Hybrid Collision Avoidance Using Image Processing

Manthan Bari
M.E Student (VLSI & Embedded System), D.Y. Patil College of Engeneering,Akurdi,Pune,India

Aparna Shinde
Assistant Professor, D.Y. Patil College of Engeneering,Akurdi,Pune,India

Usha Jadhav
Assistant Professor, D.Y. Patil College of Engeneering,Akurdi,Pune,India

Abstract-
Road Accidents Are Uncertain But Whenever The Occur Causes Damage, Serious Injuries And Sometimes Even Death. The Main Reason For These Accidents Are Due To Driver Not Applying The Brakes On Time.
Two Different Techniques To Ensure The Safety Of Vehicles And Pedestrians Are:
First Is "Front End Collision" That Happens Due To Lack Of Knowledge Of Distance Between Two Vehicles. A Collision Avoidance System (CAS),Also Known As A Pre-Cash System, Froward Collision Warning System, Or Collision Mitigation System, Is An Advanced Driver-Assistance System Designed To Prevent Or Reduce The Severity Of A Collision. In Its Basic Form, A Forward Collision Warning System Monitors A Vehicle.
Second Is "Recognition Of Traffic Lights Using Image Processing" In Which We Introduce A Real-Time Traffic Light Recognition System For Intelligent Vehicles. The Method Proposed Is Fully Based On Image Processing. Detection Step Is Achieved In Gray-Scale With Spot Light Detection, And Recognition Is Done Using Our Generic "Adaptive Templates".
Index Terms- *CAS, TLR, Image Processing, Ultrasonic Sensor*

I. INTRODUCTION

Invention of Automotive cars was one of the greatest commercial achievements of human being in the history. However, we cannot neglect the fact that thousands of people lose their life or life changing accidents due to vehicular collisions every year. Nearly 70% of highway traffic accidents are caused by not keeping braking safety distance between moving cars. Although there have been a number of technological researches in vehicle safety, there is increase in accidents. This is especially true for intersection collision. Most of the accidents takes place in crowded cities where the number of vehicles on road are greater in number. In the present situation, traffic collisions lead to injury and casualties involving people. About half of all accidents the people which suffer the most are aged between 15-45 years. Road accidents are now worldly recognized as a serious public health problem. The problem is much more serious in our country where road accidents caused deaths and left more than thrice that number injured

Collision Avoidance Detection System(CAS)

Studies have shown that if the driver is alerted half a second before a potential accident, this warning can reduce rear end accidents by 30. To ensure the driving safety, every country had been studied on automobile anti-collision technology in recent years. For this purpose Collision Avoidance System(CAS) have been used in wide range of different robotics areas. Collision avoidance systems are mostly applied in transportation systems such as aircraft traffic control, autonomous cars and underwater vehicles. Collision avoidance is a critical requirement in building automotive robot systems where they all featured some kind of obstacle detection techniques in order to prevent two or more objects to collide. The main purpose of obstacle avoidance is to obtain a collision-free trajectory from the initial point to the final point in monitoring environments. Obstacles can be divided into two parts, static where the obstacle is predefined and has a fixed position and dynamic obstacle where the position is uncertain i.e moving objects. A collision avoidance system, also known as a pre-cash system, may also be named forward collision system. This is an automobile safety system designed to prevent or reduce the severity of collision.

Traffic Light Recognition using image processing(TLR)

Since traffic scenes are complex and include lots of information, Keeping constant awareness of traffic signals becomes quite a difficult task for drivers. So some traffic data (signs) can be missed for drivers to keep an eye on, to make it possible we can introduce traffic alerting system in automotive systems. In order to assist this task, several driver assistant systems have been suggested in the past years using either database information or non-vehicle sensors such as lasers, camera, sensors etc. to provide different environmental information like traffic signs, speed limits, traffic lights, crosswalks and any other information like pedestrian or obstacles. The specific functionality of traffic lights detection shall be very useful since traffic lights position and state(red or green) provide good knowledge of the traffic environment. This shall be achieved through image processing by gathering information through camera's.

II. BLOCK DIAGRAM

The collision avoidance system designed in this report consists of hardware and software parts. The hardware consists of construction of the circuit. The software part deals with programming part of the paper. The block diagram in figure no.1 shows the different units.
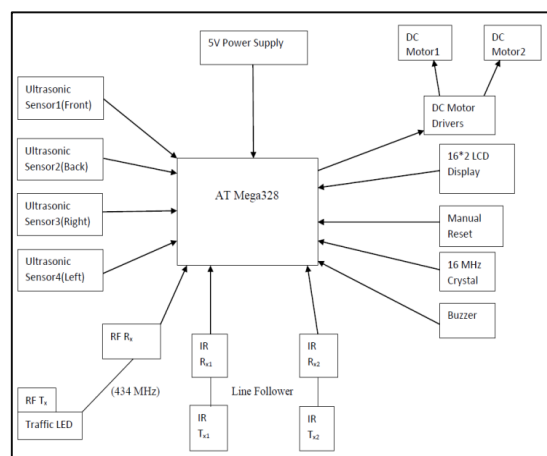

Figure 1 : Block Diagram of Wireless Collision Avoidance of Cars

AVR Controller – ATMega328p: This is the main control module of the collision avoidance system. It runs on Windows and its main supported operating system, the ATmega328, is a powerful yet low-power 8-bit AVR microcontroller capable of executing a maximum independent clock cycle of 131 effective instructions due to its superior RISC architecture.

Ultrasonic Sensor- This HC-SR04 ultrasonic sensor is perfect sensor for distance measurement and object detection. It offers great accuracy range and provide stable readings. This sensor operates at 5V dc and has 4 pins. The pins are VCC, Trig, Echo and Ground. It is used to detect the distance between the remote-control can and the obstacle.

LED- In the simplest terms, light emitting diode (LED) is a semiconductor device that provides light as the electrical current passes through it. Light generated when the particles carrying the current are known as photons and the gaps are integrated into the silicon. As light is emitted within a solid semiconductor material, LEDs distinguishes this lighting device from other systems using either heated filaments (incandescent and tungsten halogen lamps) or gas discharge(Fluorescent lamps).

DC Motor- A DC has an operating voltage of 4.5V to 9V, but a recommended voltage of 6V. Its power is 5W. The motor rotating speed is about 12000rpm. The motor is able to rotate at clockwise and anti-clockwise.

III. LITERATURE SURVEY

Dr. Madhu al presented [1] Raspberry-Pi-based predictive car collision avoidance system It appeared that an ultrasonic sensor was being used with a raspberry-bi module to prevent mishaps in the blind spot area. The ultrasonic sensor functions similarly to a radar system to find potential hazards in a driver's blind spot, but it is less expensive. Additionally, the driver is alerted before an accident using two different methods: visualisation using light emitting diode (LED) and make a sound using buzzer, and the driver is alone applying the brake or

steering to control on the speed. The ultrasonic sensor is used to measure the distance between the vehicle and the obstacles and saved the distance safely before fatalities happened.

Maziar Nekovee al [2] have discussed about rear-view collisions occurring constantly many times on the road. Investigation about how conveyances local configurations in a unit of vehicles affect the global property of the traffic systems in terms of rear-view accident control and gives details about how V2V (vehicle-to-vehicle) wireless transmission are utilized to prevent rear-view accidents

Vivek Sighal al [3] gives an overview of many techniques available in collision avoidance. There are many case studies and techniques discussed in the article where one of the prominent technique discussed is sensor based accident control methods utilizing geospatial information.

Nekovee al [4] have derived analytical bounds for the maximum acceptable information transfer delay and the reduced retransmission frequency of 802.11 based conveyance V2V transmission protocols for rear-view accident controlling applications. With the use of microscope car following models of high-way traffic along with probable two ray base expansion models of the vehicle to vehicle wi-fi mode, investigation is done on the differences for those bounds with average vehicular velocity, road-way grip co-efficient, vehicle to vehicle packet drop count and wi-fi medium fluctuations. The investigation gives quantifiable instructions and analytic input to develop adaptive vehicle to vehicle protocols, with the capability of having high reliability and effectiveness in situations of high variations in vehicle traffic and vehicle to vehicle network situations..

IV. METHODOLOGY

The key factor for successful implementation of a system is visualizing and building components that would fulfil requirements of the system. On the paper, the demonstration of the system working is achieved using process flows. The process flows indicate individual activities performed by each of the components of the system. The process flows, individually or in a group, provides view of successful implementation of a requirement by the system.

System architecture describes the solution with absolute planning for a problem. After proposing a system with specifications, designers will employ for designing a solution which includes both hardware and software tools for implementation. System architecture will describe the algorithm and flowchart implementation of system as follows. On the research work, the demonstration of the system working is achieved using process flows and circuit diagram as shown in Fig.2. The process flows indicate individual activities performed by each of the components of the system.
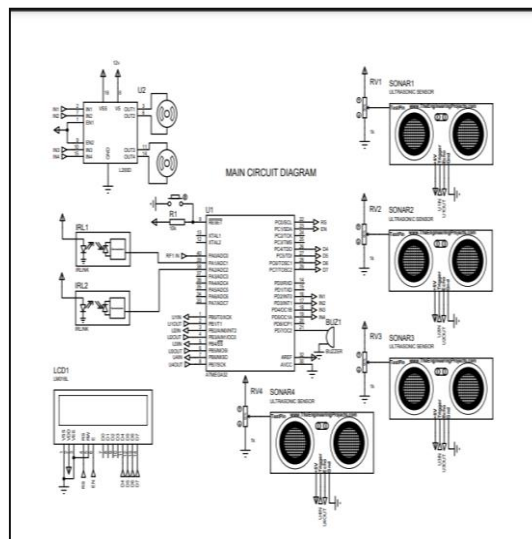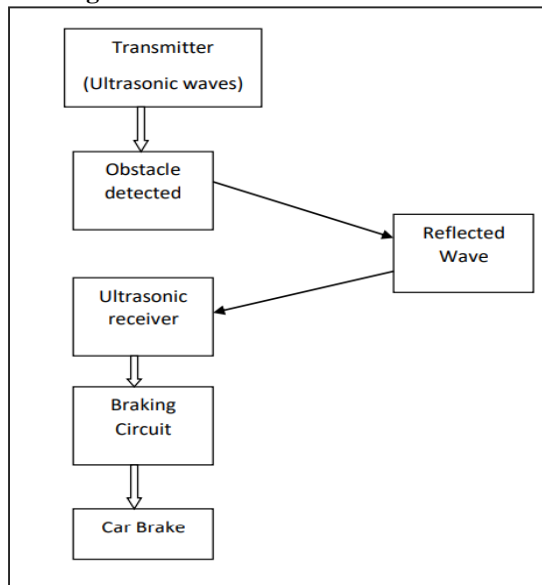

Fig.2. Circuit diagram of Collision avoidance system using image processing

V. Process Flow:
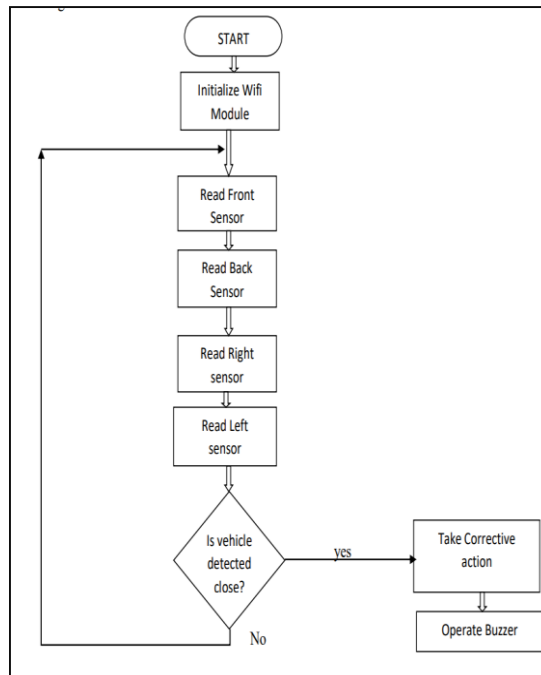
Fig.3 – Process flow for Hybrid Collision Avoidance system using image processing

Flow Diagram for ultrasonic sensing unit:

Fig.4 – Process flow for ultrasonic sensor unit

Algorithm:
Step 1: Initialize the given SystemStep 2: Get Data from the sensors
Step 3: If Sensed Data <15cm and >5cm go to Step4,else goto Step 5
Step 4: Buzzer will beat and give warning to the driver, then go to step 6
Step 5: Activate brakes after reducing the speed
Step 6: Again continue with second step
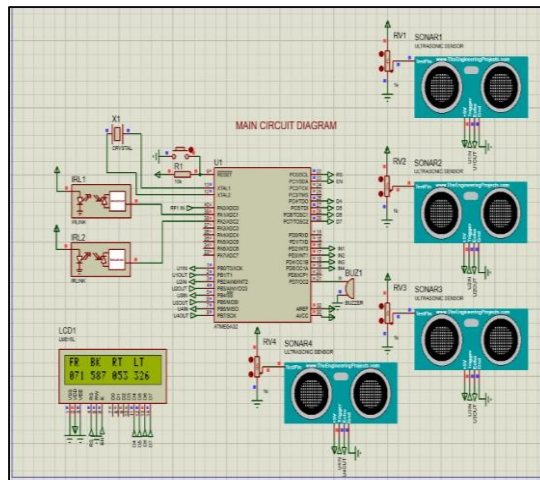
VI. Results

Fig.5 – Simulation Result

-In Collision Detection check, the proposed system showed its competence to sense collisions and , consequently, give a caution.

-The sensors can read distances that are at shorter range accurately. The system takes action automatically without any driver input. Hence this automatic braking system can stop the car to avoid an accident.

-The over speeding of vehicles can be checked by this system and speed is displayed on serial monitor and also beep sound is produced when speed of the vehicle goes beyond the threshold.

With the help of RF communication traffic signals can be detected and the traffic rules can be followed i.e to stop for red signal and keep moving for green signal.

VII. Conclusion:

This project develops Hybrid model of Collision Avoidance system using image processing. In addition, this project also focuses on use of ultrasonic sensor to detect the vehicles in the all the directions of the vehicle and indication is given by buzzer so that accident can be avoided at a turning point. In addition, the distance between the obstacle and the vehicle will be displayed on a screen. Based on the results, this project can be said to be successful and objective was achieved.

We also proposed an image processing method to recognize real time Traffic Light in urban and rural environment. The proposed method is capable of identifying traffic lights.

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