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Smart Vehicle with Automatic Pneumatic Bumper System and Video Surveillance

Bhagyashree S. Kale[1], Gayatri L. Gorale[2], Urmila K. Khalkar[3], Swati V. Patil[4]

Pimpri Chinchwad College of Engineering (Dept. of Electronics and Telecommunication), Pune-411044, Maharashtra, India.

Affiliated to Savitribai Phule Pune University (SPPU)

Postal Address: 44, 'Bhagyashree', Survey no.219/b, Opp. Vikhe Patil School, Ambad Khurd, Nashik, Maharashtra, India. (Pin Code-422010)

Abstract

Now-a-days it has been an accepted fact that major part of the accidents is due to the uneven interruptions, inappropriate driving by the drivers. Drivers who do not take regular breaks when driving long distances run at a high risk of becoming drowsy a state which they often fail to recognize early enough according to the experts. So, this project deals with controlling various systems in car electronically. This project is combination of three different units: Automatic bumper system, video surveillance for collision detection, music system control. It is integrating approach towards achieving safety.

The pneumatic bumper will move forward when vehicle coming in front of our vehicle which is responsible for an accident. Video is continuously is being recorded and it is also connected to internet. In case accident happens, the video will be sent to nearest hospital or relative through E-mail with the help of SMPT protocol. Also, the system will automatically turn OFF music system if incoming call on mobile is detected without driver interaction. The appearance of the Internet of Things (IoT) provides a new solution for automatic traffic accident detection system.

Every day around the world, a large percentage of people die from traffic accident injuries. An effective approach for reducing traffic fatalities is: first building automatic traffic accident prevention system. The system will avoid driving distractions and allow drivers to focus on their primary task of driving. We are going to use Raspberry pi to develop the project.

I. INTRODUCTION

Over the last few years vehicles are increasing day by day and hence causing city-based traffic more and more crowded and dense. As a result, traffic watching and supervising is becoming one of the very important problems in big smart-city all over the world. Automotive Electronics sector having more demand due to day by day use of embedded system for different applications in car. Most of luxurious cars having more automatic controls like Airbags, ABS, ESP, ECU, ESP, climate control & more. Automatic Guided Vehicle (AGV) nothing but vehicle guideline provided by capturing images of the road. Intelligent driver assistance system nothing but provide the full assistance to the driver when drive driving the car on the road along with considering the traffic intensity.

India is the developing country and densely populated country with the vehicle usage being really diverse. The number of people expired during vehicle accidents is very large as compared to the other causes of death. Though there are different causes for accidents but proper technology of braking system and technology to reduce the damage during accident should be developed. Hence there is need of Impact Reduction system to prevent the accidents and to reduce the damage to vehicle and also the driver. The appearance of the Internet of Things (IoT) provides a new solution for smart traffic development by car camera information sharing by the driver to other people in crowd sourcing. Right now, in metropolitan cities one of the biggest problems is traffic accidents. Most of the accidents caused injuries or either worse death. When a traffic accident occurs, it is always reported by traveller who is passing from that way and also, we do not have any information how accident has occurred.

Most of people loves listening music while driving, sometime could not hear mobile ring or sometimes driver get distracted while receiving call during driving. This could be one reasons for accidents.

Most common causes of accidents are distracted driving, Drunk driving, speeding, Rain, Missing safety features so by applying innovative ideas and combining existing technology the proposed system will definitely help to reduces accident by automatic bumper system. In case Accident happens, we will have proof of how accident happened.

II. METHODOLOGY

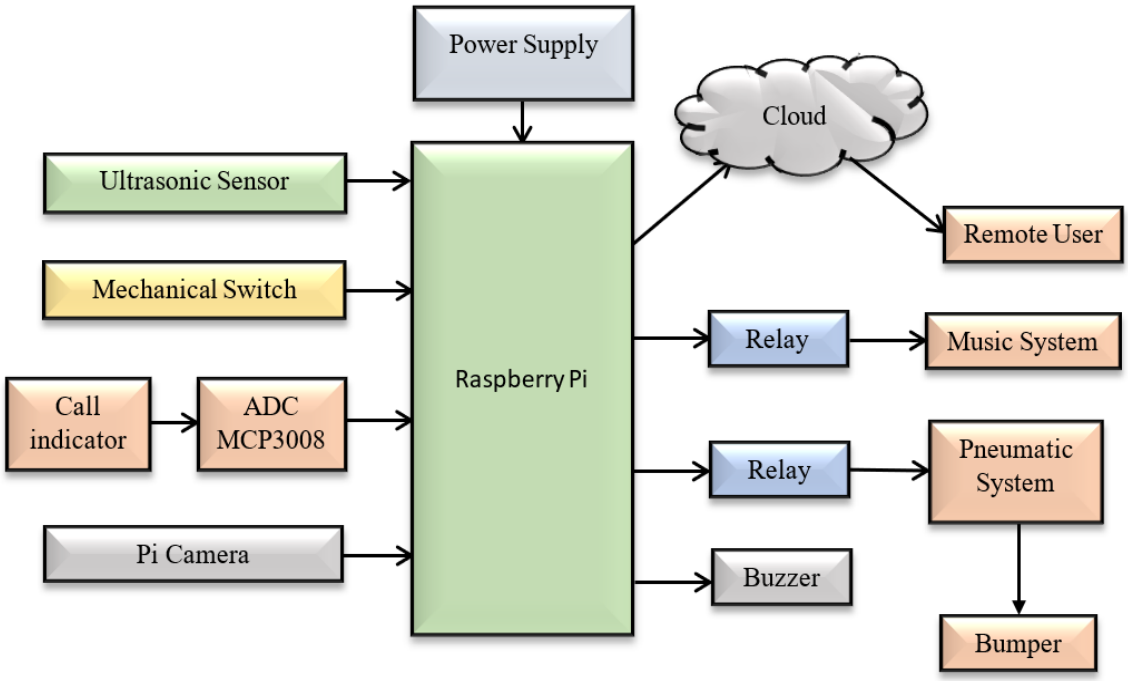

Fig. 1 Block Diagram of Complete Project

The installed ultrasonic sensor senses the vehicle coming in front of our vehicle. The received signal by ultrasonic sensor is provided to the control unit and calculates the distance from ahead vehicle. If the distance less than 50cm then activates the Solenoid Valve which will allow the flow of compressed air through it. Compressed air is provided as an Input to the Solenoid Valve which has two Outputs both connected to the Double Acting Pneumatic Cylinder.

This pneumatic force of the compressed air through the Solenoid Valve is transferred to the Bumper System. The pneumatic force provides forward motion to the Bumper and it also retracts the bumper slowly reducing the impact. Hence, the external body is kept safe; there will be no chance of internal damage.

When unfortunately, accidents happen, the mechanical switch installed at front side of car get pressed and with video surveillance car can send video automatically to nearest hospital and relatives using SMTP protocol for multipurpose. Camera gets initialize for capturing the video when distance between vehicles less than 50 cm. The video of 5 seconds is recorded and stored in internal memory of Raspberry Pi. When the mechanical switch gets pressed, it indicates that the accident has happened and the video is sent as an attachment with the help of mail with an emergency message.

Many people are fond of listening to music while driving. If there is incoming or outgoing call the driver needs to turn off the music system or to decrease the volume on his own. This leads to distraction of driver from driving and accident might happened. So, to avoid

driver's intervention, we have automated the system. If there is incoming or outgoing call, the signals will be picked up by call indicator circuit whose output is analog. To convert it into digital, the signals are given to ADC IC MCP3008 and the digital signals are given to the Raspberry Pi. The Raspberry Pi will turn off music system automatically by actuation of relay when there is incoming or outgoing call and again the music system is turned on when there is no call.

III. LITERATURE REVIEW

A. "Accident Prevention System by Automatic Pneumatic Bumper" by Asst. Prof. Aamir Sayed

In today's world vehicle accident is a major problem. To avoid this, we have developed an automatic impact reducing system in our project. The system is based on intelligent electronically control system known as "Automatic pneumatic-bumper system". Automatic pneumatic bumper system uses infrared sensor (IR), which is used to sense the vehicle coming is front of our vehicle which is responsible for an accident. As soon as any object or vehicle is sensed by the sensor the sensor sends feedback signal to engine through the relay control to activate the Solenoid Valve which allows the flow of compressed air to the cylinder. During the working of Automatic Pneumatic Bumper system simultaneously the driver also tries to stop the vehicle by applying brake pedal which somewhat slows down the engine. The compressed gas flowing through the solenoid valve will activate the cylinder which in turn activates the Bumper. This system provides pre-crash safety to the vehicle. As well as it improves the response time of vehicle braking to keep safe distance between the vehicles. By using this system, we can obtain control over the speed of vehicle in short distance.

B. "Intelligent System for Vehicular Accident Detection and Notification" by Bankar Sanket Anil, Kale Aniket Vilas, Prof. S. R. Jagtap

A system which gives an idea about what can be done to provide medical help and other facilities after accident as soon as possible. Accident can be detected using flex sensor and accelerometer, while location of accident will be informed to desired persons such as nearest hospital, police and owner of vehicle through SMS sent using GSM modem containing co-ordinates obtained from GPS along with time of accident and vehicle number. Camera located inside vehicle will transmit real time video to see current situation of passengers inside vehicle. Thus, this paper emphasizes on post-accident system for detecting and informing about it. Simulation result on hyper terminal is also presented in this paper.

C. "Mobile Phone Accidents – Experience of India" by H. Abdul Shabeer, Wahida Banu

To develop a highly efficient automatic system for early detection of incoming and outgoing call, by placing an antenna along with mobile detection unit above the driver seat.

This unit is capable of distinguishing whether the cell phone used either by the driver or by the passenger, if the driver uses of cell phone is detected, a safety application named Cellphone Accident Preventer (C.A.P.) which is developed using J2ME will be automatically load on the driver's cell phone which helps in eliminating the risk of accidents from occurring, at the same time ensuring that the user does not miss any emergency call. The research has been extended to show how far the system will help in preventing accidents and to what extent this system will help in reducing the Indian economic loss incurred unnecessarily due to road accident fatalities.

IV. FLOW CHART FOR SYSTEM IMPLEMENTATION

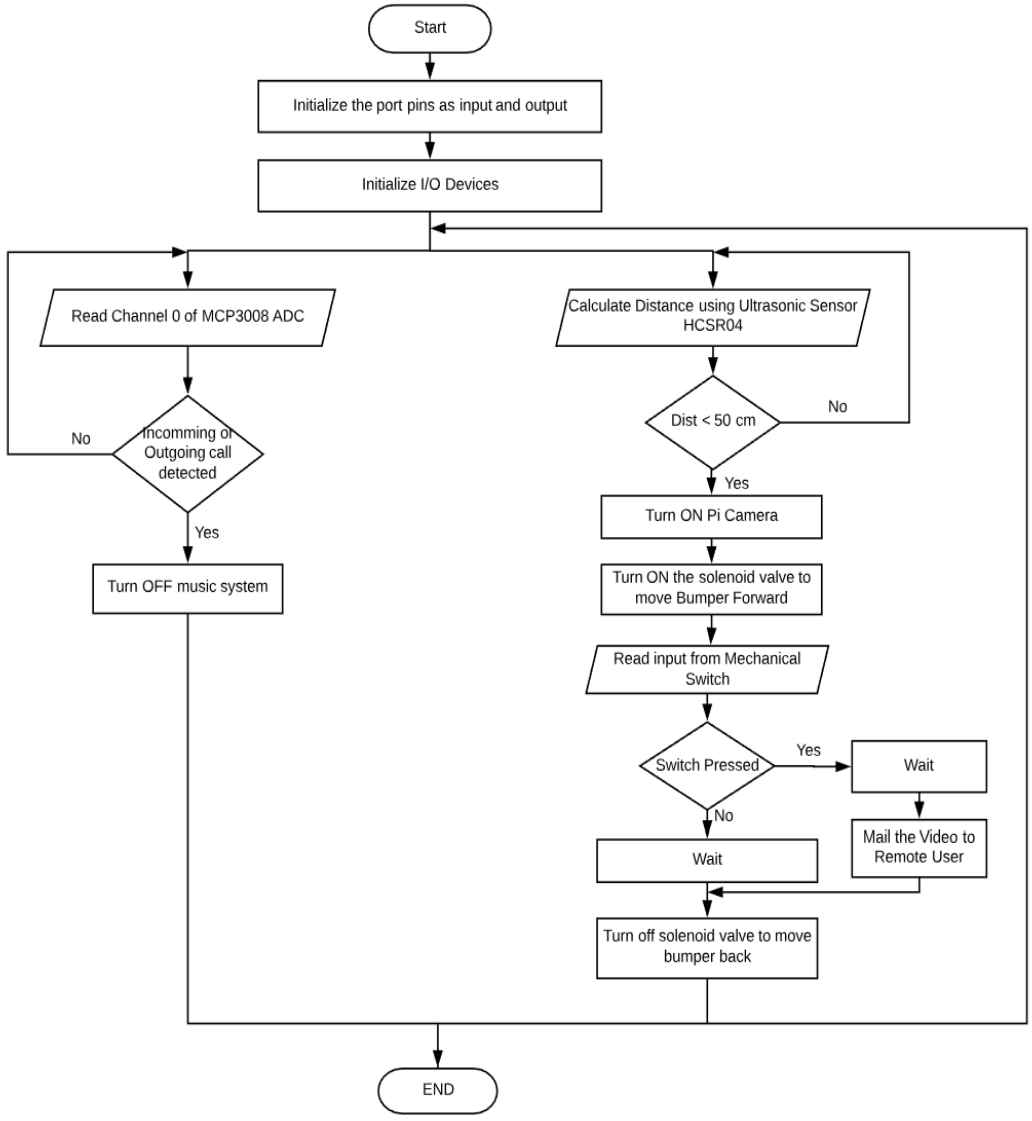

Fig. 2 Flow Chart

V. RESULTS

If the distance between two vehicles is less than threshold, let's say 50 cm, then the pneumatic assembly will be activated by turning on the solenoid valve which will allow the compressed air stored in reservoir to flow into double acting cylinder to move bumper in forward direction as shown in fig. 4. The buzzer will also turn ON to alert the driver. When the distance goes more than threshold (i.e. 50 cm), then bumper will move backward to its initial position and buzzer will turn OFF.

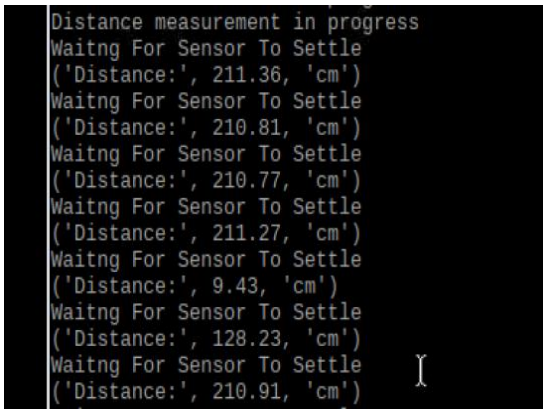

Fig. 3 Distance measurement

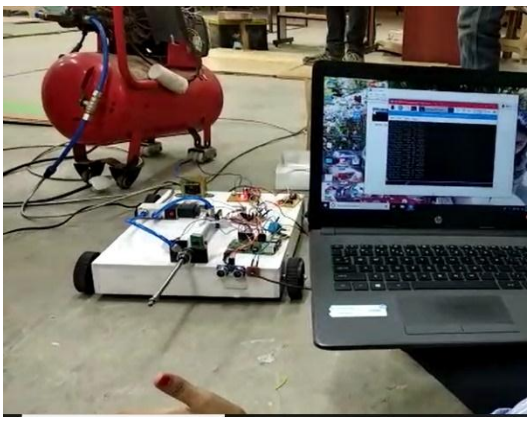

Fig. 4 Bumper moves forward

When the distance is less than 50 cm, this will activate the Pi-Camera and the video of about 5 sec will be recorded by the camera. The video will be stored in the path given in the code. The video will be overwritten every time it is recorded. The recorded video can be used as a proof of how the accident might have happened. For this, the video is sent to the mail of any remote user which may be relatives, police station or a hospital as shown in the fig. 5. To indicate whether the accident has happened, the mechanical switch is used. In case of accident the switch gets pressed and generates active low signal which is detected by Raspberry Pi. When the accident is detected, then only the video will be sent as a mail to the remote user.

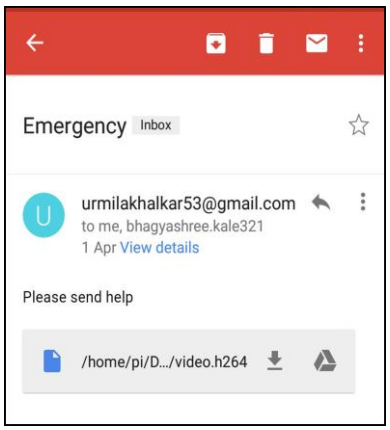

Fig. 5 Video sent via e-mail

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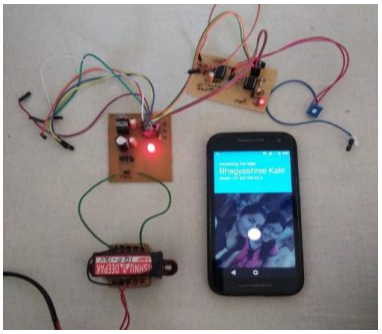

Fig. 6 Call Detector Circuit

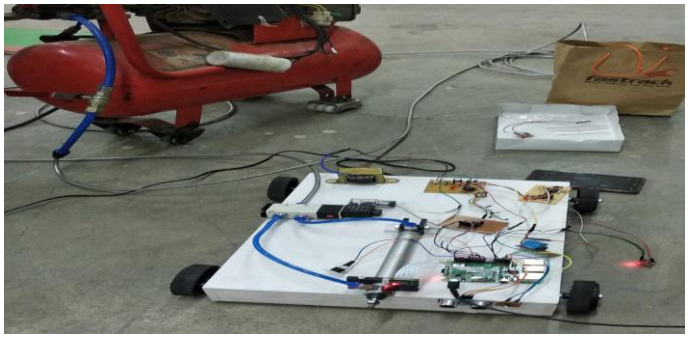

Fig. 7 Total System Implementation

VI. CONCLUSION

Our main aim behind the implementation this system, is to improve the technique of prevention of accidents and also reducing the hazard from accidents like damage of vehicle, injury to humans, etc. After successful installation of the system in car, it helps to achieve low Impact damage. In this system, bumper moves 15 cm forward automatically when vehicle coming in front of vehicle which is responsible for an accident, thereby reducing impact of accident on vehicle engine and on passengers, video surveillance in car captures the video of 5 seconds automatically and the system sends video to mail upon accident detection with the help of mechanical switch so, the video can be used as a proof, and also the system controls the music system upon call arrival or termination.

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