing with various devices, 40kB of RAM, 512 kB of flash memory and high speed performance at speed of 60MHz. also for their researches they used two of a warning module and two of the speed control module such as Liquid Crystal Display (LCD) Module and a Buzzer and also DC Motor and Relay Module.

Next, the research done by Rao, *et al.*, March 2014, said that they research used to stop the vehicle by using Ultrasonic sensor detect obstacle. They also use a microcontroller of AT89552 which is to check the data with the program embedded in the motor driver and perform appropriated actions on the electric DC motor. The program for their project is programmed in the embedded C language.

Then, according to Govindaraju, *et al.*, August 2014, the signal is monitoring continuously with the help of the GPS, if the condition of speed is abnormal then it send to an ARM processor to reduce the vehicle speed. They also used Keil C software in order to program in microcontroller which can support every level of developer. It also generated embedded application for virtually every ARM process application and helps to provide the variation simulation output.
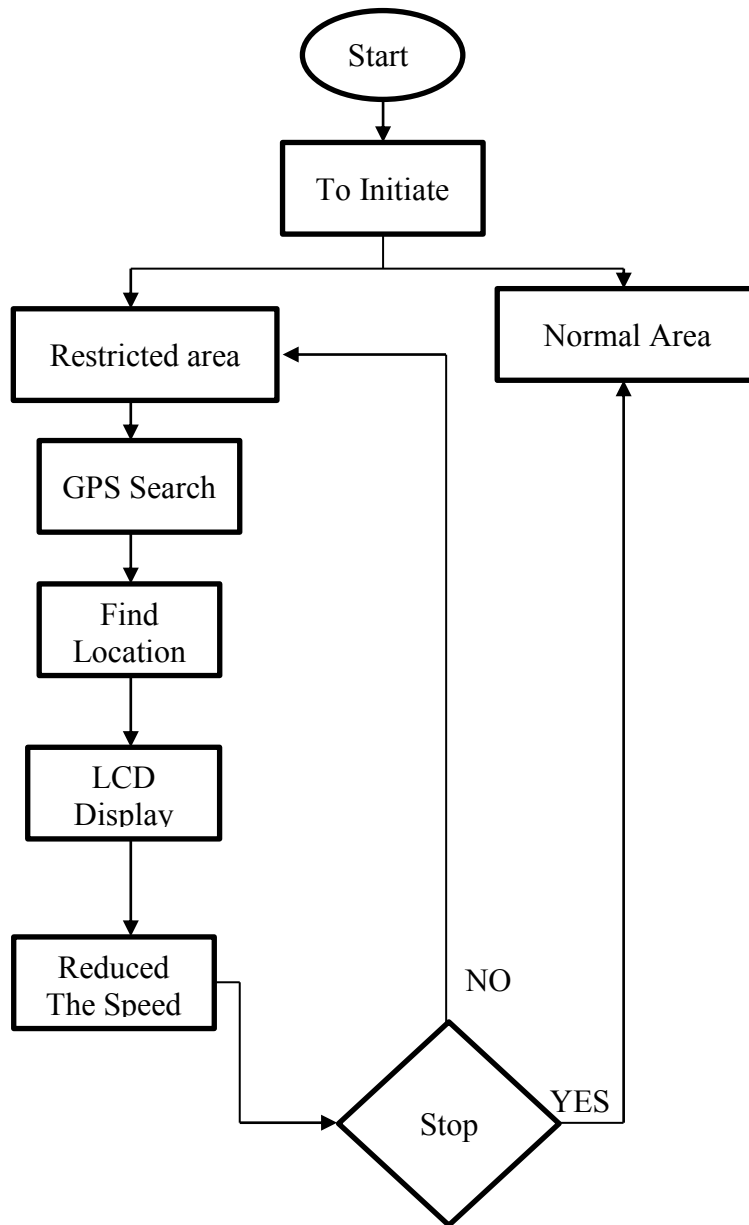
Figure 2.2: Flowchart of Process (Govindaraju, et al., August 2014).

As shows in Figure 2.2 above, first step is it initialize power is supplied to vehicle section and GPS as well as GSM. Then, next step is two stages are vehicle section and pedestrian limit. After that is the two areas are normal speed and restricted area. Then, the GPS ready to track the location and display the message by using LCD. Then it wills automatically getting reduced the speed by limit in step 6. After the process is completed, it getting move to original state then last step is stopping the process.

Lastly, according to Babu & Sudhakar, November 2014 they used IR LED and Photodiode in their research which is it proximity sensor when IR signal transmitted from LED depending upon the distance of the obstacle or humps there is reflection of IR beam from that, material the circuit provide the signal to microcontroller and with same process of fuel reduction technique, the vehicle fuel has been reduce and the speed of vehicle also been reduced. IR LED and Photodiode are generated a Buzzer sound to alert the vehicle. Their research also used solar panel to generate an electrical energy from natural resources like solar light. There are some application and advantages of their system which is:

i. Speed control through RF technique.
ii. Speed control at humps.
iii. Speed controls when any obstacle found.
iv. U curves safety indications.
v. Low power transmitter is enough for operation.
vi. Lot of accidents possible is avoided.
vii. Suitable for all kinds of vehicle safety system.
viii. Less man power is required
ix. Steep edges are detected.
x. Driver alertness will be more.
xi. High, low beams of headlights are controlled automatically.
xii. Controlling the horn of the vehicles across schools, hospitals etc.
xiii. Because of using solar it will be cost effective

2.2 Hardware Overview of System

Hardware overview is an analysis of the component which will be considered used in the design of vehicle speed control using wireless technology. The main component will be discussed contain of Microcontroller, RF Module, DC Motor and Liquid Crystal Display (LCD).

2.2.1 Microcontroller

In these researches, microcontroller will be used as a platform for system can be functioning. Microcontroller is a small computer on a single integrated circuit containing a processor core, memory and programmable input/output peripherals (Dizvi, 2012). Furthermore, microcontroller also effectively has revolutionized of the standard in electronic component today which is they invent a robot to form a large consumer goods. Block diagram of the circuit and operating mode are shown in Figure 2.3 below, the 12V DC supply has been regulated to 5V using a voltage regulator. The diode 1N4001 is provide which is to reverse the protection of the connection and the capacitor is to stabilize the 5 V supply. However, the voltage regulators is generally do not functioning in correctly unless the circuit input supply is approximately 8V or higher (Nicolae & Marcel, May 2014).
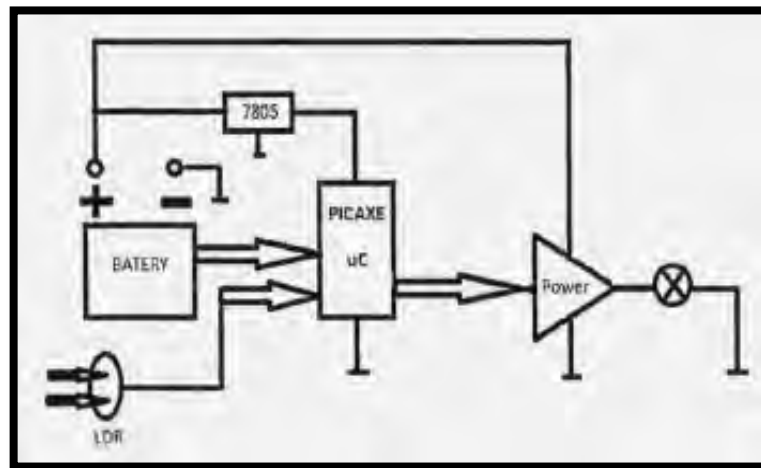

Figure 2.3: Block Diagram of the circuit and operating mode (Nicolae & Marcel, May 2014).
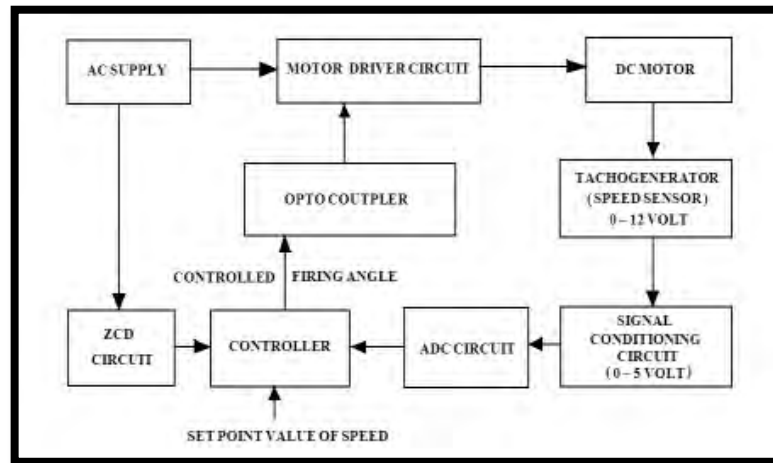
Figure 2.4: Block Diagram of Closed Loop DC Motor Speed Control System
(Mondal, et al., 2013).

In the proposed design shown in Figure 2.4. a DC motor of 12 Volt, 1000 rpm, Zero Crossing Detector (ZCD) for zero reference and a Tachogenerator as a Speed sensor has been used. This system describes that the design and implementation of the AT89c51 Microcontroller based closed loop DC Motor Speed Control System that controls the speed of a DC motor through Optically Coupled Half Controlled SCR bridge rectifier used as a Motor Driver circuit. In the research, they used to design and develop AT89c51 Microcontroller based embedded closed loop speed control system of DC Motor where Proportional (P) Control algorithm has been implemented to control the firing angle of the SCR for controlling the voltage applied to the DC Motor. Microcontroller in the design has been fed with the tachogenerator output voltage after conversion into suitable form by the signal conditioning circuit designed (Mondal, *et al*., 2013)

According to Chavan, *et al*., April 2014, microcontroller can be damage and overload if Input/Output (I/O) devices required current which is more than 10mA in order to avoid, the buffer HCT245 is connected to the every ports of the microcontroller. The HCT245 is an 8-bit bi-directional buffer and is connected to the 8 pins of the ports. The pin 1 is enable pin connected to the Vcc through resistor. The pin 9 is the RESET pin of the microcontroller and is connected to the switch. Buffers also provide isolation between microcontroller and I/O devices which helps the microcontroller to operate in normal mode and the chances of program corruption