EMBEDDED BASED ACCIDENT PREVENTION TECHNIQUE USING IMAGE PROCESSING

D.Guru Pandi[1], J.Navarajan[2], R.Vishal[3], D.Vibuvasan[4]

[1] *Assistant Professor, ECE Department, Panimalar Institute of technology, Tamil Nadu, India*
[2] *Assistant Professor(Grade-I), ECE Department, Panimalar Institute of technology, Tamil Nadu, India*
[3] *Student, ECE Department, Panimalar Institute of technology, Tamil Nadu, India*
[4] *Student, ECE Department, Panimalar Institute of technology, Tamil Nadu, India*

ABSTRACT

This is a technology that serves as the best in the closing minutes of human life. Communication has attained great heights ever imagined by the mankind, we believe this technology could serve better to humans. As the condition of the road in our country is not extraordinarily good and they are dynamically varying at some places there are pitches and at some places there are humps in the road. During night driving this may cause accidents to people because they are not visible in the dark. One approach to eliminate this and to save human life is explained in this technique. This is done by the perception technique which is detailed below.

Keyword: *break sensor, buzzer, 2 axis robot, camera /LIDAR, PIC CONTROLLER 7 processor.*

1.INTRODUCTION

According to the National Survey it has been calculated that every year number of accidents that occur in India are close to 1.3 million. Out of which around half million people suffer from non-fatal injuries with many sustaining a disability as a result of their injury. There are two major reasons that leads to an accident. The first main reason is the dangerous road conditions. These are major distractions for safe and comfortable transportation. Keeping our roadways in good condition is a challenging problem because of harsh weather, unexpected traffic load, and normal wear and tear, degradation of even well-laid roads. The second main reason is being driver distraction. In this paper we have explained about how we can prevent accidents in this congested traffic conditions as well as in the dangerous road conditions. We have used a camera which can continuously send signals on changes in the road. We have used a microcontroller which does a continuous image processing of the road and compute the results and prevents from vehicular accidents this operation are done by an Image processing technique. The component details are PIC Controller,Camera, Buzzer, Break sensor, Two axis robot.

2.DESIGN OVERVIEW

In the existing system, it uses an ultraviolet ray to detect the objects in front of the car and applies brakes before the car hits the object which may be a car truck or any other obstacles.The drawback is thatit cannotalso be used to detect lane. And also the second drawback is thatthe ultraviolet rayis initially transmitted and the reflected ray is observed and the obstacle is detected. It is considered to be a slower process. For this process the speed of car is a major constraint since it's a slow process the speed must not be above 20km/hr and it can be used only in traffic conditions. The proposed system uses a LIDAR/Camera which takes a real time image of the road and does an image processing to detect the obstacles in the road and accordingly prevent accident. The accident stoppage

technique is that the camera is placed at the back of rear view mirror which acts as a perception system. It collects all the information regarding the condition on the road it may be any obstacle any flaw on the road and gives the data to a controller which is defined with certain cut-off ranges so that if there is any obstacle on the road, the processor will sense and check whether the car is slowing down or not.If not then the automatic braking system will be activated and hence the car will stop before hitting the obstacle.

3.DETAILED EXPLANATION

In this project we use anPIC 16F84 controller to monitor and control the behavior of vehicle using a camera, break sensor and axis robots.Fig 1 shows the block diagram of Accident Prevention technique. In this technique, First we are capturing the image of all the objects in front of a moving car followed by which, image processing is done by the processor and further checks for the break sensor if any object is found. In case if the user is conscious of the obstacle he will apply the break and the collision is avoided. In case, if the user is conscious of the obstacle he will apply the break and will avoid collision, whereas if he is not aware of the obstacle he is not going to apply break the controller monitors this and hence gives a first stage alert to the user and waits for a certain period of time and even after that if the user is not responding by applying break the controller initiates the driver circuit to apply the break and stop the vehicle before getting collision.

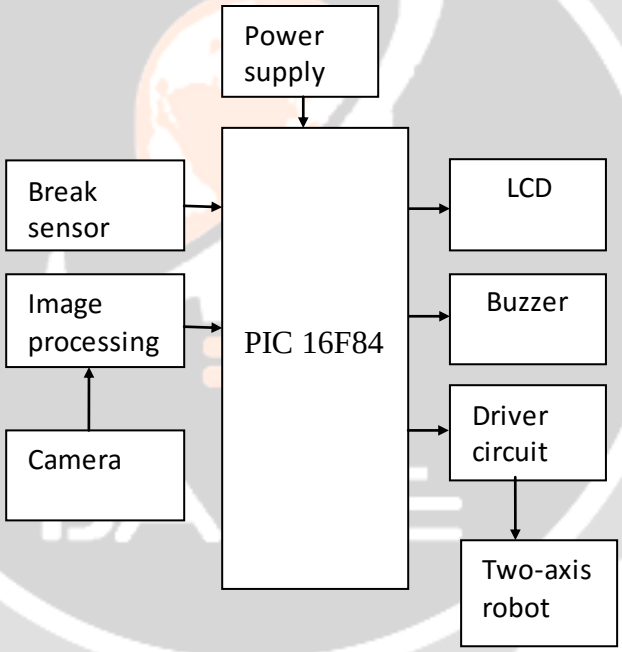

Fig. 1 – Block Diagram

The accident prevention system fully works on the basis of a continuous video processing system, a camera is placed at the backside of a rear view mirror which is placed in the front windshield of the car which works like a perception system collecting all the changes in the environment and gives it to an PIC controller which does processing and senses any obstacles present on road and if the size of the obstruct is minimum and doesn't cause any damage that it is well below the car, the car doesn't slow down and will be able to move continuously with the same speed, but if there is any obstacle that hinders the progress of the car the processor will check whether the car is slowing down or not . If it doesn't slow down the automated system applies brakes and slows down the car before getting collided with the obstruction. Initially our idea was to give a notification PIC controller to the driver inside the car but the response speed of human is less so we decided to make it fully automated.

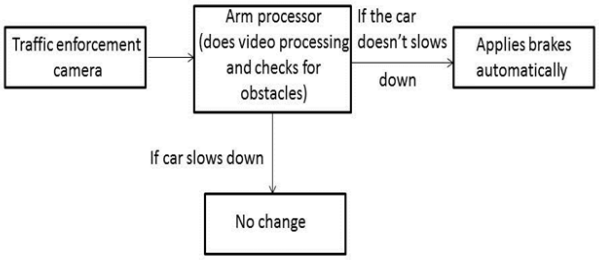

Fig. 2- BLOCK DIAGRAM

The video processing takes place and if the detected object is below cutoff range which is acceptable no changes happens but if the detected object is above cutoff range the car automatically applies brakes if the user doesn't slow down.

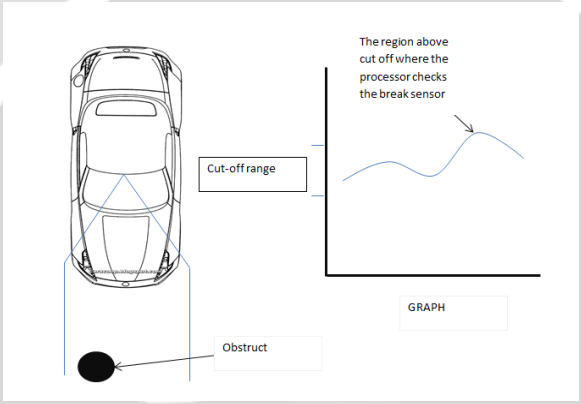

Fig. 3

4.VIDEO PROCESSING

JPG format is being used by the 2 D images anr are being represented using the two dimensional array in such a way that each value in the array represented the RGB triplet for an individual image pixel. This technique gives detail information on the techniques used to enhance the traffic images and extract the road direction and the flaws in the road for use in heading detection. The different processes are detailed below

4.1 Gray scale Conversion:

The first step in image analysis was the conversion of the RGB image into gray scale using standard techniques. An example gray scale image is shown in Figure 4

Fig-4

4.2 Median Filtering

After gray scale conversion, the median filter is used to smoothen the noise in the image(Figure 5). A median filter is used to modify the pixels of the image so that the new pixel value will be selected as the median of the neighboring values within the range. This filter will be used to remove the random noise in images but it wil still maintain the overall integrity of the image regions and boundaries. This type of filter will be categorizes as a blurring filter in many image processing toolkits.

Fig-5

4.3 Thresholding

The conversion of gray scale image into a black and white image is the next processing technique which is called as thresholding. In this process a threshold value is selected from the gray scale image. It is takes as cut off to

determine the pixels must be converted into white or black rom the image. The result is shown in figure 6. This image will show a clear flow of lines from the lower point of the right corner to the upper left vanishing point.

Fig-6

4.4 Line Detection

Hough Transform(HT) is performed on the threshold image. Using the HT algorithm mapping of all points in the image space into sinusoids within an alternate polar coordinate parameter space is done. The polar coordinates defined within this parameter space define the angle and magnitude or length of vector normal for probable lines in the image space. Mapping in the HT parameter space to lines can be done using these parameters. Every point corresponds to a numerical value that wil relate to the likelihood of the line which is given by the polar coordinates that exist in the real image. The most prominent lines are are defined by the local maxima within the image. In the resulting parameter space image the bright spots indicate the local maxima and the most well defined lines are being reflected in the image. On analyzing further, it is revealed that the the single parameter space lines are being represented from the local maxima of the parallel lines. The appearance of the ridge in the parameter space image is being explained.

5.BREAKING CONCEPT

PIC (Peripheral Interface Controller) – The microcontroller used is PIC 16F84 which is 8-bit microcontroller. This PIC microcontroller is made by microchip technology. PIC controllers are low cost at the same time consume only less power so it used in the project. The numbers of instructions to perform a variety of operations vary from 35 instructions in low-end PICs to about 70 instructions in high-end PICs. This controller is programmed using embedded c language . The signal from the ADC(analog to digital converter) is processed by the PIC controller, and it gives an instruction as an output, based on the condition of the signal, with respect to the obstacle detected in front of the vehicle to the servo motor. The signal received from the ADC is also displayed on the LCD display (which gives an visual warning on the dash board for the driver) for a initial first stage warning. The distance at which automatic braking should be applied is already programmed in the microcontroller. When the measured distance reaches this value, the PIC controller sends the signal automatically to the servo motor which in turn applies brakes through the two axis robot mechanical arrangements.

5.1 SERVO MOTOR

The output from the PIC controllers is the input of the servomotor. This servo motor allows precise control of velocity, angular position and acceleration. The camera in front captures image and the processor processes it to find the location and distance of the objects form the vehicle. Thus, it is a closed loop mechanism that uses position feedback to control its motion and applies braking accordingly. The input to it is a signal, either analog or digital, representing the position for the output shaft commanding it. The measured position of the output shaft is compared to the reference value which is initially loaded in the controller. If the output position differs from that reference, an

error signal will be generated which then causes the motor to rotate in either direction as required, so as to bring the shaft at the output to appropriate position. As the required position approaches, the error signal changes to zero and the motor stops. The shaft at the ouput end of servo motor is capable of travelling somewhere around 180 degrees. A general servo motor can rotate form 0 to 180 degree and it is not capable of turning more than that due to the mechanical stop built on the output main gear.The angle through which the shaft of the servo motor need to rotate is determined according to the signal given by the PIC microcontroller.

The breaking is done by the servo motor through the mechanical arrangement. This system is done by using a pair of helical gears and a grooved cylindrical component. The large gear is placed on the output shaft of the servo motor and smaller is mounted on the master cylinder piston rod. Thus, when the output shaft of the servomotor and hence the larger gear rotates in say anticlockwise direction, the smaller gear and hence the master cylinder piston rod rotates in clockwise direction. Due to the groove on the cylindrical component translator motion is also produced. This is due to a pin, one end of which is inserted in the groove and the other end is fixed rigidly to a support. Thus, a combination of rotary and translator motion is produced.

Hence, the fluid pressure is applied due to stretching out of the master cylinder piston (in the same manner as that of the brake pedal) thus resulting in braking of the car. The piston moves to the original position when the motor output shaft rotates in clockwise direction. Thus the speed reduces when the rotation is in clockwise direction (i,e anticlockwise of the larger gear). Thus breaking is applied or done by the servo motor based on the signals given by the PIC controller. This constitutes the braking circuit.

6.CONCLUSION

Thus accidents due to night driving and improper road conditions as well as drowsy night drive can be controlled to certain extend. No technology can produce 100% accuracy thereby this technology saves humans life to a certain controllability level. This system is designed for a accident prevention considering the portability and the durability of the conditions of the environment. However the general operation may depend on the presence of two moving cars thus thereby it can also prevent accidents in a large scale. The construction was done in such a way that it makes maintenance and repairs an easy task and affordable for the user should there be any system breakdown. All components were soldered on one Vero-board which makes troubleshooting easier. In general, the system was designed, and the real time implementation done with a photo-type of the model.

7.REFERENCES

[1]. Real-time Image Processing Algorithm for the Detection of Road and Environmental condition.- James G. Haran,John Dillenburg2 and Peter Nelson.

[2]. Image Processing Road Detection.-
PranjaliUlhe, PrajaktaBhure, AnkitaBakade, AshwiniBute, NajukaKoram.

[3]. IR based vehicle with automated braking and driver awakening system.-Dr. Tajendermalik, MUkilsharma, Neerajkatri, PardeepBudhwar.

[4]. Wang Feng et al., "Real-time Road Mapping System"International Conference on Dept. of Remote Sensing Instituteof Surveying and Mapping Zhengzhou, China,
IEEE 2009.

[5]. Cantoni, V., Lombardi, L., Porta, M., Sicard, N., (2001). "Vanishing Point Detection:
Representation Analysis and New Approaches." *Proc., 11th Conf. on Image Analysis and Processing*.

[6]. Koutaki, G., Uchimura, K., (2005). "Automatic Road Detection Based on Cross Detection in

Suburbs." *J. of Imaging Science and Technology*, vol.49. no.2, pp.163-169.

[7]. The Volvo Owners Club: New Collision Warning with Auto Brake helps prevent rear-end collisions. http://www.volvoclub.org.uk/press/releases/2007/collision_warning.shtm.

[8]. Zhang Xin ; Lou Yuanyuan ; Yang Xiufang , "Intelligent Computation Technology and Automation (ICICTA), 2008 International Conference IEEE", Study of Control Logic for Automobile Anti-lock Braking System ,Volume :1, page(s): 493 - 497 , 20-22 Oct. 2008.

[9]. Mitsubishi Motors Co., Kanagawa, Vehicle Navigation and Information Systems Conference, 1993., Proceedings of the IEEE-IEE,Development of vehicle-following distance warning system for trucks and buses ,page(s): 513 - 516, 12-15 Oct 1993.

[10]. "Objective Tests for Automatic Crash Imminent Braking (CIB) Systems - Final Report," DOT HS 811 521, September 2011.

[11]. "Crash Imminent Brake System Performance Evaluation, June 2012 Working Draft," Docket NHTSA- 2012-0057-0001.