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Engineering

A SAFETY VEHICLE CONTROL SYSTEM USING RASPBERRY PI

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ABSTRACT This project aims to detect the onset of drowsiness in drivers, while the vehicle is in motion, Autonomous Emergency Braking and Automatic detection and recognition of text and symbol in traffic signs. Detection of drowsiness in drivers is done by continuously looking out for symptoms of drowsiness, while considering physical signs. Physical cues including yawning, drooping eyelids, closed eyes and increased blink durations. An Automatic Emergency Braking system or Autonomous Emergency Braking System is an autonomous road vehicle safety system which employs sensors to monitor the proximity of vehicles in front and detects situations where the relative speed and distance between the host and target vehicles. Some of the most common reasons why drivers fail to apply the brakes on time are distraction, inattentive, sleepiness, lack of concentration while driving. The AEB System is designed to function on different sets of road scenarios. If the driver fails to act on time to avoid collisions, the AEB System will automatically apply emergency brakes. Each government imposes some sets of rules and regulations to ensure a safe traffic system. Each person especially the driver must obey these rules and regulations for secure travel. An efficient driver must notice each of the road signs in front of him and need to act accordingly. By implementing such devices will ensure a safe travel. In proposed work, advanced collision avoidance system is introduced which detects the presence of obstacle in front as well as in blind spot of vehicle and alert the driver accordingly. This system implants ultra sonic sensor for detection purpose of real time moving and stationary object under all weather environment.

KEYWORDS : Raspberry pi,MQ-3 sensor ,Ultrasonic sensor

I.INTRODUCTION

There are several advanced technology and innovations are available for vehicle safety. Even though there are advanced technological innovations for vehicle safety, the growth in number of accidents is continuously increasing. And these accidents are due to collision or intersectional accidents. Collision of vehicles occurs due to mistakes done by driver and intersectional accidents are caused due to bad weather conditions. Hence, to overcome these mistakes an intelligent collision avoidance system is proposed. So, the mistakes done by the driver are eliminated. Only sports cars and other luxury cars consist of antilock brake system, speed sensor, and other automatic systems. But these cars cannot be affordable to everyone. So, this system is developed which can be implemented in every car. A collision avoidance system consists of several sensors that are placed within a car which provide warning to the driver if there are any dangers that lie ahead on the road. These sensors include how close the car is to other cars, how much its speed needs to be reduced when obstacles closer to the car, how close the car going off the road, And the system consist of audio warning to prompt the driver, initiates braking if the driver fails to respond to the warning. Since the system consists of sensors which send and receive signals from other cars, obstacles on the road. A good example of the system is how it works when a driver is about to change lanes, and there is an obstacle in his blind spot. The sensor will detect that obstacle and give information to driver before him start turning his car, and prevent him from getting into serious accident.

There is lot of techniques available for distance measurements and to avoid forward collision but the one technique which is introduced in our system is fast, effective, and cheap by using ultrasonic sensor. Ultrasonic sensor is used to measure the distance with respect to the preceding car. Hence, the rear end collision can be avoided by using ultrasonic sensor. In our proposed system, we use humidity sensor to calibrate the level of humidity in the surrounding environment. If the humidity level is less than fixed threshold then the sensor alerts the system by giving warning signals for bad weather conditions.

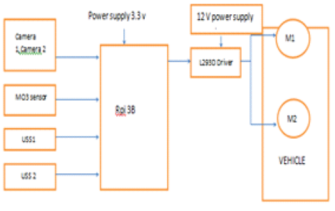
Traffic sign recognition is used to maintain traffic signs, warn the distracted driver, and prevent his/her actions that can lead an accident. A real-time automatic speed sign detection and recognition can help the driver, significantly increasing his/her safety.

This project focused on a low cost, off the shelf solution, specifically, a mini embedded computer Raspberry Pi, that is capable of doing everything you would expect a desktop computer to do, from word processing, image processing to playing games.

Drowsy driving is one of the major causes behind fatal road accidents. One of the recent study shows that one out of five road accidents are caused by drowsy driving which is roughly around 21% of road accidents, and this percentage is increasing every year as per global status report on road safety 2015, based on the data from 180 different countries. Among these the major cause is due to driver errors and recklessness. Driver fatigue is cause behind such mishaps. Heavy traffic, increasing automotive population, adverse driving conditions, tight commute time requirements and the work loads are few major reasons behind such fatigue. With this paper, we are presenting technique to detect driver drowsiness using of Open CV, raspberry pi and image processing (Wei Zhang, 2012). Several studies have shown various possible techniques that can detect the driver drowsiness. Such driver drowsiness detection can be measured using physiological measures, ocular measure and performance measure (Mario, 2015 and Mayank Chauhan, 2014). Among these physiological measure and ocular measure can give more accurate results.

II.METHODOLGY

The system consists of an ultrasonic sensor, camera, raspberry pi board and the Open-CV software. The detection of the object is done by camera and the ultra sonic sensor measures the distance from the object. The camera is used to detect the presence of the object. The ultrasonic sensor and the camera, both are interfaced with the raspberry pi board and processed through the Open-CV software.



A.Raspberry Pi 2, Model B:

The Raspberry Pi is a small computer chip which have the capability of the laptop and used for many applications in real time environment. Python software are programmable codes which is well suitable for this board. This programming capability with the General Purpose Input Output pins are used in several applications. The Raspberry Pi 2 increases the processing capability than the previous board. The Raspberry Pi 2 consists of an upgraded Broadcom , which is a ARM Cortex-A7 quad-core processor that runs at a clock of 900MHz. It also consists of 512 MB RAM. The Raspberry Pi is a low power consumption, low cost product for network engineers and software developers for developing applications.

A.Camera:

The camera is used to capture the images. The camera which is used in this work is Logitech USB web camera. The resolution of the camera is up to 5 mega pixel and so the image would be clear. The pin 1 and pin 2 operates at 5V and 3.3V respectively. The camera mostly uses 3.3V of supply so that the remaining power can be used by the board. The inputs and outputs need 1A of power supply. The web camera consists of 5mp resolution, image capture resolution of 640 x 480,and with the frame of 30. This camera configuration in the board is simple and is easy to plug and play the camera in the board.

C. Ultrasonic Sensor:

Ultrasonic sensors measure the distance using the properties of its sound waves. The sensor is used for detecting the range information of the object. The horizontal and the sensor detects the accurate distance of the object in the sensors range. Angle of vision is found, thereby measuring the distance of the obstacle. The main task of obstacle avoidance is to control the vehicle in a non-collision position and to move in an obstacle free path. The object's distance is also found through the mapping method. This is a very compact, highly sensitive and low power consumption device .

The working of the sensor is done by transmitting and receiving the sound waves through this device. The sensor will receive waves of frequencies. These frequencies is produced back in the form of echo when an object comes ahead. The time is calculated between the sound waves and the echo received. One of the de-merit of this approach is that the reflecting surface is not in proper shape, the distance measure may be in-determined. The ultrasonic sensor is mounted on the front of the chassis to achieve the desired result.

E. MQ-3 Gas Sensor

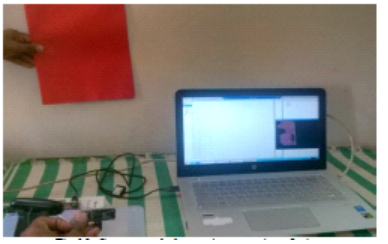
The sensor is composed by AL2O3 ceramic tube, tin di oxide(SNO2) sensitive layer, measuring electrode and heater are fixed into a crust made by plastic and stainless steel net. The heat provides necessary work conditions for work of sensitive components. The enveloped MQ-3 have 6 pins, four of them are used to fetch signals and 2 other are used for providing heating current. Resistance value of MQ-3 is different to various kinds and various concentration gases.

D. Software-Open CV:

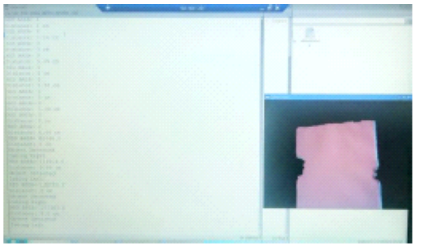
Open-CV (Open Source Computer Vision) is a library which is made by Intel which consists of functions used for computer vision. C++ is the main language for Open-CV software. The image captured is segmented into pixels and so each pixel is processed by this programming technique. Algorithms related to machine learning is also possible with Open-CV. Python and C++ are languages which are supported in Open-CV, these run on windows, Linux OS, etc. Open-CV runs on a variety of platforms. Point operator consists of Histogram and threshold. Convolution and smoothing are done in the local operator. Python is a programming language started by Guido van Rossum, which became very popular mainly because of its simplicity. The development is done on SIFT on Mars. Histogram is done during the under distribution of data. Python wrappers are coded which can be used as Python modules. At first the code is as fast as original C++ code and second, it is easy to code in Python. Library for numerical operations in python is called as Numpy. OpenCV array structures are converted to and from Numpy array structures are changed to Open CV. Matplotlib and Scipy supports Numpy. So python in Open CV with is an appropriate tool for fast prototyping of computer vision problems.

III.RESULTS AND DISCUSSIONS

The simulation for the processing of the image is done in matlab software. The color detection is done from the original image and the desired color and the shape is obtained. These results show in figures below that color processing is to be done in real time



Camera and ultrasonic sensor interfacing



Obstacle detection output

The camera is interfaced with the raspberry pi board and it is processed through the Open CV Python language. The output is seen in the Python shell. The camera data does not show any value till it detects an object. When the object is filtered, the area of the object is noted continuously and if the threshold range is reached it shows that the object is detected. The ultrasonic sensor is also interfaced with the raspberry pi board. The ultrasonic sensor transmits and receives the value from the object. The distance of the object is continuously noted by the sensor and displayed in the software. If the values meet the threshold value then it displays the output as object detected. The above shown figure shows that the camera and the sensor are connected and the output is seen. The camera detects the object and calculates the area of the same. The sensor is used for distance measurement from the object and its reading are shown in the display combined with the readings of the camera. This shows that the object is detected and the distance is noted in order to alarm the system about the obstacle and to make the vehicle to steer away from the obstacle thus avoiding collision.

CONCLUSION

The proposed system is designed into a small car model as a prototype to control the distance between the car and the preceding car and also distance between the front obstacles and initiates automatic braking. System detects the lane line and automatic lane control is done to avoid accidents in a significant manner. Lane detection will ensure that car follows proper lane discipline for safety purpose.

The work described in this paper is split into two parts, similar to other applications in the field, as “detection” and “recognition”. For the detection part, shape-based algorithms were used because color-based segmentation is much less reliable than shape-based segmentation. In similar cases to speed sign detection, they were many different techniques used, such as genetic algorithms, Hough transforms, and artificial neural networks based algorithms.

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