RASPBERRY-PI BASED VEHICLE COLLISION AVOIDANCE SYSTEM

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Abstract - *Highway obstacle perception is the most versatile and grueling task in the real-time scenario. With the escalation of prominent embedded technologies in the automotive field, the life of people becomes more congenial and issues safety against accidents.. At present, roughly in all vehicles an astute safety and vigilant system are put into effect which apprises the driver to steer clear of an accident. In proffered work, an advanced collision avoidance system is set in motion which discovers the presence of obstacles in front as well as in blind spots of vehicles and warns drivers correspondingly. This system embeds an ultrasonic sensor for the detection purpose of real-time moving and stationary objects under all conditions.*

Key Words: Ultrasonic Sensor, GSM module, DC motor, Raspberry-Pi, Buzzer,

1. INTRODUCTION

In this day and age accidents are habitually increasing at an elevated rate due to heedless driving. Road accidents are the crucial root of deaths in India. India had been lined up number one in the number of deaths due to accidents. On account of advanced technology and escalation in population, the use of vehicles is rising quickly.

In these times it is foremost to secure the lives and accident obstruction is very difficult. To get control of such problems, many vehicle manufacturers and automobile device companies have aimed to develop speed control systems to maintain a vehicle safe distance. A Driver Drunk System and Vehicle collision is a system that can scale down this accident to some degree caused due to sloppiness of the Driver. Researchers have brought forward a number of automatic road accident detection methods. These methods predominantly use airbags, smartphones, infrared sensors (IR sensors), and mobile applications. None of these methods are flawless for automatic detection.

Finding a solution has set off a daily concern these days, and that is where the motivation for this project came up from. A novel approach based on an ultrasonic sensor is proposed in this project. Vehicle collision avoidance using ultrasonic sensors delivers the advantage to detect an accident not only in various street situations but also it might perform well under various natural conditions like rains.

2. EXISTING SYSTEM

In the existing system, image processing algorithm is used in order to detect an object around the vehicle. The camera modules captures object around the vehicle including motion data of the object. Then data gathered form the camera modules is then processed using image processing algorithm in order to give decision to the driver whether the collision is in course or not, making sure the safety of vehicle and the driver.

Disadvantages

There is a delay while giving decision.

It fails to give decision in foggy and rainy weather condition.

Also in night-time, it is unreliable

3. LITERATURE SURVEY

Formerly, the subsequent efforts were conveyed out by researchers. The developed systems are admirable but they're sloppy in terms of effectiveness.

Quang N. Nguyen, Le T. Anh Tho, Toi Vo Van, Hui Yu, Nguyen Duc Thang "Visual Based Drowsiness Detection Using Facial Features"

In this system, they are utilizing two algorithms viz. EOG and Decision Tree. EOG measures the electric activities of eye muscles. EOG has been used extensively in the study of drowsiness due to its high sampling rate. The decision tree is used to organize pixels into images into five classes' viz. face, right eye, left eye, nose, mouth. This system is useful to

detect drowsiness and avert road accidents but there are some flaws like it will not work on people with dark skin.

Hrishikesh B. Juvale, Anant S. Mahajan, Ashwin A. Bhagvat, Vishal T. Badiger, Ganesh D. Bhutkar "Drowsy Detection and Alarming System"
This system is developed by applying image processing fundamentals. Clustering and slope detection algorithms are used. This system is developed without using database storage although it comes with some drawbacks that there should not be any reflective object behind the driver.

Brojeshwar B, K. S. Chidanand "An Application for Driver Drowsiness Identification based on Pupil Detection using IR camera"
Thresholding algorithm is utilized to draw out the background and face region can be obtained with ease by removing mean from input grayscale image. There are no wires, cameras, monitors or other hardware is to be attached yet the connection can be lost.

Ines Tayeb, Olfa Jemai, Mourad Zaied, Chokri Ben Amar "A Drowsy Driver Detection System Based on a New Method of Head Posture Estimation"
A Drowsy Driver Detection System Based on a New Method of Head Posture Estimation- This system allows the detection of six possible states of head inclination viz. right, left, backward, and forward beside the right and left rotation which is utilized in video analysis for which video is captured and segmented into frames. By virtue of its non-obstructive nature, it is more reliable and practically applicable.

4. PROPOSED MODEL

The proposed model presents a unique approach supported by an ultrasonic sensor that issues the supply to detect an accident and can help to make sure drivers' safety and their rescue in a very worst-case scenario.

4.1 System Architecture:

Proposed model is embodied of an ultrasonic sensor (HC-SR04), a GSM (Global System for Mobile communication) sim800l module, Raspberry-Pi 3 Model B board and a DC motor with L298 Motor Driver Module. All the modules are connected directly to Raspberry-Pi board to its GPIO (General Purpose Input Output) and programmed using python programming language.
An ultrasonic sensor is positioned at the blind spot of the vehicle and a GSM module is used for sending the location in case of accident. The architecture is shown in Fig.

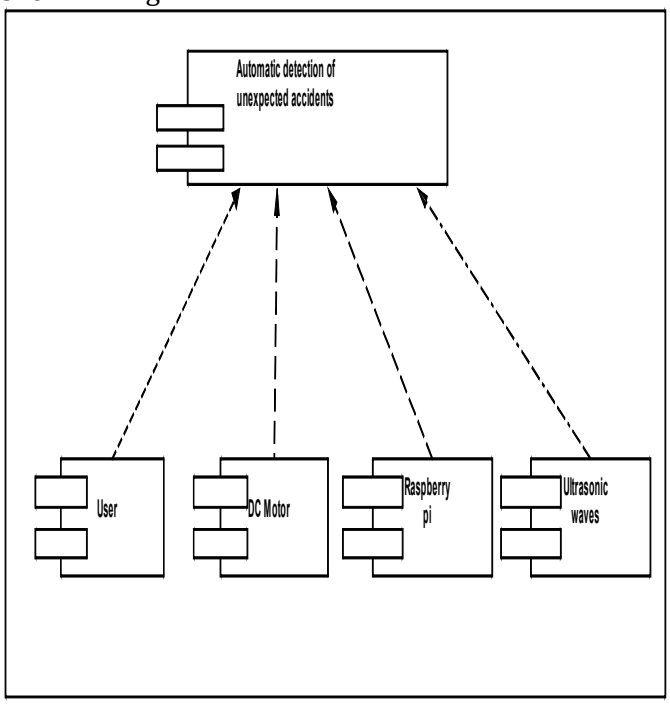

Fig- System Architecture

4.2 Modules:

Ultrasonic Sensor (HC-SR04) – This sensor uses SONAR to found the distance of an object. It offers the range detection with high precision and stable reading from 2 cm to 400 cm.

GSM SIM800L module – It allows sending and receiving SMS and making and receiving voice calls and also GPRS transmission. Low cost and small in size and quad band frequency support.

Python Program Control Unit (Raspberry-Pi Model B) – Raspberry-Pi is used to do all the calculations and perform algorithm using input given by all modules.

DC Motor with L293D Motor Driver Module – To demonstrate the use of how all modules will perform in order to avoid collision with another object by decelerating the engine (DC motor in our case).

4.3 Working:

In the proposed model, the distance between sensor module and respective bumper is measured calling it as threshold distance 1, the distance between the vehicle and object moving away from the vehicle must be greater than threshold distance 1. When any object breaches threshold distance 1, the processing system will alert the driver and decelerate the engine (DC motor in our case).

Furthermore to avoid any uncertainty, we have assumed second threshold distance 2, which is less than threshold distance 1. When any object collides with vehicle breaching the threshold distance 2, the processing system will detect the scenario as an accident, sending the location of vehicle to respective rescue service.

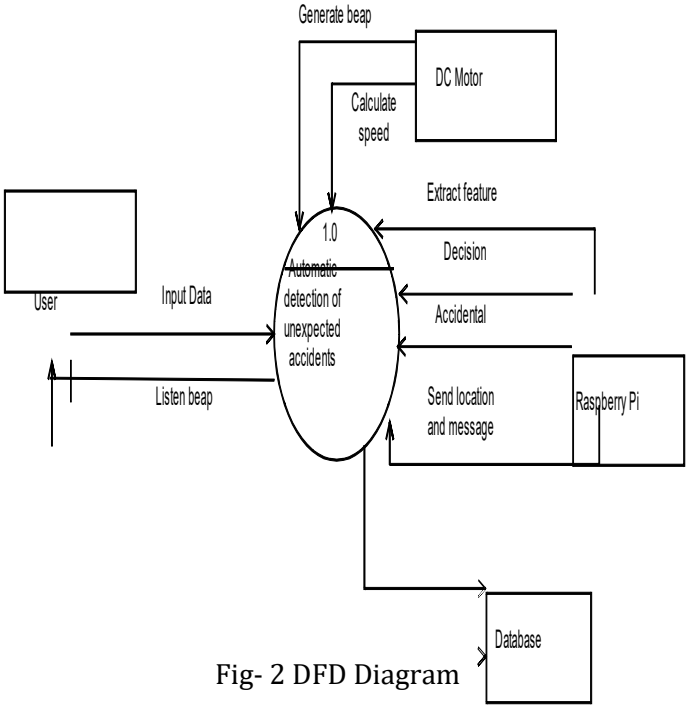

Fig- 2 DFD Diagram

4.4 Algorithm:

Step 1: Initialize the system
Step 2: Get the data form sensor
Step 3: Extract features by utilizing python control program
Step 4: Decision
Step 5: If threshold distance 1 is breached, alert the driver and decelerate the engine (DC motor)
Step 6: If threshold distance 2 is breached detecting as an accident, send message and the location.

4.5 Result and Discussion:

Distance of the object from vehicle	Threshold Distance 1 (5cm–20cm)	Threshold Distance 2 (0-5cm)	Decision
11	breached	-	Alert the driver and decelerate the speed of vehicle
28	-	-	Alert the driver and decelerate the speed of vehicle
4	-	breached	No action
35	-	-	Considered situation as accident and send message and location to the respective hospital

Above table shows,

if distance between object and the vehicle > threshold dist.1 = No action

if distance between vehicle and the object is < = threshold dist.1 then, driver is alerted and speed of the vehicle is decreased.

if distance between vehicle and the object is < = threshold dist.2 then, unexpected accidental scenario is considered, sending message and the location to respective rescue service.

5. Conclusion

In this project, a novel technique for the detection of a road accident is proposed. In this technique, low cost ultrasonic sensor is used to detect an accident. There are many state-of the-art techniques for the detection of road accidents automatically. These include smart-phones, Infrared sensor (IR sensor), airbag system, and mobile application. Although,

these techniques are good enough to detect an accident, however, each technique has known limitations. The proposed system is reliable as it uses two ultrasonic sensor modules for road accident detection

6. References

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