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AUTO CONTROL OF VEHICLE SPEED

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Abstract: *This project is designed for Electric vehicles and is aimed to reduce the speed automatically when the system detects that the vehicle is running at high speed. Running vehicle is simulated with DC motor and its speed will be controlled using variable voltage regulator IC. The main objective of this project is to avoid accidents occur due to the over speed running vehicles.*

To prove the project practically, the prototype module is constructed with 100RPM DC motor and its speed is varied using LM317, this is a variable regulator IC. This circuit designed with Hall effect sensor can generate digital pulse for every revolution of the disc attached to the motor shaft.

In this project number of revolutions in the form of digital pulses is counted in stipulated time and estimated the speed.

Here exact speed is not displayed, if the motor is running at its normal speed, the LCD interfaced with main processing unit built with controller displays Normal speed, if the speed is increased to its maximum level, than the display shows Over speed.

When the motor is running at high speed, the controller chip energizes the relay and this relay contact is used to reduce the speed automatically through current limiting resistor by which the motor speed will be reduced and will be stopped automatically indicating the breaks applied. Alarm is also used to alert the driver during over speed running condition.

INTRODUCTION

Speedometer is one of the important Dashboard accessories of any Transportation vehicle & controlling the over speed running vehicle is more important, because most of the accidents are taking place due to the high speed running vehicles. In this project work much importance is given for reducing the speed automatically when the vehicle is running at high speed. Speed is also displayed in two steps, they are Normal speed" and "Over speed", means here exact vehicle running speed is not displayed. The display shows above three levels and these are approximate levels.

To simulate the running vehicle, here a simple DC motor is used. There are many techniques existed in the world to control the speed of a DC motor, in order to control the speed, the best method of speed control technique is to be evolved which shall be high efficient, less power consumption, easy interface, and modular design, which can be adoptable easily, the solution is linearly variable DC voltage concept. For this purpose here a simple circuit is constructed with LM317 variable regulator IC which is used to control the speed of motor by applying variable DC voltage source. The motor used in the project operates at 12V dc, which consumes very less power. The purpose of this project is to control the speed of a small 12v DC motor through regulator IC and measure the RPM through the circuit that is designed with AT89C51 microcontroller chip.

The DC motor selected selected for the purpose is rated for 100RPM and its shaft is coupled with a metal disc to monitor the motor speed by varying the voltage. In this concept the motor speed can be varied linearly from zero to its maximum speed. For measuring the speed microcontroller is used and no of revolutions made by the disc

in specific time can be counted by which speed is estimated and displayed through an LCD interfaced with main processing unit built with 89C51 microcontroller chip.

The disc attached to the motor shaft is having a small permanent magnet at its edge and this arrangement is made to detect the revolutions made by the motor through Hall Effect sensor. The display section is constructed with LCD and it is interfaced with the microcontroller and this controller is programmed to count & display the revolutions. Since the concept is to measure the RPM, the controller accepts the count up to 10 seconds by which the speed will be estimated and displayed.

The Hall Effect sensor circuit consists of IC3144 Hall Effect sensor & permanent magnet arranged parallel to each other and this arrangement must be synchronized with the magnet attached to the disc such that the sensor generates high pulse for every revolution made by the disc. These pulses are fed to the microcontroller chip and this chip is programmed to count the pulses for a specific time of 10 seconds, and display the appropriate speed through LCD.

In the field of automobiles, it is essential to monitor the speed of running vehicle and control the speed accordingly. Therefore, Hall Effect sensor is used as contactless or proximity detection system of counting the wheel revolutions.

In order to measure and display the speed of simulated Electric vehicle. 89C51 microcontroller based system is used in this Project. To simulate the running wheel, DC Motor is used. Since this is a demo model, vehicle need not to be constructed, controlling the motor through variable voltage source, running vehicle is simulated.

LITERATURE SURVEY

[1] Aaron Sharpe Byoung, Ryoun Koh, Simon Mc Lernon (2016). Development the Over-speeding warning system using wireless communications for road signs and vehicles. This paper describes a prototype system that can help reduce the over-speeding problem by fitting a transmitter on road signs and a receiver on vehicles. A maximum speed limit data signal is broadcasted continuously from a road sign, and a vehicle fitted with a wireless receiver module can detect the speed limit signal. The system can compare the vehicle's current speed with the speed limit and trigger an audible alarm (and alert message) to indicate that the speed limit has been exceeded. A working prototype has been designed, built and tested successfully using an 8-bit embedded microcontroller. Using appropriate transceiver modules, it is possible to implement Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communications in order to implement a wide range of different and useful functions, including collision detection, vehicle identification and even the processing of fines for traffic rule violations. This paper describes the design details of an over-speeding warning system and addresses several other practical applications of wireless.

[2] Lae Yin Mon, Khin Khin Saw (2018). Development the Design and Construction of Speed Detection System for Vehicles. This paper has a system is design to detect an over speeding vehicle by computing the speed of the passing vehicle using the time taken to travel between two sensors at a fixed distance. In this system, IR Sensors are the main part of circuit design that detects the speed of the vehicles. The system keeps the time taken by the speed of the vehicle in crossing the fixed distance from two sensors. When the vehicle passes through the first IR sensor, this sensor gets activated. From this instant forward, a timer is initiated and will continue to keep time until the vehicle reaches the second IR Sensor. Then the microcontroller starts to count the time and calculate the speed of the vehicle as km/h and this speed is displayed on a 16X2 LCD

Module. If the vehicle's speed is greater than the limited speed, the buzzer will be alarmed and LED will be blinked. Then LCD will be displayed "Reduced Speed Now.

[3] According to K. N. V. Satyanarayana, G. Yaswathini, P. L. Kartheeka, N. Rajkumar, A. Bhima Raju (2018), IOT Based Vehicle Speed Control Automatically in Restricted Areas using RFID. This is a process of decreasing or limiting the speed of vehicle. Whenever the vehicles enter in to the normal zone, there is no speed limit. Whenever vehicle enter into the restricted zone i.e., hospitals, school, parks the speed is automatically reduced. For this purpose, a module is designed that is RF module It has two modules; one is transmitter module and receiver module. Transmitter module is placed at sides of road. Receiver module is placed inside the vehicle. The radio waves are radiated from the transmitter module and these are sensed by receiver module and compare the speed with recorded speed. If vehicle speed less than the recorded speed it does not allowed to decrease the speed of vehicle. Otherwise, it controls the speed automatically. The vehicle speed is displayed on the LCD module.

VECHICLE MECHANISM

Over speeding of vehicles has become a pressing concern in today's fast-paced world. As urbanization increases and road networks expand, the temptation for drivers to exceed speed limits grows, often with devastating consequences. This project explains the potential solution to the problem of over speeding.

TECHNICAL ARCHITECTURE

BLOCK DIAGRAM

The Block Diagram is shown in the Figure 1.

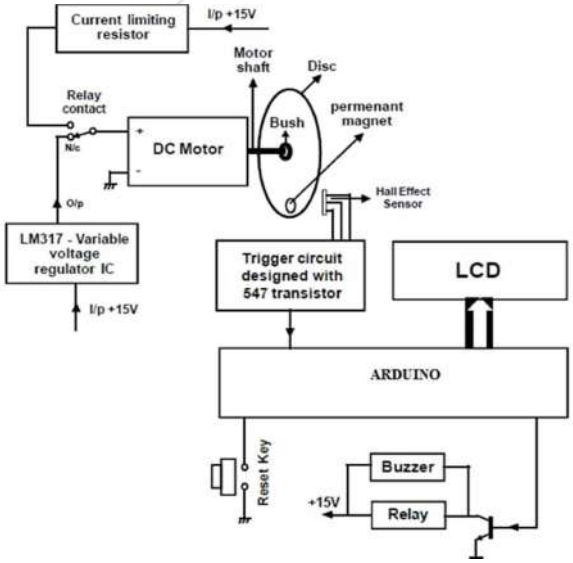

Figure 1 Block diagram

When Supply is given from the battery the DC motor starts. Then the wheel starts rotating. Near to wheel, Hall effect sensor is placed. It Senses the speed of the motor whether it is running at Normal or over speed. The signal goes to the Arduino in which LCD is interfaced with the Arduino. LCD displays Normal speed when the motor runs at Normal Speed. It shows Overspeed where the motor nuns at Overspeed. When it is running at

Overspeed then Micro Controller sends signal to the relay and the contacts of the relay will be closed. Buzzer starts alarming and the speed will be decreased gradually and vehicle will be stopped. The speed is so reduced so that the vehicle will Stops automatically.

CIRCUIT DIAGRAM

The Circuit diagram is shown in the figure 2.

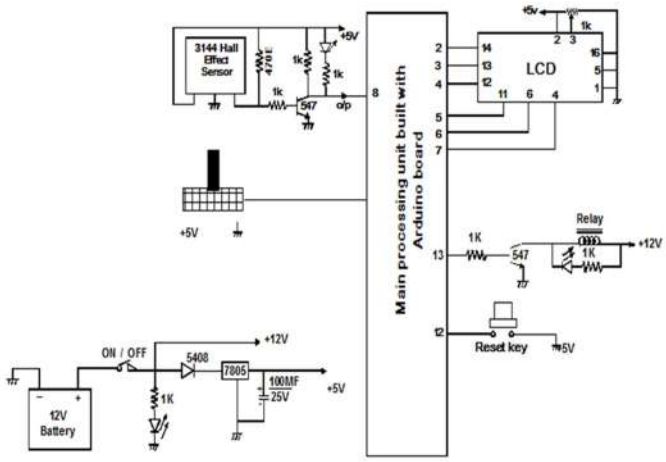

Figure 2 Circuit diagram

The Figure 5.2 illustrates the "Auto Control of Vehicle Speed" system, which is designed using a microcontroller (such as an Arduino) along with various essential components. At the core of this system is a 3144 Hall Effect sensor, which detects magnetic fields from a rotating element, likely the vehicle's wheels, to monitor the speed. The sensor is powered by a 5V supply and sends its output through resistors and a transistor to the main processing unit. This unit processes the sensor data and controls the speed of the vehicle by engaging or disengaging a relay connected to the vehicle's speed control mechanism (braking system).

An LCD display is used to provide feedback on the vehicle's speed or system status, connected to the microcontroller for easy monitoring. The relay circuit, driven by the microcontroller, allows the system to adjust the vehicle's speed automatically, based on the sensor's readings.

The entire system is powered by a 12V battery, with a LM 318 voltage regulator stepping down the voltage to 5V for the microcontroller and other 5V components. Additionally, a reset button is included to manually reset the system when needed.

ADVANTAGES

- Rash driving can be avoided
- Accidents are minimized
- Alerts the driver automatically
- Control of the vehicle is high

DISADVANTAGE

- Only used for Electric vehicles

APPLICATION

- Used in Electric vehicles.

TESTING&RESULTS

HARDWARE MODULE

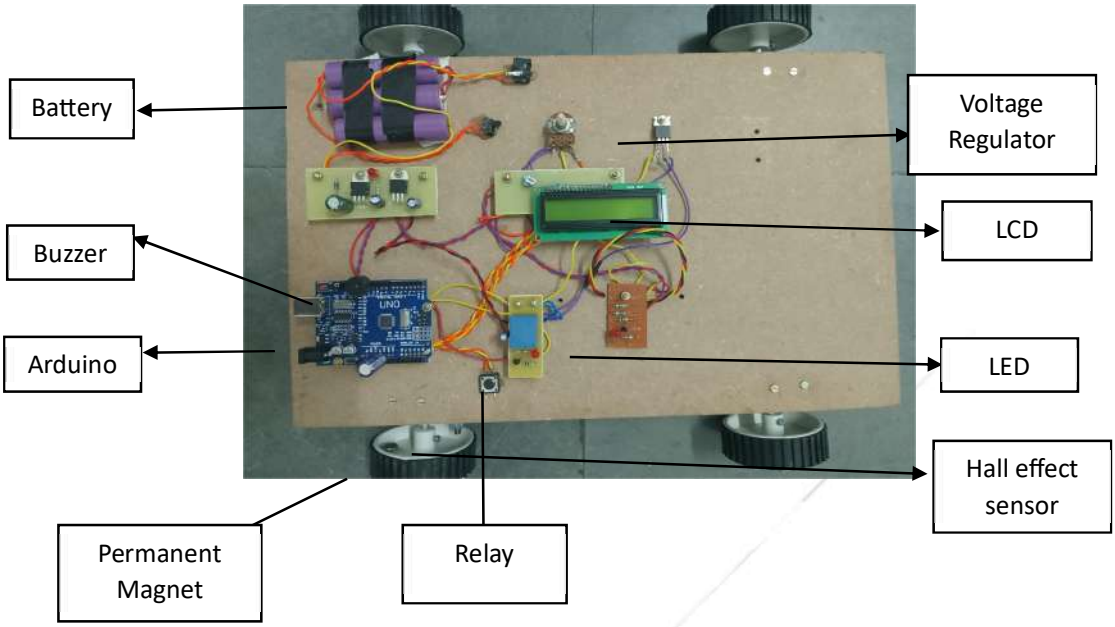

Figure 3 Top view of vehicle

The above figure shows the hardware module of the vehicle. As we can see the Arduino UNO, Voltage Regulator, Battery, LCD, LED, Electromagnetic relay, Buzzer which are explained below.

Arduino Uno-The Arduino Uno serves a crucial role in the electric vehicle, providing a versatile and programmable microcontroller platform. This small yet powerful board enables the vehicle to execute various tasks, such as sensing the speed conditions, collecting data, and controlling actuators for specific operations.

Battery- In Electric vehicle, the battery serves as the primary power source, supplying power for various functions such as sensor, DC motor. It enables the vehicle to move, collect data through sensors, and perform task of speed controlling.

Relay-A relay is an electromagnetic switch, which can be used to make or break the circuit. Here a relay is connected at the output of the microcontroller to control the speed of the motor.

Hall effect sensor- Hall Effect sensors are activated by a magnetic field and in many applications the device can be operated by a single permanent magnet attached to a moving shaft or device.

DC motor- DC motors are used for a variety of purposes, including electric razors, electric car windows, and remote control cars. Here a 12 V, 100 RPM DC Motor is used.

Voltage Regulator- A voltage regulator converts a varying input voltage into a constant 'regulated' output voltage. Voltage Regulators are available in a variety of outputs like 5V, 6V, 9V, 12V and 15V. Here a 12 V Voltage Regulator is used.

Buzzer- Arduino gives signal to the buzzer when it gets a signal that the vehicle is running at overspeed. So that buzzer gives a sound at overspeed conditions.

LCD- An LCD is a display of information on a screen. Here LCD shows Normal speed when vehicle is running at normal speed. And shows Overspeed when the vehicle is running at Overspeed.

Case-1: Normal speed

The vehicle is started when the DC supply is given from the battery. Using Hall effect sensor the speed is calculated and signal is given to the Arduino. The LCD is interfaced with the Arduino. A speed setpoint is given to the Arduino. If the calculated speed is less than the setpoint then the vehicle is running at Normal speed. The Arduino gives signal to the LCD. LCD shows the word "NORMAL SPEED" and its calculated speed is shown in the display as shown in the Figure 4.

Figure 4 Vehicle at normal speed

Case-2: Overspeed

When the calculated speed is more than the setpoint speed, then the LCD shows the word " OVERSPEED" and the calculated speed is shown in the display as shown in the Figure 5. Then the relay gets signal from arduino and its contacts will be closed and the speed of the motor is reduced gradually and the vehicle will be stopped automatically.

Figure 5 Vehicle at overspeed.

CONCLUSION AND FUTURE SCOPE

This project work titled as "Auto control of vehicle speed" is designed and developed successfully. For the demonstration purpose a prototype module is constructed for live demonstration, results are found to be satisfactory.

This project successfully demonstrates an innovative approach to enhancing safety in electric vehicles by automatically reducing speed in response to over-speed conditions. The use of a DC motor to simulate vehicle dynamics, controlled by an LM317 variable voltage regulator, provides an effective platform for testing the system. The integration of a Hall effect sensor allows for accurate monitoring of speed through digital pulse generation.

The system's ability to distinguish between normal and over-speed conditions is effectively communicated via an LCD display, enhancing user awareness. The automatic speed reduction mechanism, triggered by a relay, showcases a practical solution for mitigating the risk of accidents due to excessive speed. Additionally, the inclusion of an alarm serves as a critical alert for the driver, promoting immediate corrective action.

FUTURE SCOPE

The future scope for electric vehicle is vast and promising. The Auto control of Vehicle Speed System presents significant opportunities for enhancement and adaptation to meet the needs of modern electric vehicles. One primary area for improvement is the transition from small prototype motors to heavy-duty motors commonly used in electric vehicles. This requires the integration of advanced motor control techniques such as PWM and field-oriented control (FOC). These methods will enable more precise speed control and better torque management, essential for handling various driving conditions and ensuring vehicle performance aligns with safety standards.

Additionally, integrating advanced sensors and communication technologies can elevate the functionality of the speed control system. Implementing GPS, accelerometers, and LIDAR will provide real-time data about the vehicle's environment, allowing for adaptive speed control that adjusts based on traffic and road conditions.

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