IMPLEMENTATION OF VECHILE SPEED LIMITING AND POTHOLE IDENTIFICATION USING ULTRASONIC SENSOR

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ABSTRACT:

In each and every developing country one of the major problems are maintaining the surface of the road. Detecting and reporting the surface condition of the road which assists the drivers to avoid the accidents. We are developing a system for monitoring the surface condition of the road. This system used the ultrasonic sensor for detecting the potholes and which measure the height and depth of the potholes. GPS which is used for plotting the location of potholes. For different types of road surfaces, the control of speed is required to adjust in a proper manner. This paper gives a very cost effective and efficient way of designing a surface identifier for fully autonomous vehicles. In existing system potholes are just identified and the information is tweeted to the driver using beep alarm. The proposed system pothole areas informed to the Government authorities for reconstruction purpose, and also the vehicle speed is controlled. And it also informs the driver in the form of voice, whenever the pits and obstacles are detected using voice module.

Keywords — ULTRASONIC SENSOR, GPS, GSM SIM900, IR SENSOR, PIC16F877A, VOICE MODULE, RELAY, SPEAKER.

INTRODUCTION:

Death ratios of the peoples are increase day to day life. Road accidents are one of the causes of increasing death ratio. Now a days road accidents are major issue in most of the counties, one of the reason of road accident is due to irregularities of the road surface and high speed of driving. The abnormal road surface condition is mainly occurring due to weather condition, heavy vehicle, those are makes potholes and all other problems in road. To overcome this problem, regularly monitoring the road surface and control the vehicle speed is necessary. In our method, ultrasonic sensors are used to detect the potholes. The information about the potholes from the sensor is given to the PIC microcontroller. The microcontroller preprograms to control the vehicle speed. Here relay is used to control the speed of the driving. It is helpful to avoid the accidents, vehicle damages, vehicle firing, etc. And also the information is send to the government authority through the GSM module for reconstruction work.

RELATED WORK:

Several researches have done on pothole detection and vehicle speed controlling techniques. A brief description about the existing systems as follows.

Zhang et al. this paper developed the identification of pothole using stereo vision. In this technique, the disparity calculation algorithm is used to generating the disparity map; it is used to detect the pothole from the road surface. This map gives size, volume and position of the pothole. In various scenarios it gives robust experimental result. S.S.Rode, S.Vijay et al. have proposed pothole detection using Wi-Fi based architecture and also it gives a warning system to avoid accidents or vehicle damages. The access points are used for broadcasting data, which is placed in the roadside surfaces. When vehicles are entered

in the area covered by the access points, it sends information to the driver in the form of trigger or audio signal. R.Sundar, S.Hebbar, V.Golla, et al.have developed traffic control system helps to pass the vehicle smoothy. RFID determines the green light detection in that path and also RFID helps to read the stolen vehicle. When the stolen vehicle is detected the message is send to the control room throw the GSM SIM300. Zigbee module is used on the chip for wireless communication between the ambulance and traffic ccontroller. Strutu et al. In this paper, potholes are detected based on mobile sensor network. This method finds the potholes from the road surfaces. GPS and video modules are used in this architecture and also it is used over a large outdoor area. At last gathered information are highlighted using GIS platform. I. Moazzam, K.Kamal, S.Usman et al. This paper discusses the pothole detection using kinetic sensor. In this technique filler materials are used to repair the defected surface. When potholes are detected, these materials are used to reconstruct that surface. The property of metrology and visualization is the important one for pothole detection. This gives the analysis of cracked surface based on the depth of the pothole and also finding the length, width and area of the surface. Hedge et al. Have proposed warning system; it gives a prior warning message to the driver to avoid accidents. It is also used to find the irregularities of the road surface. The accidents and collisions are reduced by sharing the information to the nearest control room. In this technique, depths of the pothole and coverage areas are already stored in the database. Y.Sato et al.have proposed vehicle speed controlling system. In this system the RFID tags are used to control the motor speed. When the vehicle is entered into the school zone, the vehicle speed is automatically controlled. The tags are installed in the sign of the school zone, hospital zone, etc. It receives the signal from the RFID transmitter, when vehicle is crossing the RFID receiver. Harry lahrmann et al. have developed to control the speed of the vehicle. In this technique monitors the speed of the vehicle and finds the position of the vehicle. Vehicle

installed in the ISA registration will pass through the readers to control vehicle speed. Rajesh kannan megalingam et al. this paper proposed management of vehicle speed. The wireless sensors are used to maintain the speed of the vehicle. MicaZ motes and Tiny wireless measurements are identify the speed. These motes are estimating the density of the traffic routing map. Wireless communication is employed for data transfer between system and remote system.

HARDWARE MODULES

PIC16F877A MICROCONTROLLER:
Peripheral Interface Control (PIC 16F887A) is a 8 bit microcontroller with 8k program memory. Here microcontroller mainly used for control the overall system. It receives the certain information from the Sensors and GPS, such information are potholes and other obstacle detected. From this information controller gives the decision to the output device for doing predefined function.

ULTRASONIC SENSOR:
Ultrasonic sensor is working principle based on RADAR principle. From the fig.1, this sensor has four pins Vcc, Trigger, Echo, Gnd. The Ground and VCC pins are connected to the ground and 5V .Trigger is used for triggers the sensor. The ultrasonic sensor is transmitting the ultrasound wave if any obstacles are present in the way, it reflect the wave back to the sensor. The reflected wave is received by Echo pin. The Echo pin is gives the time taking for sound wave from transmitting to reflect in sensor. From which we calculate the distance.
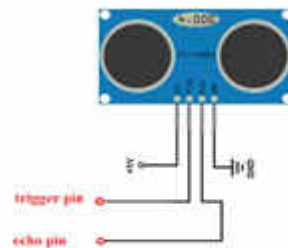

Fig.1. ultrasonic sensor

IR SENSOR:

IR sensor is an electronic device which is used to detect the aspects of its surrounding. It consists of two parts such as emitter circuit and receiver circuit. IR sensor is transmitting the infrared radiation to object and reflect back to the IR receiver. Here IR sensor is mainly used to for detecting animals, human being in front or behind it. This is used to avoid the accident due to driver careless.

GPS:

The **Global Positioning System** (**GPS**) is used for finding the location of the potholes. The GPS is already store the area of the potholes and humps on road in database. If any vehicle detects the potholes and/or abnormal road condition, now the GPS is capture the current position of the vehicle and access the stored location to calculate the distance between vehicle and potholes, this information given to controller, the location of the potholes and abnormal road condition is send to the government through the GSM.

RELAY:

A relay is usually an electromechanical device that used to control the speed of the motor. From Figure.2 It has three terminals Normal Open, Normal Closed and common terminal. Normally it operate at 12v supply that a time normal closed terminal is contact which allows high voltage to motor ,then motor runs there high speed. In case, information about the potholes and any other obstacle (animal, human being, other vehicle it's surrounding) are given from controller, the relay is contact in normal open mode that reduce the high voltage to loe level voltage. Then the motor speed is reduced.
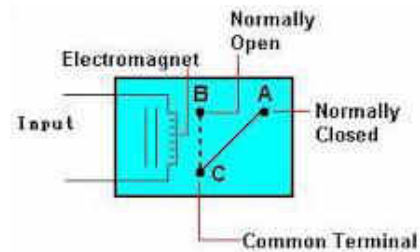

Fig.2. Relay operation

GSM SIM900:

This is Quad-band GMS/GPRS modem, it mainly used for communication purpose. It is suitable for SMS, voice as well as data transfer application in M2M interface the modem has RS232 interface, which allows connecting microcontroller with modem. In our system, GSM used for deliver the message about the road condition to the government authorities. The government authority's number is registered in GSM. When the any decision from the controller is received, the GSM send the message to the government, this message includes the location of the potholes for reconstruction purpose.

VOICE MODULE:

The voice module is used for gives the information about the potholes and other obstacle to the driver in the form of voice. The voice is already record in it. This send to the speaker, this speaker produce the voice message when potholes are detected.

IMPLEMENTATION OF PROPOSED METHOD:

The block diagram of the system is shown in figure 3. Ultrasonic sensor emits an ultrasound at 40,000 Hz which travels through the air and if there is an object or obstacle on its path it will reflect back to the sensor, from the travel time and the speed of the sound we can determine the distance.

$$Distance = speed \times time.$$

The measured distance is given to controller. Inside the controller the threshold value is predefined if the measured value is greater than threshold value, it is potholes, if it smaller then it is hump otherwise normal road. By this distance, pits on the road can be detected. The controller is preprogramming to control the speed of the vehicle when the potholes are detected. That time controller activates the relay, the relay operates at normal open mode then speed of motor is reduced based on the program. Infrared Sensor which is used as Obstacle detector. This sensor transmits an infrared signal, this signal is fall on any object then this reflects back to the infrared receiver. In is way we identify the object such as any vehicle its surrounding and also IR sensor sense the heat energy so it detect the human being and animal nearby it. So, when the obstacle behind or front of the vehicle is detected, this information given to the controller, this controller activate the relay which control the motor then vehicle speed will be reduced.
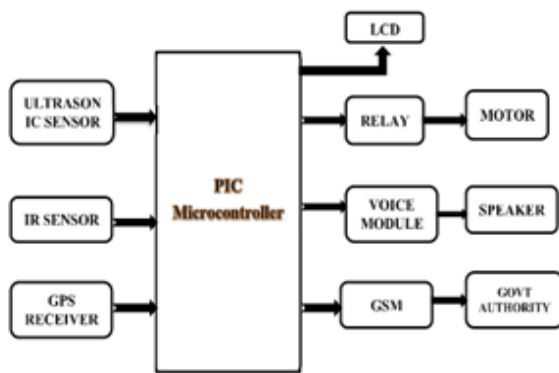

Fig.3. Block diagram of Proposed system

And any one of the above conditions are occur, microcontroller will activate the voice module. Voices are already stored in that voice module. And then speaker will play the prerecord voice from the voice module to inform the driver. The LCD display the location of the potholes and distance .When the lot of pits are detected, GSM will send the message to government authorities for reconstruction road and that message contain the location of that particular road using GPS.

RESULT:

The working model of the system is simulated in proteus simulation software .The simulated output shown in figure.4.Pic Microcontroller is used here which control the overall function. In the control is programed developed in Mplap. Damaged road are inform to driver and government.
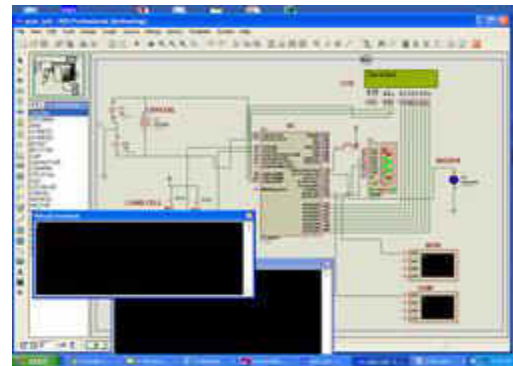

Fig.4. Simulated output

CONCLUTION:

In this proposed method implemented pothole detection on the road surfaces and reducing the vehicle speed. Ultrasonic sensors are used to measure the distance from the vehicle and defected road surface. It is helpful to the drivers to avoid accidents. When the potholes are identified in the road surface, immediately in the information is forward to drivers and government authority through GSM for reconstruct the process. In future, previously detect the potholes in the road surface and it is stored in the database. It will be highly useful to the drivers to avoid accidents. And also consider the Google maps to route the drivers in the smooth way. It is helpful to the drivers avoid to go in the irregularity roadside.

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