

Automatic Vehicle Speed Control System In A Restricted Zone

Sathiskumar S, Navean G V, Hari Prakash R, Vishnu Praveen S

Abstract: As far as automobiles are concerned, safety is very important to reduce the occurrence of accidents in speed restricted zones. It minimizes the loss of property and life. According to the recent surveys, in the past few years, an accident near the school zones, hospital zones and sharp turnings have increased tremendously, because of their hurry to get the targeted place soon. Therefore controlling vehicle speed has been a crucial issue to be considered. This paper aims to give a practical, compact and simple design to develop an automatic vehicle speed control system, which has to be quickly get implemented in school, college, hospital, sharp turning zones to reduce the number of accidents. This automated speed controlling system is built using the microcontroller-based platform of the Arduino Uno board. Here the Arduino is programmed in such a way that, the prescribed speed limit was incorporated in the transmitter unit which transmits the signals, and it was received by the receiver in the vehicle using Zigbee wireless communication technology and the speed of the vehicle was automatically controlled by the input signals by the receiver, with the help of speed encoder sensor. Once this technique was implemented the accidents will be reduced on a larger rate, and also reduce the nuisance by some drivers.

Index Terms: Arduino, receiver, speed control, transmitter, Zigbee,

1. INTRODUCTION

The Indian Law Commission has an advisory to limit the speed at critical zones, to reduce the road accidents and to make a peaceful environment for the people. The existing methodologies can't able to reduce the accidents still now, Because of the rash driving of some drivers. Hence speed control is in need to be implemented in all the vehicles. Here is the new idea of ours to install an automated speed control system in the vehicles mainly in the restricted areas. Here setup device as a transmitter where the multiple devices are combined to monitor the speed of the vehicle when the vehicle enters above the prescribed speed and controls it by placing a receiver at the vehicles, based on the signals transmitted the speed of the vehicle get reduced by interfacing a microcontroller. The current speed of the vehicle is sensed by the dc motor and the output of it was given to the microcontroller where it compares the speed with the prescribed limit and the speed is controlled automatically. The technology used in this system to communicate between transmitter and receiver is Zigbee technology, which covers up to 10-100m within its range. This is comparatively cheaper than others. Therefore this system controls and monitors the overall vehicles in its covered area. By implementing this system the accidents are reduced in this fast-moving world. In the developed and developing countries, people finds inconvenience with the road accidents, jamming of vehicles because of the drivers who dislike to obey the laws at the restricted zone, where the speed has to be limited as prescribed in that zone by using an automated speed control system to limit the speed automatically using Zigbee technology.

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2 LITERATURE REVIEW

2.1 LITERATURE INTRODUCTION

A recent survey shows that the maximum rate of serious road accidents are raised due to high uncontrollable speed than necessary speed limited in the particular zone and also due to unaware obstacles. Minimizing the number of rate of accidents and their worst consequences are the most challengeable task for the automotive manufacturer, traffic government authorities and automotive research and development groups. The important needs for the driver while driving the vehicle is awareness of the restricted zone in any term either audible or visual alert to insist the driver of the vehicle about the obstacle in front of the road. And this system is available in today's vehicle as a special feature in the vehicles market, and the future vehicle requires higher safety in driving controls intelligently in each and every vehicle. Road transport is a major type of transport system used in India. India has a huge network of road connects throughout the nation. Our nation faces the maximum number of accidents and accidental fatalities while comparing to other nations around the world. The Ministry of Road Transport & Highways report revealed that India has got one road accident every minute in a year which lost one life in 3 minutes. Contrary to popular belief, only 1.5% of the accidents are caused by defective roads. In the majority of the cases (77%), the driver is at fault. This becomes more dangerous in populated regions like schools or hospitals. In school areas, speed breakers are provided to reduce the speed of vehicles, but the drivers do this manually. Many times due to driver's fault speed is not controlled.

2.2 REVIEWS OF AUTOMATIC VEHICLE SPEED CONTROL SYSTEM

Amulya A M, et.al., Intelligent vehicle speed controller:

In this paper, they concentrated to avoid the collision of the vehicle due to its over speed in the speed restricted zones by automatically. This can be done through the embedded systems and the RF transmitter and receiver modules. When the vehicle enters the speed, the restricted area driver has to reduce the speed of the vehicle manually. If the driver did not slow down the vehicle, the electronic controller would take the lead to control and reduce the speed of the vehicle by receiving the signal from the transmitter in that zone. By that

received signal, the Arduino microcontroller would process to give a signal to the motor to control the speed. Here mainly they use the RF transmitter and receiver to identify the restricted zone. [1]

Vaishal B. Niranjane, et.al., Automatic vehicle speed control system:

They explained the working of their system in three different zones where the speed wants to reduce automatically by using Zigbee technology. They are Normal zone, silence zone, speed limit zone. The speed is reduced by reversing the motor rotating direction through the microcontroller 8051. The Zigbee transmitter is placed at that zone for example hospital while the vehicle reached that area the signal is received by the Zigbee receiver in the vehicle. The speed of the vehicle is compared with the determined speed in that area. If speed is higher for that zone the microcontroller takes in action to reduce the speed of the vehicle and if it is silence zone it disables to make a horn.

Amarnarayan, et.al., Automatic over speed controlling of vehicle:

The main aim of the authors to control the speed of the vehicle to avoid the accidents in the hospital zone, curve roads and deep cuts due to over speed. This can be done with the ZigBee technology with the arm-7 microcontroller. The prescribed speeds at that zone are incorporated in the transmitter module and when the receiver in the vehicle senses the signal that arm-7 microcontroller would check whether the driver reducing the speed for a limited time. After the timer passes the limited time, the microcontroller makes the signal to reduce the speed of the motor, which makes the vehicle decelerate without the action of the driver.

Gummarekula sattibabu, et.al., Automatic vehicle speed control with wireless in-vehicle road sign delivery system using arm 7:

The objective is to design the electronic display controller for Vehicle Speed control and monitor the zones with the help of the embedded systems and they designed to display the information on the dashboard about the zone. To achieve this they use two units, which are zone status transmitter unit and electronic display and control unit (Arm-7). Here if the sensible zone is detected by the receiver in a vehicle the signal processes in the controller and warns the driver by displaying it and gives a buzzer sound. There is a timer for driver action to decrease speed if the time passes then the vehicle automatically sets to desired predefined speed.

LITERATURE CONCLUSION

The above study has a high impact on the design and components selection of the automatic vehicle speed control system and inferred that Zigbee wireless communication can be used instead of RF communication module and RFID tag in the system for real-time working systems in the vehicle. The method for recognizing the restricted zone is done through the Zigbee transmitter in the zone and the Zigbee receiver is placed on the vehicle which is inferred from the review. The content from the above-mentioned reviews is taken into consideration for the design and development of the vehicle speed control system automatically.

PROBLEM STATEMENT AND MARKET NEEDS

The main concern of the modern automotive industry is passenger safety and accidents due to drivers' negligence are one of the problems for the roadside people. This problem is being partly solved with the use of this vehicle speed control system. Hence a system that does ensure safety is in huge demand. Such a system is called the Automatic vehicle speed control system.

TARGET SPECIFICATIONS

After the study of the problem statement and the market needs for the system, the target specifications for the systems are being framed. In this case adaptation of the system, compact to a vehicle, and the process of the system is being defined. The main parameters based on which the system is to be designed are as follows

- Reliable
- Low cost
- Low power consumption
- Quick response
- Durability
- Easy adaption in vehicles
- Compact process
- Highly secured

Research and development

The whole system is being controlled by an Arduino uno as a microcontroller. The main reason for choosing this as a controller for their advantage of having higher processing speeds and their ability to handle multiple inputs and outputs at the same time without compromising the accuracy and precision of the outputs. This Arduino UNO which has enough capacity to process the input from the Zigbee receiver. The main purpose of the processor is to process the signal from the Zigbee transmitter which receives by the receiver. By using these input signals Arduino Uno process these signal and actuate the respective relays and the processor accordingly generates output signals. This specific board can also be connected to a computer for easy implementation or modification of the code that basically is the brain for the processor to control the activities. Also, the board's ability to connect with the computer via dedicated software can be used to view an analog or graphical representation of both inputs.

PROPOSED SYSTEM:

Transmitter block diagram:

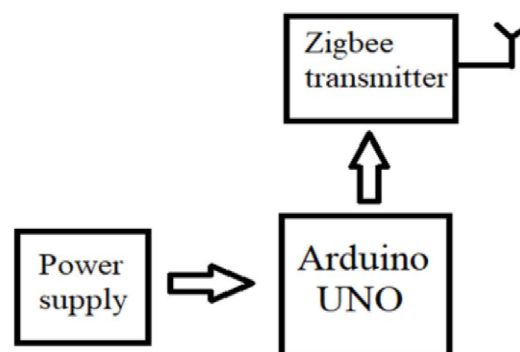


Figure 3.1 transmitter block diagram

The transmitter block consists of the power supply, Arduino UNO and Zigbee transmitter.

In this block, the Arduino microcontroller was programmed with a predefined speed limit and transmits the signal with the help of Zigbee wireless communication.

Receiver block diagram:

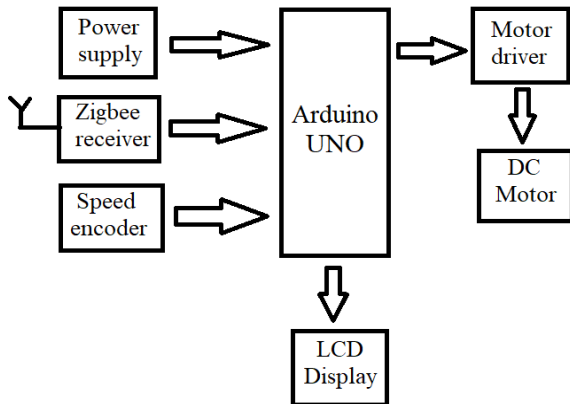


Figure 3.1 receiver block diagram

In the receiver section, it receives the speed of the vehicle through speed encoder input signal, and other components of the receiver unit are a dc motor, motor driver, LCD display, Zigbee receiver, Arduino UNO as a microcontroller. Based on the signal received from the transmitter placed in a special zone the speed of the vehicles reduces automatically with the help of these devices.

4.3 DESIGN CONSIDERATIONS

- There is no time lag for the output signal to reach the motor.
- The average time taken to process the inputs and outputs by the Arduino is 30ms(approx.)
- The motor driver takes around 10ms(approx.) to switch the circuits

Therefore, the total delay in the execution of the program will be, $\text{delay} = 10+10+30= 50\text{ms}$ (milliseconds)

COMPONENTS OF THE SYSTEM

- Zigbee transmitter and receiver.
- Electric Motor
- Motor driver
- Battery
- Controller
- Vehicle speed encoder.

WORKING OF PROPOSED SYSTEM:

The main objective of this system is to reduce the accident rates in the speed restricted zones like school zone, hospital zone and sharp u-turns due to the negligence of the driver to reduce the vehicle speed to limited speed as mentioned in the signboard in that zone. In this automatic vehicle speed control system, When the vehicle enters the speed limiting zone the transmitter block starts to work and transmit the signal to the vehicle receiver which is placed in the vehicle, the Zigbee receiver which is connected with microcontroller process the signals and compares the speed of vehicle with the predefined speed of that particular zone. The Arduino Uno was used as a

controller that two-controller were used here one for transmitter control and other for the receiver and other actions to take place based on the program set up in the controller. The transmitter circuit is powered by dc battery is enough for the working of Zigbee which is placed near the restricted zones. The driver of the vehicle will be warned to reduce the speed by giving warning alerts through visual or audible alerts for reducing the speed manually by the driver. If the speed of the vehicle is less than the predefined speed programmed in the microcontroller no action takes place. If the speed of the vehicle is greater than the predefined speed then the microcontroller controls the speed of the vehicle motor by sending a signal to the motor driver in it and the motor driver used reduces the speed of the electric motor, if rpm of motor decreases which automatically reduces the speed of the vehicle in that particular zone.

PRACTICAL IMPLEMENTATION

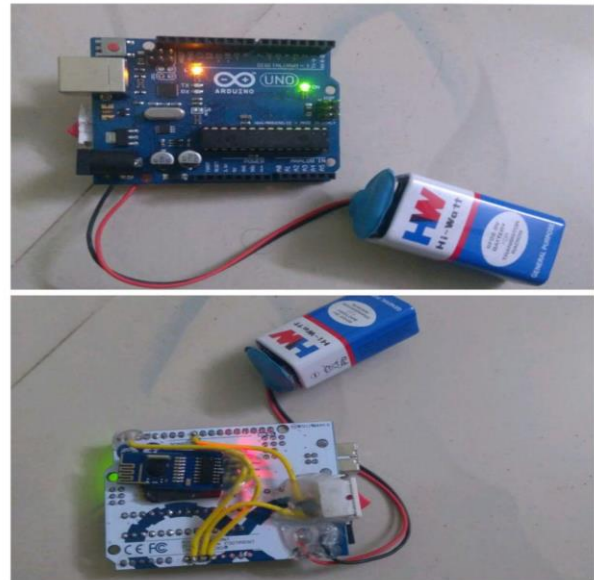


Figure 4.1 transmitter circuit

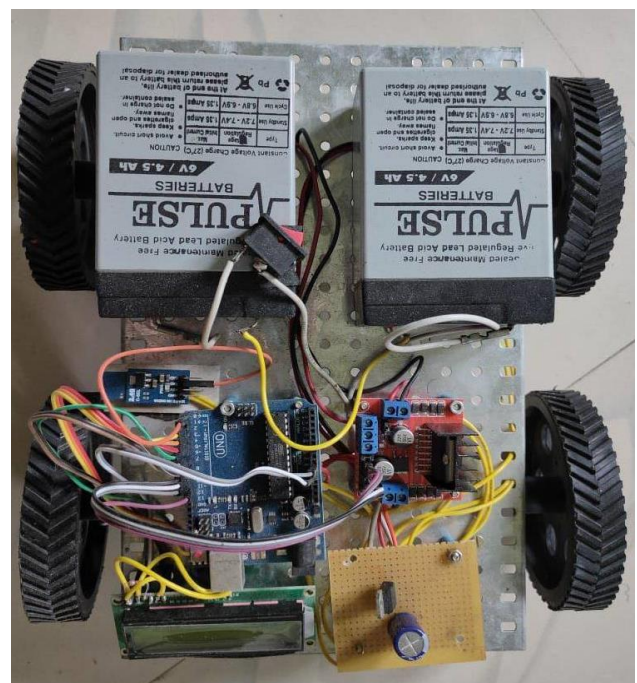


Figure 4.2 receiver circuit

the implementation of 'AUTOMATIC SPEED CONTROL OF VEHICLES IN THE RESTRICTED AREA' using Arduino UNO, DC motor, Zigbee module and sensor, where the speed of the vehicle is reduced automatically. This speed control system assures that the number of accidents near the school and another specific zone to reach its minimum speed. this system requires very low cost, durable, low power, and gives maximum safety to the public and simple design to implement in the specific areas. This system also works on bad weather days. This system will protect the public from the rash drivers, alcoholics, and the drivers who lost their minds while driving. By implementing this system we can give a safe and peaceful environment to the public

CONCLUSION AND RESULTS**Future scope**

This system proves to be highly effective in minimizing the over speeding and unwanted accidents in restricted zones. In current systems, there is no autonomous speed restriction in the vehicle to avoid accidents. Hence further research and optimizations of the automatic vehicle speed control system will allow us to implement in vehicles for improved safety for roadside pedestrians, passengers, and other road users.

Findings

The automatic vehicle speed control system is a much more practical and safety feature for the pedestrian and it is economical in implementation. The Zigbee wireless communication is chosen rather than the RF wireless communication due to its secured encryption and multiple connections for communication.

CONCLUSION

This study shows the role of reducing vehicle speed automatically and its contributions to the safety of pedestrians and road users. It is found that the use of the vehicle speed control system contributes a lot in minimizing the accident rate that occurs due to the negligence of the driver to disobeying roadside signboards in special zones. Though the VSC system in a vehicle is effective, they help much in terms of improving safety, keeping both the passenger safety and the pedestrians on the roads. Considering the automatic VSC system is incorporate in school zones or hospital zones which allows the vehicle to act independently to slow down the vehicle when the vehicle comes at a higher speed which minimizes the accidents due to negligence of the driver actively and in a way more effectively. Hence it is concluded from the above study that the uses of Automatic vehicle speed control systems in restricted zones minimize unwanted accidents to a great extent compared to normal behavior.

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