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Driver assistance system on highways based on legal safety

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Abstract: Nowadays frequent roads accidents are occurring due to the improper maintenance of roads and also due to the rash driving of the vehicle at crucial zones. This project provides a system to warn the drivers when their vehicle comes close to schools, hospitals and crowded areas. It also provides timely alert to the drivers by automatically detecting the presence of potholes and humps on roads. The indication of crowded zones is done with the help of two units such as transmitter unit which provides zone based information to the drivers and a receiver unit that contains a LCD to display the zone based information. The presence of holes and humps are identified by using an ultrasonic sensor and is indicated to the drivers by using a buzzer. This system provides a way to regulate the speed of the vehicle at crowded areas and also to prevent vehicle damage.

Keywords: Ultrasonic sensor, buzzer, LCD, RF transmitter and receiver

I. INTRODUCTION

Over the past few years due to the increase of population the vehicles used by people have also increased to a great extent. This has resulted in a lot of accidents on roads and has led to the loss of many human lives including women and children. These accidents are caused due to the carelessness of drivers driving at high speeds in overly populated areas such as schools zone, hospital zone, construction sites etc. There may be signs placed to indicate speed limit within school or hospital premises but it is not mandatory that every time the driver watches these signs and drive accordingly. He may choose not to obey the rules or may not even notice the signs placed along the roadsides. These accidents are also caused due to the improper maintenance of roads. Many accidents are occurring during the night due to the presence of unidentified potholes and humps. This also results in serious vehicle damages. This project provides a method to alert the drivers about the presence of holes and humps on roads even during night time. It also provides a warning when their vehicle comes close to accident prone zones such as hospitals, schools etc. It also helps the drivers who are new to a certain location by indicating about no parking areas, one way routes, speed limits present in that particular location. These various zone based information are stored in a database along the roadside and it provides timely alerts to all the vehicles capable of receiving that information passing through that zone. This system also helps to regulate the speed of the vehicle when it enters a particular speed limit area. This regulation of the speed of the vehicle is done by using a motor gear which controls the motor present inside the vehicle. This is a most cost effective and efficient method to prevent road accidents and vehicle damage.

II. LITERATURE SURVEY

This section provides a detailed description about the researches that have been done based on road safety system.

Rajeshwari Madli [1] has proposed a method that identifies potholes and humps on roads and provide timely alerts to drivers using GSM and location based information. But this method does not consider the fact that the road gets repaired and it continues to alert the drivers even if there is no hole. Lorate Shiny [2] have proposed a method that identifies the congested areas and controls the speed of the vehicle but this method does not provide timely alerts to the drivers about the presence of holes on roads. This creates a serious problem during the night. Moazzam [4] have proposed

a low cost model for analyzing 3D pavement distress images. It makes use of a low cost Kinect sensor, which gives the direct depth measurements, thereby reducing computing costs. The Kinect sensor consists of a RGB camera and an IR camera, and these cameras capture RGB images and depth images. These images are analyzed using MATLAB environment, by extracting metrological and characteristic features, to determine the depth of potholes. Sudarshan S. Rode [9], have proposed a system in which, Wi-Fi equipped vehicles collect information about the road surface and pass it to the Wi-Fi access point. The access point then broadcasts this information to other vehicles in the vicinity in the form of warnings. However, the system turns out to be an expensive one as all vehicles should be installed with Wi-Fi stations and more number of access points have to be set up. He Youquan [7] developed a model to detect the three-dimensional cross-section of pavement pothole. The method makes use of LED linear light and two CCD (Charge Coupled Device) cameras to capture pavement image. It then employs various digital image processing technologies including image pre-processing, binarization, thinning, three dimensional reconstruction, error analysis and compensation to get the depth of potholes. However, results get affected by LED light intensity and environmental factors.

III. SYSTEM MODEL

The proposed system in this project alerts the drivers when their vehicle approaches school areas, hospital areas, construction sites etc. It regulates the speed of the vehicle and also provides timely alerts to drivers about the presence of holes and humps on roads.

This system consists of two sections: transmitter section and receiver section. The transmitter section is placed along the roadside and the receiver section is placed within the vehicle. The block diagram for both sections is given.

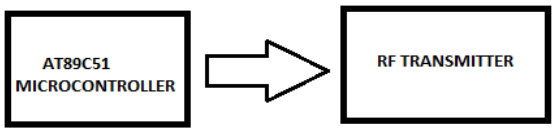


Figure 1: TRANSMITTER BLOCK

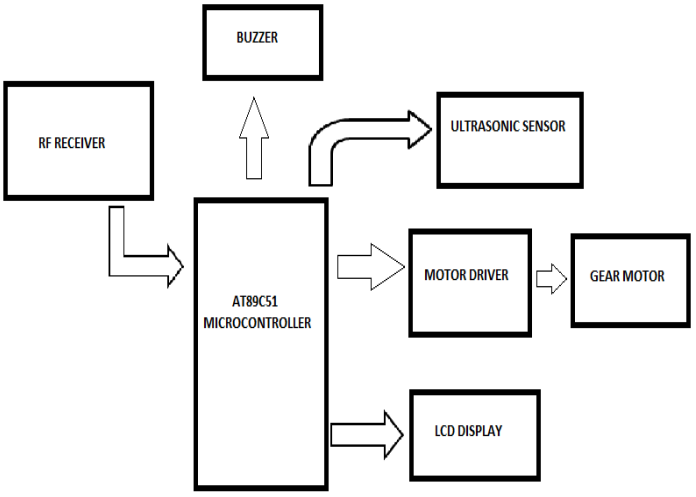


Figure 2: RECEIVER BLOCK

Transmitter section

The transmitter section consists of a microcontroller and a transmission module for transmitting the location based information to the vehicle. The transmission module contains a data encoder IC and a RF transmitter.

Receiver section

The receiver section consists of a RF Receiver, decoder IC, Buzzer, Ultrasonic sensor, Motor Driver and LCD. These devices are connected to a common

microcontroller which is used to control the working of all the components inside the receiver section

1. Microcontroller

It is used both in the transmitter section and receiver section. The microcontroller is the heart of the proposed system and is responsible for performing various tasks starting form processing all the sensor inputs to alerting the driver. In this system we use ATMEL AT89C51 microcontroller. The AT89C51 is a low-power, high-performance CMOS 8-bit microcomputer with 4K bytes of Flash programmable and erasable read only memory (PEROM). It has an endurance of about 1,000 Write/Erase Cycles. It is based on an 8 bit central processing unit with an 8 bit accumulator and another 8 bit register as main processing blocks. AT89C51 is supported with on-chip peripheral functions like I/O ports, Timers/Counters, serial communication port. In this system it is supplied with a power of about 5V or 12V based upon operation it is performing. It is very much used in providing alert signals to the drivers to control the operation of the ultrasonic sensor, RF transmitter and receiver, and also to regulate the speed of the vehicle if necessary.

2. RF transmitter and receiver

An RF transmitter module is a small PCB sub-assembly capable of transmitting a radio wave and modulating that wave to carry data. An RF receiver module receives the modulated RF signal, and demodulates. In this system transmitter is used transmit the zone based information and the receiver is used to receive the same information. The type of modulation technique used in this transmitter is FSK modulation. The RF transmitter consists of a data encoder to encode the information being transmitted so that it is received without any errors. Similarly the RF receiver consists of a data decoder to retrieve the original message being transmitted. Both these transmitter and receiver are connected to the microcontroller in both the sections. When particular information such as "HOSPITAL ZONE AHEAD" is encoded and being transmitted the receiver will decode the information and send it to the microcontroller. The microcontroller after receiving the incoming data

Figure3.1: RF Transmitter

Figure3.2: RF Receiver

warns the driver by displaying it on the LCD screen. The LCD will be placed in a position visible to the driver.

3. Ultrasonic sensors

Ultrasonic sensor contains a transmitter and a receiver. It is used to measure the distance at which, objects are placed in front of it. The ultrasonic sensor transmits high frequency sound waves and waits for the reflected wave to hit the receiver. The distance is calculated based on the time taken by the ultrasonic pulse to travel a particular distance. There are different types of ultrasonic sensors with different transmission ranges and angles of detection. In this system we use the HC-SR04 sensor which works at frequency of 40 KHz and can measure distances of the objects in the range 2 to 400 cm with a 15 degree angle of detection. This device is placed within the vehicle and it is connected to the microcontroller. It senses the presence of humps and holes depending on a particular threshold value. The normal distance between the road and the vehicle is first measured using the ultrasonic sensor. This distance is set as the threshold value. When the distance is greater than the threshold then the driver is alerted with presence of holes. If the distance is lesser than the threshold then the driver is alerted with presence of humps. Both the indication is done by using a buzzer.

4. Motor driver

It is used to regulate the speed of the vehicle when it enters crowded areas such as hospital, school, construction sites etc. It is connected to the microcontroller at the receiver section. When the vehicle enters the crowded zone the microcontroller placed in the vehicle checks whether the speed of the vehicle is within the speed limit of that particular area.

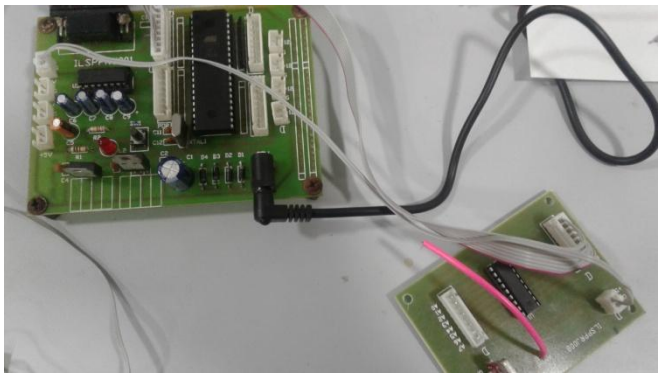
If the speed is limited then it does not perform any operation. If not the microcontroller regulates the speed of the vehicle by controlling the motor driver connected to the gear motor.

Figure 4: motor driver

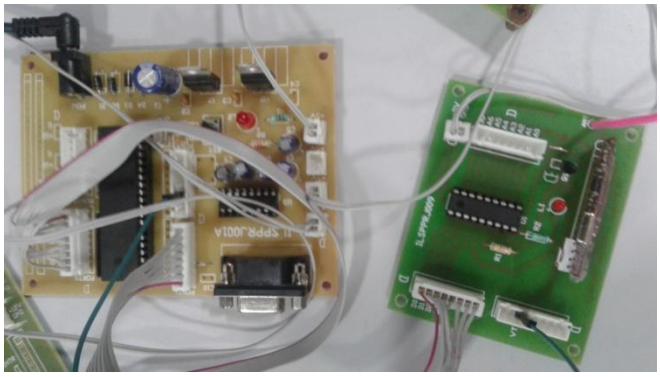
IV. IMPLEMETATION RESULTS

The system has been implemented by designing the transmitter and receiver section separately. Any vehicle entering the area having the receiver will receive the signal. If the signal received indicates the presence of a particular zone and the speed limit of that area the LCD present in the receiver will display the information. In addition to that the controller present in the system will check the speed of the vehicle. If the speed is within the limit it will not make any changes. If not it will induce the motor driver to control, the speed of the vehicle. Thus the speed of the vehicle is regulated. The ultrasonic sensor is used to sense the presence of unidentified holes and humps.

Transmitter section is given



Receiver section is given



V. CONCLUSION

In this project a model for automatically regulating the speed of the vehicle and also to alert the drivers about the presence of holes and humps is implemented. This system helps to prevent accidents in crowded areas and accident prone zones such as schools, hospitals, working areas etc. This system also enables the driver to maintain the speed limit within a particular area and prevents vehicle damage. Thus a cost effective method for regulating the accidents on road is proposed and implemented.

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