Abstract

Embedded system is a special purpose computer system designed to perform a dedicated function. Unlike a general purpose computer, such as a personal computer, an embedded system performs one or a few pre-defined tasks usually with very specific requirements. Since system is dedicated to specific tasks, design engineers can optimize it, reducing size and cost of the product. Embedded system comprises both hardware and software. Embedded system is a fast growing technology in various fields like industrial automation, home appliances, automobiles, aeronautics etc. Intelligence in predicting any near future disaster is a ramping up technological trends in preventing many accidents and lives. This system detects any minor speed drops of the preceding vehicle help of Ultrasonic reflection and alerts the Current Vehicle Operator as well as the succeeding Vehicle with the help of a ramping up Light. Advanced driver assistance increasing road safety by reducing the number of accidents as well as reducing the impact in case of non-avoidable accidents. Increasing traffic efficiency with traffic congestion control resulting in reduced transport time, fuel consumption and thus contributing to improving the environment. User communications and information services offering comfort and business applications to driver and passengers.

I. Introduction

The rapid growth of economic structure and people’s living standard continues to improve. As well as road traffic and vehicle accidents take place often this causes huge losses of life and property to the country and people. Traffic has become an important event in the national awareness. Poor emergency incident is a major cause for the high number of traffic sufferers and the death rate in our country. A number of technological and sociological improvements contain help decrease traffic sufferers during the past decade, e.g., each 1% increase in seat belt usage is estimated to keep 136 lives.
Advanced life economy events, such as electronic stability control, also show significant method for reducing injury, e.g., crash analysis study have exposed that regarding 34% of fatal traffic accidents could have been prevented with the use of electronic stability control. It is always being said “Prevention is better than Cure” and this Model perceptively suggests and determines the way of implementing a collision prevention method for road transportation. This module uses conventional Ultrasonic sensing devices to sense and detect the drop in speed of preceding vehicle speeds which is easier and faster in processing compared with the high prized image processing and large quantization algorithms, but with a simple and efficient Sense and Signaling algorithm which would simulate the braking speed ability of the driver and alert when the vehicle speed is violated beyond the braking speed by alarming the Primary Driver and alarms the Vehicle which follows it. This is one of simplest methods in implementing vital and low-cost Vehicle safety devices.

II. Vision-Based Collision Detection and Alarming

Exiting Vision based collision detection and alarming systems uses active or passive motion detection sensors with inbuilt distance to speed since algorithms a like motion vector algorithms, etc., to detect heading speed of the preceding Vehicle. It is precise in detecting the object by being centric on the target vehicle image; however when it comes to acquisition, quantization and distance to speed data manipulation, the image acquisition being the challenging part, a lot of time-lapse to deliver exact data and signaling the driver is inevitable and a bit deficient.

III. Ultrasonic Based Vehicle Distance Measurement

The technique of distance dimension by ultrasonic in air include constant signal and pulse echo system. In the pulse echo method, a burst of pulse is send through the transmission medium and is reflected by an object kept at specified distance. The time taken forth pulse to propagate from source to receiver is relative to the distance of object. For contact less measurement of distance, the device has to rely on the aim to show the pulse back to itself. The target needs to have a proper orientation that is it needs to be perpendicular to the direction of propagation of the pulses. The amplitude of the received signal gets much attenuated and is a function of nature of the medium and the distance between the transmitter and target. The pulse echo or time-of-flight method of range measurement is subject to high Levels of signal attenuation when used in an air medium, thus limiting its distance range.

IV. Functional Scheme

The Functionality of the system can be determined in three main steps.
1. Detecting distance of the preceding Vehicle.

2. Validating the Speed-Distance characteristics with the braking ability of the vehicle.

3. When the Braking capability criteria violates, the system sends an object. For contact less measurement of distance, the device has to rely on the target to show the pulse back to itself. The target needs to have a ramping up audio and visual Alarm to the Current Vehicle Driver as well sends an external alarm to the dedicated lamp at the vehicle rear side.

V. Working Principle

In a brief text, the key functionality of the module is to continuously detect the object or vehicle which we head towards, measure the distance of the object from the Prime vehicle, check with the braking pros algorithm if the distance is safe for braking at any of the moment the preceding drops its speed, alarm the succeeding vehicle about this event.

![Sensor placement scheme in a Model Vehicle.](image)

The Functional scheme (Fig-2) does as well depicts the algorithm for the software flow. The Microcontroller enables a set of Ultrasonic sensors to transmit and waits for the reflected sign, on receipt; it calculates the difference between transmitted to receipt duration which is preserved in the controller memory. The Software now checks the speed of the vehicle to check with the distance of the preceding vehicle to the braking ability of the vehicle of that speed. If the distance of preceding Vehicle satisfies this above set of criteria the Software ignores other steps of functions and jumps back to enable and read the Ultrasonic sensor module. When Violated, the Function enables to ramp up the intensity of internal buzzer, internal Visual light and External Visual light in exponential relation with the distance of the Preceding vehicle. As the vehicle is more near the intensity of the alarming signal and volumes are high so that to impulse, the vehicle operator to apply brakes. The internal Alarming signals alerts the Vehicle operator whereas the external light alerts the succeeding vehicle to say that the brake might be applied sooner and tends him to be ready for it.
Fig-2: Functional block of Auto Collision Prediction system.

Fig-3: Functional Flow of Auto Collision Prediction system.
VI. Speed-Distance to Braking Capability Measurement

This diagram below suggests 60 metres of braking distance will be required by a car at 100 km/h. resulting in a total stop distance of 88 metres. There are a lot of these diagrams issued around the world and most tend to have an entire stop space at 100 km/h inside the variety of 80 metres to 94 metres.

Fig-4: Functional Flow of Auto Collision Prediction system.

Stopping distance of a vehicle is given by

\[ d = \frac{v^2}{2\mu g} \]

Where,

D is distance in meters

v is the velocity,

\( \mu \) is friction coefficient,

\( g \) is acceleration due to gravity

Fig-5: Speed vs. braking distance

VII. Conclusion

This paper deliberates on the sudden drop in speeds of preceding vehicles and very vital sign to alert the vehicle operator and to assert him to start applying brakes in lieu to avoid any collision between vehicles. It is also learnt from this
research that the signal acquisition and processing activity using and Ultrasonic and simple controllers being a lot faster than a “camera base representation giving out” scheme, this is also a cost effective and simple, and it is certainly an implantable solution. The data were queried from the ICCFOT databases, based on the driving record of 15 human drivers. Based on the observed driving behavior, two data sets were identified: representing safe and threatening driving situations. Since the data sets were unbalanced, the geometric mean of true-positive rate and precision was used as the main performance index in this study. The evaluation results show that the JHU-APL logic achieved the best performance but its performance is still less than satisfactory, especially because of its low true-positive rate.

References