International Journal of Scientific Research and Engineering Development-– Volume 5 Issue 4, July-August 2022

Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

Development of Microcontroller Based Vehicle Speed Alarm

Washington Enyinna Mbonu*, Kingsley Ugochukwu Walter Ikpo**

*(Electrical and Electronic Engineering, Federal Polytechnic Nekede Owerri Imo State,
Email: washingtonfiso@yahoo.com)

** (Electrical and Electronic Engineering, Petroleum Training Institute, Effurun, Delta State
Email: ikpo_kuw@pti.edu.ng)

----------**********----------

Abstract:

The goal of developing the system is to control the speed of vehicles and to avoid accidents. Using the system we can control and vehicle speed. If the speed goes beyond first limit then alarm is generated to notify the motorist and after that if the speed again is increased to the given limit than the vehicle is automatically switched off for fixed time interval. A speedometer system is used to monitor the speed of the vehicle. The voltage output of the speedometer system is used to set the time the alarm comes ON

Keywords **— Speed limit, vehicle, automatic, speedometer, alarms**

----------**********----------

I. INTRODUCTION

It is known that road accidents are increasing every day. Most of these road accidents are caused because of vehicle high speeds especially if the places have sharp turnings and junctions exist. Running the vehicles with high speed even at those places is the main cause for the accidents. Reduction of number of such accidents is the prime step needed to be taken. Many systems have been developed to prevent these road accidents .One of them is Cruise control system that is capable of maintaining speed defined by the motorist and another version of this is the Adaptive Cruise Control that is capable of keeping the vehicle at safer distance from the preceding vehicle. But these systems have no capability to notice curved roads where the speeds of the vehicles have to be lowered to avoid the accidents. Later curve warning systems (CWS) have been developed to detect the curved roads by using Global Positioning System (GPS) and the digital maps obtained from the Geographical Information Systems (GIS) to assess threat levels for motorist if approaching the bend road quickly. But these maps need to be constantly updated and are not useful if there are unexpected road. In the current dispensation system, manually operated systems are used, for instance in public transport vehicles, a rod is welded below the accelerator and in some cases speed lockers are used in gear box so that the vehicles can maintain certain limit. So, a system being develop is a system which controls speed of the vehicle and sends an alert notification to the car owner, that vehicle has crossed maximum limit. The model therefore developed will deal completely to control the speed of the vehicle. The model main end is to develop a speedometer. And using this speedometer detects the speed of the vehicle by detecting the signal generated by Hall Effect sensor present in the tyre of the vehicle. After determining the speed, if the speed goes beyond the fixed limit then it notify the driver of vehicle by an alarm and also using the GSM modem to send a notification message to the owner of that vehicle. The alarm is generated for the first fixed speed limit, and if the speed limit further exceeded to the maximum limits then slowing down the speed of the vehicle for fixed time.

A. Scope of the Research

In general, the speed of the vehicle is changes according to the accelerator pedal position. The concept used in developing the model is detecting the speed of the vehicle using PIC microcontroller and controlling the speed by slowing down the speed and also generating alarm and sending message. The model consists of PIC microcontroller, Hall Effect sensor, speedometer, GSM Module for sending SMS and alarm for making alarm sound. The speed of the vehicle is configurable. Device will operate using vehicle's battery. Message will also be configurable.

The procedure for implementation is, first the system is being connected to the vehicle in such a way that a +12V and GND are connected to the battery. Then the speed limit is set using a potentiometer. The microcontroller will sense the pulses from the Hall Effect sensor and check the speed limit whenever the vehicle is in motion.

Microcontroller is used has a hardware interface. It takes input from Hall Effect sensor and used to determine speed of vehicle. This Hall Effect sensor is present in the wheels of the vehicle. The signal output from the Hall Effect sensor is sensed by microcontroller. Thus, microcontroller takes pulses as input and the output is the speed produced. (which is the actual speed of the vehicle).Working of hall effect sensor is that it generates a pulse once every revolution of the shaft. Then the pulses produced are output to counter, and count the number of pulses in specific time interval.eg 50 counted pulses in one sec time interval means the shaft is turning at :50rev/sec=3000rev/minute. Now the micro controller checks the speed of the vehicle. If the speed limit is exceeding the set value it will alert the driver using panic alarm.

B. Object of the Research paper

The main objects of this research work are

- To implement a digital speedometer.
- Incorporate a speed monitor with respect to set threshold.
- Actualization of speed using analog to digital conversion technique;
- Displaying the analog value in a digital format using an alphanumeric LCD display;
- Actualizing set points
- Experimenting hall -effect technique.

II. SPEED MEASUREMENT

Definition of speed is the distance travelled divided by the time taken

$$S = \frac{Distance}{Time}$$

So if travelled 200 kilometers and it takes four hours, the average speed is 50 kilometers per hour. But that doesn't tell anything about the speed on the way, because the vehicle might have travelled by different routes or paused your journey. Only a speedometer can tell the actual speed at any given moment.

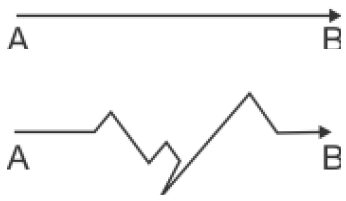

Fig. 1. Vehicle average speed route

What is taken into consideration here is the *average* speed; what is needed is the *instantaneous* speed: the speed at which the vehicle is going at any given moment. Figuring that out is a lot harder than you think. What is really needed is a way of figuring out how fast the car's wheels are turning.

Fig. 2. Image of speedometer

II. MATERIALS AND METHODS

The block diagram of the system is depicted in figure 3. The use of a microcontroller into the system makes it to be a stand-alone type of system that is capable of taking decisions to keep the system functioning properly. The microcontroller receives input signals from the speed limit switches and the digitized actual car speed. In this work three switches are used to set the speed limits at 60 km/hr, 80 km/hr, and 100 km/hr. These speed limits may be altered as desired. The actual car speed may be measured by using several methods but a more accurate method involves the use of sensors such as the Hall effect based sensor

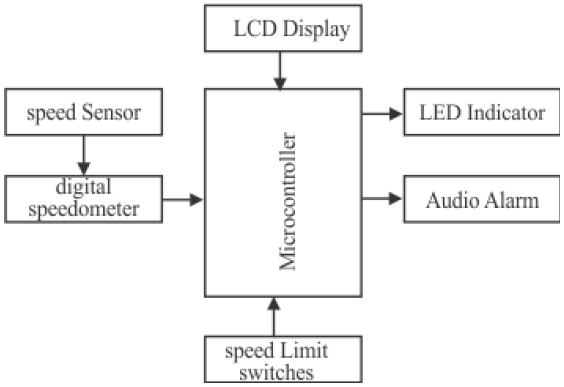

Fig. 3. Block Diagram of Automatic Car Speed Controller System

The system operates by comparing the digitized car speed with the value of the speed limit set by the user. Depending on the result of the comparison a decision is taken to light up the appropriate LED and also to write a message on the screen of the LCD. An audible alarm is sounded if the set speed limit is exceeded by the driver. The flowchart of the program executed by the microcontroller is shown in figure 2. This shows that the microcontroller polls the input sensors and depending on their states an appropriate decision is taken after which the microcontroller goes back to monitoring the sensors in a continuous loop. The circuit used for the simulation of the operations of the car speed controller was built in the environment of Proteus Design Suite Version 8.0 (Labcenter Electronics 2014) and is shown in figure 3. A variable resistor RV2 shown in figure 3 is used to represent the actual speed of the car. One of the transistor switches (Q1-Q3) is used for one of the desired speed limits. The microcontroller is programmed to turn on the green, red, or yellow LED as appropriate and to also write a message on the screen of the LCD. An audible alarm system is turned on by the microcontroller when necessary

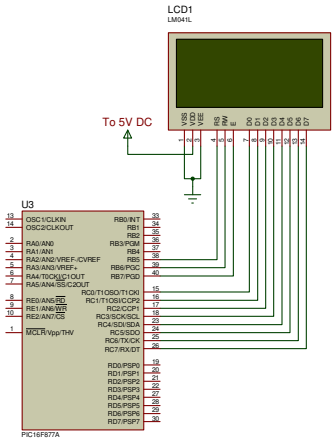

Fig. 4. Circuit diagram of LCD interfaced with Microcontroller

The Alarm Unit

This Unit Gives Audible Sound For when the process level reaches the SET Point. Below is the requirement of the ALARM unit.

Selection of the ALARM

The unit was implemented with a DC Buzzer Alarm. Below is the choice of the selection of the buzzer alarm:

- It has a wide operating voltage i.e. 5-24V

- It gives a clear and audible sound.
- It is easily biased with a resistor.
- It is cheap and very available.

The Unit is Directly Controlled by the Controller Unit. It is connected to Pin 19 of the PIC16F877A Microcontroller. It was biased a 1K Resistor. Below is the circuit diagram of the Buzzer Unit:

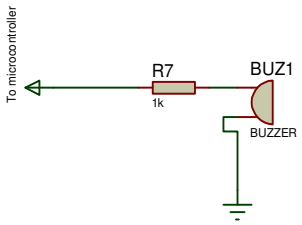

Fig. 5 The Alarm-Buzzer Unit Circuit

Buzzer Operating Current

The buzzer operates with a voltage of 5-25V;
Current: 2mA to 10mA;
A pin of the microcontroller can supply 5V (as specified in Pic16f877a microcontroller datasheet)

Supply 5mA at 5V to the Buzzer:
From Ohms law: V=IR;
R=V/I
V=5V; I=5mA
$R = 5/(5x10^{-3}) = 1000$;
Therefore R=1K ohms.

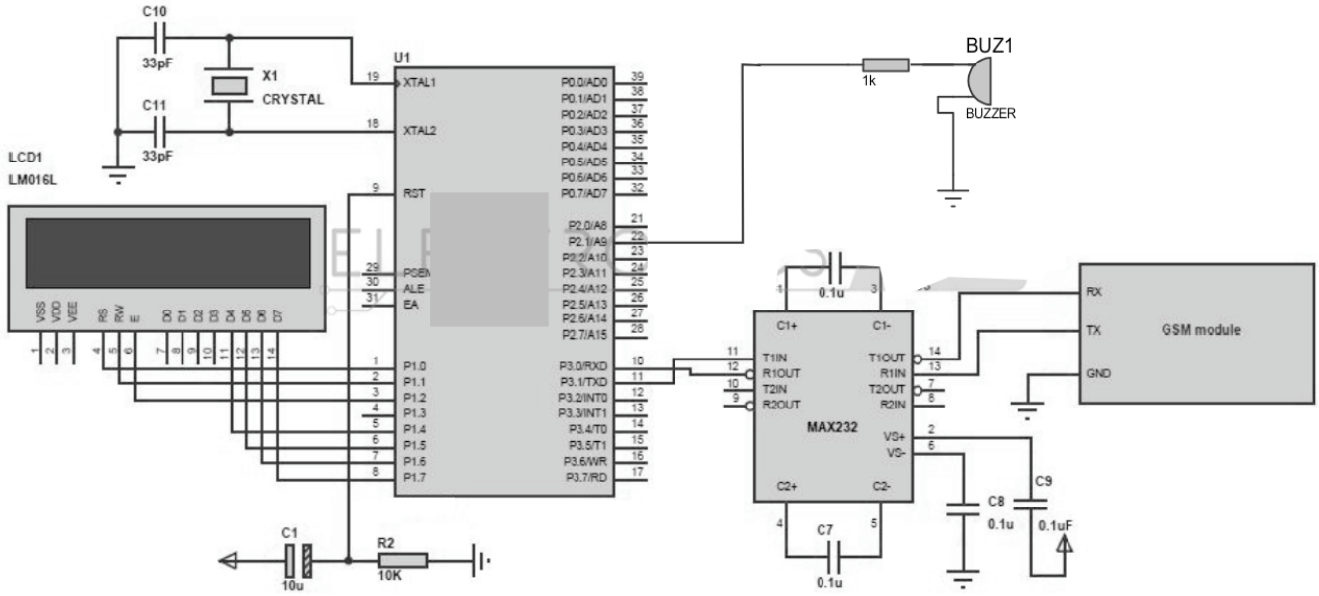

Fig. 6. Circuit Diagram of Automatic Car Speed Controller System

Software Design

This section deals with the program that was written to serve user's purpose. The control program was written in C language and compiled using MPLab integrated development environment which is an integrated applications software development system.

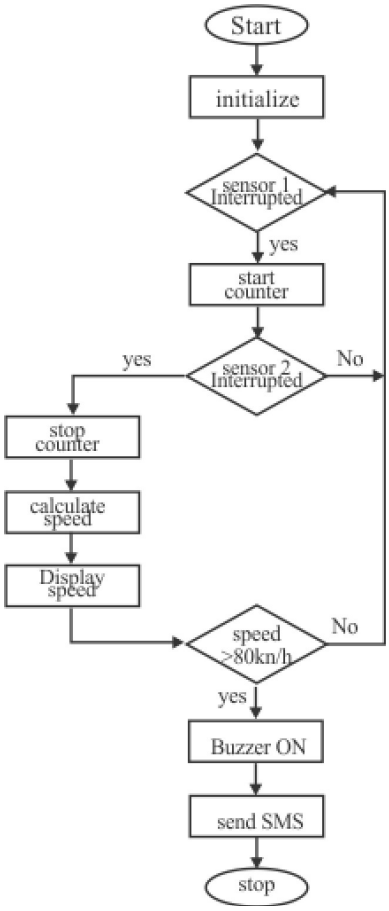

Fig. 7 System software flowchart.

RESULT DISCUSSION

An experiment was conducted to determine the relationship between the measured speed displayed on the LCD and the actual speed on the speedometer of the vehicle. Also the status of the buzzer was checked. The procedures of the experiment and the analysis of result obtained from the experiment is stated as follows:

Table 1.1 Experimental Result Table

S/N	Speed (km/hr)	Buzzer	SMS sent
1	40	no	Not sent
2	80	yes	sent
3	50	no	Not sent
4	90	yes	sent

The objective of this research is to alert driver and vehicle owners of speed violation and was achieved as illustrated by the results of table 1.1. When the vehicle has not violated the set speed limit, the LCD display shows the speed, no sms sent and the buzzer is not turned ON to alert. But when has gone beyond the set speed limit, the buzzer is turned ON and sms is sent to alert the speed violation.

CONCLUSIONS

In this paper we presented a new design to control the speed of vehicles. A real time system is built using PIC microcontroller. The microcontroller is interfaced with Hall Effect sensor to impose restriction on speed. By implementing alarm system a good safety measurement has been taken. Also the GSM modem is used for communication purpose i.e. to send message on mobile phones. This paper also concludes that system can impose restriction on speed, due to which safe driving is possible. It also provides high end security as speed is controlled. Rate of accidents can be minimized. Alert message is send to Owner and thus provides communication.

ACKNOWLEDGMENT

We express our sincere thanks to Engr. Dr. Abdulhamid musa, Dr. Chioma Chukwuemeka Ikpo, Engr. Osundu U. and Engr. Okpo K., for their constant and valuable guidance in completing this research.

REFERENCES

[1] Lusetti, Benoit & Nouveliere, Lydie & Glaser, S.. (2008). Experimental strategy for a system based curve warning system for a safe governed speed of a vehicle. 660 - 665. 10.1109/IVS.2008.4621319.

[2] Akihiko, T., Iwaoka, T., Yamaguchi, Y. & Danzaki, T. (1992), "Automatic Car Speed Controller", United States Patent Number 5107947. [Online] Available: http://www.freepatentsonline.com/5107947.pdf (December 10, 2014).

[3] Eswaramoorthy, P. & Arunkumar, M. (2014), "Intelligent Vehicle Control Based on Identification of Road Signs by Solar Powered RFID Transponders", International Journal of Research in Engineering and Technology, 3, 85-89.

[4] Jyothi, K. & Karthik, Rajesh. (2019). Design and implementation of vehicle over speed warning system. International Journal of Recent Technology and Engineering. 7. 266-268.

[5] Barıs_S_ims_ek, Fatma Pakdil, Berna Dengiz, Murat Caner Testik, "Driver performance appraisal using GPS terminal measurements: A conceptual framework", Transportation Research, pp: 49-60, 2013.

[6]

