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Automatic Safety System for Automobiles

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Abstract - *In this paper, the need for safety of vehicles by reducing the impact of crash by applying a smooth or partial braking with the help micro controller. The driver overtake risk of measuring a certain object from a particular distance and fails to notice within the critical limit is also designed in this work. The acceleration will be directly slowed without disturbing the safe throttle (actual throttle mechanism), the designed machine itself overtakes the control of acceleration pedal if the brake is not applied to a certain limit. The method is designed in such a way to be applied to both low cost and existing vehicles as the Indian roads are specially build.*

KeyWords:

Adaptive Cruise Control (ACC), Lane Keeping Technology, Auto-Parking System, Tire Pressure Monitoring System (TPMS), Prevent Pre-crashing System, Collision Warning Systems (CWS), Drive-by-Wires, Automatic Braking Systems (ABS), Advance Driver Assistance Systems, Intelligent Transport System (ITS).

I.INTRODUCTION

An automobile has been used to move human beings or objects since the automobile was invented and the automobile technology has been developed within the last few years. Recently, the automobile is thought as daily necessaries because we spend much time in an automobile and enjoyed the entertainment such as game, e-mail, DVD, mp3, and internet etc… in the car. In nowadays, the intelligent car with Adaptive Cruise Control (ACC), Lane Keeping Technology, Auto-Parking System, Tire Pressure Monitoring System (TPMS), and Prevent Pre-crashing System has been equipped because we need the convenient and intelligent car.

These new automobile technologies are made possible by the development of semiconductor technology, optical technology and software technology. Nearly 70% of the highway traffic accidents are caused by not keeping braking safety distance between moving cars. The driver makes a mistake by incorrect judgment for braking safety distance is the main reason to cause traffic accident.

To ensure safety during driving, every country is building a study on automobile collision and anti collision technology in recent years. The statistics show that the time of the dangerous situation, if can driver more half a second time reaction time, it can reduce 45% collision accidents, so the modern cars equip all kinds of measuring and alarm system in order to keep driving safety.

Main role in the past and the active systems along with some of the conventional system includes Drive-by-Wires, Automatic Braking Systems (ABS) where developed and this system is called Advance Driver Assistance Systems. Therefore, car makers in Europe and Japan are developing for safety such as both collision safety and preventive safety and new car technology for intelligent car such as Intelligent Transport System (ITS), rear view camera system, Road-to-vehicle and Inter-vehicle Communication Systems, Auto-Parking System, Hybrid Car, Electric Car and Hydrogen Fueled Car. In addition, some vehicle

networks will enter commercial use, such as the Flex Ray interface instead of CAN bus for onboard Local Area Network (LAN), which supports high-speed transfer, and MOST (Media Oriented Systems Transport) or IDB-1394, which can move multimedia data, that is audio and video signals, from multiple camera systems or multimedia devices, such as DVD, navigation system, mp 3, TV tuner, and CD changer etc. at once.

In the chapter 2, we discuss the various literature surveys of many authors for the past decade. In chapter 3, we discuss about the proposed system from the literature survey and chapter 4, describes the conclusion and result of the proposed system.

II. LITERATURE SURVEY

"Fabrication of Auto-Braking System for Pre-Crash Safety Using Sensor" International Journal of Control and Automation Vol. 2, No. 1, March, 2009 by Eung Soo Kim. The Auto-Braking System was designed by VHDL and fabricated to keep a distance between two cars. It provides Pre-Crash Safety System for Intelligent Car. This module can detect the distance between front vehicle and driver's vehicle to keep a constant distance using a sensor and operate the brake system forcibly if the driver does not decrease the speed of car. The system displays the distance between the two vehicles and the speed of your vehicle. The performance of the system was good.

"A Deceleration control method of automobile for collision avoidance based on driver perceptual risk" IEEE international Conference on Intelligent Robots and Systems, Oct 4881-4886 by Takahiro Wada. To reduce rear-end crash of automobiles, it is important to judge necessity of deceleration assistance as earlier as possible and initiate the assistance naturally. On the other hand, we have derived a mathematical model of driver's perceptual risk of proximity in car following situation and successfully derived driver deceleration model to describe deceleration patterns and brake initiation timing of expert driver. In this research, an automatic braking system for collision avoidance will be proposed based on the formulated brake profile model and brake initiation model of expert driver to realize smooth, secure brake assistance naturally. It will be shown that the proposed control method can generate smooth profile for various conditions. In addition, experimental results using a driving simulator will show validity of the proposed system based on subjective evaluation.

"A Theory of Visual Control of Braking Based on Information About Time to Collision", Perception, Vol 5, pp 437-459, by Lee. Collision Warning Systems (CWS) are safety systems designed to warn the driver about an imminent collision. A CWS monitors the dynamic state of the traffic in real time by processing information from various proprioceptive and exteroceptive sensors. It assesses the potential threat level and decides whether a warning should be issued to the driver through auditory and/or visual signals. Several measures have already been defined for threat assessment and various CWS have been proposed in literature. In this paper, we will focus on two time-based measures that assess both front and rear collision threats. In particular, a new threat metric, the time-to-last-second-acceleration (T_{lsa}), for lead vehicles in rear-end collision is proposed and compared with its counterpart, the time-to-last-second-braking (T_{lsb}). The T_{lsa} is a novel time-based approach that focuses on the lead vehicle (as opposed to the following vehicle). It inherits the properties of the T_{lsb} and, as such, is coherent with the human judgment of urgency and severity of threats. It directly quantifies the threat level of the current dynamic situation before a required evasive action (i.e. maximum acceleration) needs to be applied. Furthermore, different warning thresholds are proposed by considering the average driver reaction time. Its effect on decreasing the severity of a rear-end collision is studied and its reliability is tested using a well-established physics-based robotics simulator, namely Webots.

From all these literature surveyed papers it is evident that only works related to warning system

and collision avoidance is given no information on whether braking could be applied in a perfect distance at a faster rate was given. The disadvantage found was the throttle pressure and wheel acceleration was not designed in such a way affecting the travelers or the drivers.

III. PROPOSED SYSTEM

In this section we present the work done on the basis of reducing the braking speed of the vehicle. Calculation strategies and method introduced using the controller is shown in Figure (i).

The deceleration is said to be negative acceleration. You are driving your car and the traffic light ahead turns red. You apply the brakes for 3.59 s, and the velocity of the car decreases to +4.99 m/s. If the car's deceleration has a magnitude of 2.53 m/s2. Average passenger car deceleration rate from coasting on level terrain with Auto Tran., from 60-70 mph speed range.

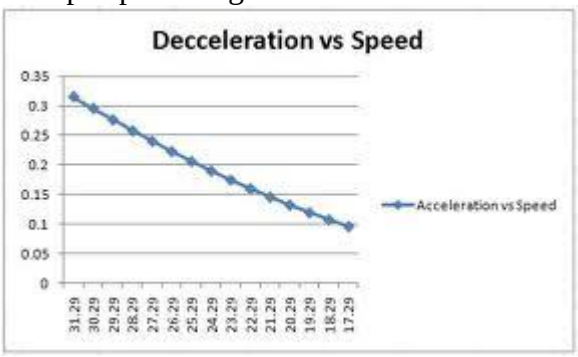

Figure (i). Deceleration Vs Speed Curve

The microcontroller used is the PIC 16F877, which provides a safe and reliable method for controlling. The system needs to be attached to the existing method in which cars are designed so flexibility is a major need. The method is shown in Figure (ii).

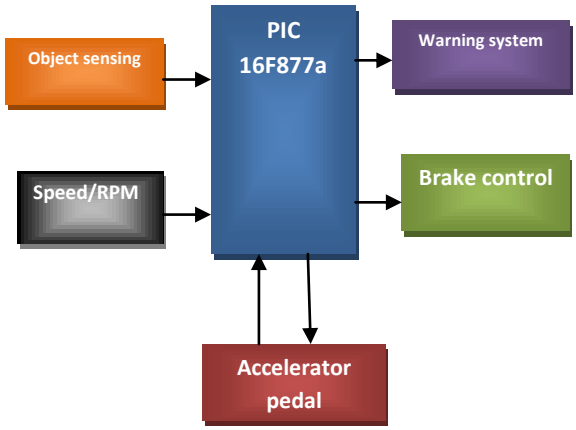

Figure (ii). Proposed System

In the Figure (ii), the object sensed using any of the object sensor is given as input along with speed obtained from the RPM counter which will be sent to the controller based on the commands provided it will calculate the speed that's need to be controlled based on the PID algorithm.

The speed control will be only applied if the distance is below 45% to collide or else the driver will only have control after he applies the brake. The system will take over if it is too close this will make the brakes and accelerator pedals to be cut from the drivers control and the system will apply the brake and here the algorithm provides a smooth operation of the vehicle and sudden jerks will not be realized.

IV. CONCLUSION & RESULTS

It was found that the method could be simulated and the results were verified through MATLAB 2009 and the graphs are plotted. Safety and automation is the main trend of future vehicle development. In the future authors believe that safety and warning measurement will be the basic all existing vehicles. The warning and smooth braking system will not only prevent accidents but ensures comfortable travelling at the highways also. When the driver cannot operate the car effectively or vehicle unrestrained or driver doze off, it can help the vehicle slowing down or braking.

VI. FUTURE WORK

Further investigation for personal adaptation of braking and control completely by the vehicle even in cities also applying these added values to the already existing vehicles that will not need remodeling is the main objective of this research work.

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