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Intelligent automobile accident avoidance mechanism with alarm system

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ABSTRACT

The proposed paper describes about the automation that is involved in the accident avoidance systems. Many of the surveys clearly says that most accidents occur mainly due to driver's drowsiness or consumption of alcohol. The main objective of the proposed system is to prevent accidents by sensing the nearby vehicles and monitoring the state of chauffeur. When the driver is found drowsy then a control signal is given to the Atmega16 microcontroller used. The controller is responsible for parking the vehicles safely on the sides of the roads by changing the lane using ultrasonic sensors and driver connections. In similar way, the automatic control will be brought in the system when the distance between the adjacent vehicles get reduced to threshold distance, say 1m, according to the programmed algorithm. An alarm system is also been proposed in the system to give intimation to the driver regarding the switch over from manual to auto mode.

KEY WORDS: lane changing, Atmega16 controller, Ultrasonic sensor, alarm, auto mode.

1. INTRODUCTION

Statistical Analysis: According to the recent surveys, Nearly 1.3 million people die in road crashes each year, on average 3,287 deaths a day. An additional 20-50 million are injured or disabled. More than half of all road traffic deaths occur among young adults ages 15-44. Road traffic crashes rank as the 9th leading cause of death and account for 2.2% of all deaths globally. Road crashes are the leading cause of death among young people ages 15-29, and the second leading cause of death worldwide among young people ages 5-14. Each year nearly 400,000 people under 25 die on the world's roads, on average over 1,000 a day.

The intelligent automobile accident avoidance system will help in overcoming such fatal accidents and deaths that occur due to recklessness of driver of driver such as alcohol consumption, sleep deprivation.

Existing System Overview: The already existing system will automatically act according to the image sensing module whether the driver is sleeping or out of control and will go in an automatic mode from manual mode and change the lane. The ultrasonic sensor at normal time will show the respective distances of vehicles adjacent to it. This will be helpful for the driver normally. In auto mode the sensors get the distance of the vehicles or obstacles and according to the algorithm the drives (brake, steering, etc) gets activated (Shivam, 2013)

SF- Front ultrasonic sensor
SD- Diagonal ultrasonic sensor
SL- Left ultrasonic senosr

Proposed System: In the existing system, no intimation is given to the driver regarding the changing of auto mode. So, an alarm system is interfaced to the controller in order to alert the driver about the switch over of mode. And also, when the host gets closer to nearby vehicles to some threshold distance of 1m, which can also be changed according to the convenience, then the control will be shifted to automatic mode with an alarm to avoid the risk of accidents.

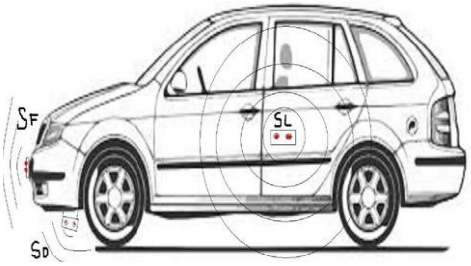

Figure.1.An existing automobile with accident avoidance system

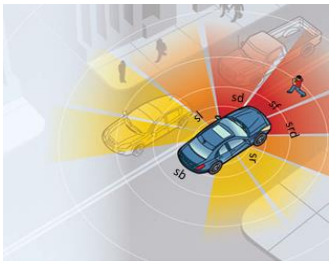

Figure.2. Proposed system with sensors in all sides

Sr- Right ultrasonic sensor
Srd- Right diagonal sensor
Sb -Back ultrasonic sensor

2. MATERIALS AND METHOIDS

The following block diagram depicts the operation of accident avoidance mechanism with alarm system. When the driver is found drowsy by the image sensing and processing module then it sends a control signal to the controller ATmega 16. This ATmega 16 controller is always in a loop to detect the control signal. If it detects a control signal then the vehicle goes in automatic mode. Its steering, acceleration, brake and clutch are now controlled

by the controller according to the program. The ultrasonic sensor detects the obstacles and help in parking the vehicles.

In other case, when the vehicles or obstacles gets closer to the host, then it is sensed by the sensors placed on front, back and both sides of the vehicle. The sensor will in turn sends a control signal to the microcontroller. The microcontroller also detects this signal, then takes necessary automatic action according to the programmed algorithm.

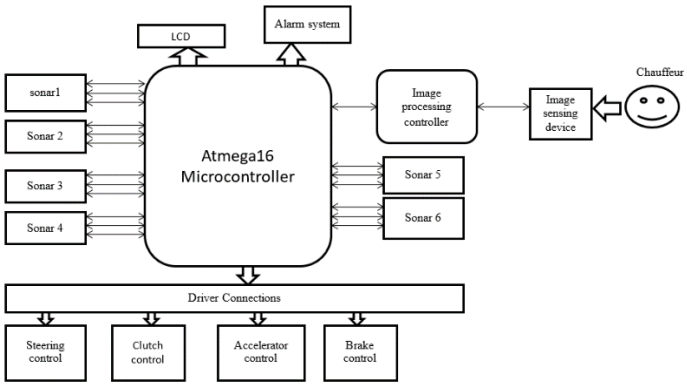

Figure.3. Block diagram depicts the operation of accident avoidance mechanism with alarm system

Sensing Unit: The function of the sensor used in the system with the microcontroller is given below,

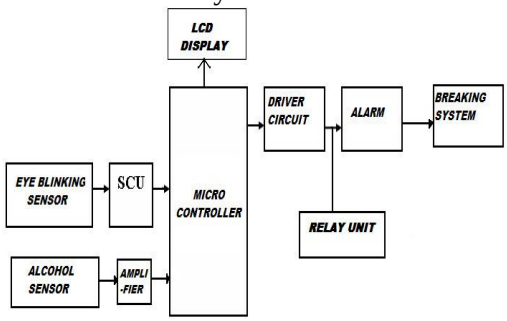

Figure.4. Interfacing eye blink and alcohol sensor with microcontroller

Eye Blink Sensor: The sensor comprises two sections namely a transmitter and a receiver section. If eyes are open, then the IR will be reflected and received by the sensor, and if eyes are closed, then the IR sensor stops receiving the signal and it sends a control signal to the controller. Similarly, if eyes open up again, the sensors receive the signal, and then the vehicle starts automatically displaying the message on the LCD (Bhumbar, 2012).

Alcohol Detector: The alcohol sensor will detect the alcohol content from human (driver) breath and send its value to microcontroller. Alcohol sensor (MQ3) is suitable for detecting alcohol concentration just like your common breathalyzer. It has a high sensitivity to small value of BAC (Blood Alcohol Content) and fast response time. The sensor provides an analog resistive output based on alcohol. The sensor has sno_2 as gas sensitive material to sense alcohol (Bhumbar, 2012).

Ultrasonic sensor: The ultrasonic module will be offered with an impulse through SIG, the trailing edge springs, and transmits a string of ultrasonic signal of 40 KHz when the module receives it. Then the electrical level of SIG stitch will be raised. The duration of high level T3 will be ensured by the distance between the object and the sensor. After 18.5ms, the high level descends, when no object is in a distance of 3M.

The relationship between the distances up to the object. L and the reflecting time T is expressed by the following formula:

L=C • T/2 ------- (1)

C is the velocity of sound; L is the measured distance; T is the time of transmitting and receiving sound waves. Similarly, when the distance reaches threshold distance, then a control signal will be sent to microcontroller.

LCD: This is most widely used display device for embedded systems. The LCD unit receives character codes (8 bits per character) from a microprocessor or microcomputer, latches the codes to its display data RAM ,transforms each character code into a 5 ´ 7 dot-matrix character pattern, and displays the characters on its LCD screen. The distance measured by the ultrasonic sensor is displayed in the screen.

Steering Drive: The following drive is recommended for rotation of the steering. The motor used can be a servo or stepper motor. This is connected to a high current driver which is controlled by the microcontroller ATmega 16. In similar way with the help of motors clutch, brake and accelerator can be controlled.

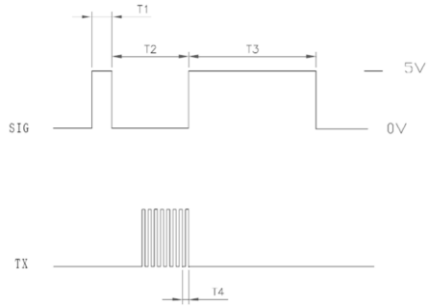

Figure.5.Pulse from ultrasonic sensor

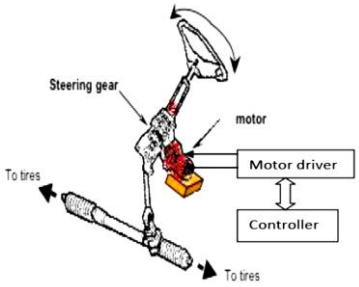

Fig.6. Steering control with controller

1. T1 (Trigger): 5µs; 2. T2 (Postpone): 200µs
3. T3 (Pulse width): 0-18.5ms; 4. T4 (Cycle): 25µs

Alarm System: Whenever the controller switches from manual to automatic mode, alarm system is operated and buzzer sound will be given to alert the driver.

3. RESULT

MATLAB software is used for image processing.
AVR studio programming is used for microcontroller.

Algorithm

- Image sensing device will check whether the driver is drowsy or not.
- If yes, it sends control signal to the controller; else repeat from step 1.
- ATmega16 controller is in a loop to check for the control signal from the image processing module.
- If the control input is high, then it follows the below 5 cases, else it proceeds from step 1.

Case1: Diagonal sensor detects the railing of the road, if yes then the vehicle will be stopped on that location itself, else continue with case2.

Case 2: Front and left sensor will detect the nearby vehicles. If such vehicles are found, then the vehicle will be stopped on that spot, else continue with case3.

Case 3: If the vehicle is found only on the left side, then the car keeps on moving until the vehicles in the left crosses the host, else continue with case4.

Case 4: If the vehicle is found only on the front side, then the car will turn left; then it proceeds from case1,else continue with case5.

Case 5: If no vehicle is in the left or in the front then turn left and again it proceeds from case1.

- End.
- Else, the ultrasonic sensor senses the distances of nearby vehicles.
- When the distance reaches to program minimum distance, then it sends control signal to microcontroller.
- The microcontroller is also in a loop to detect signals from sonar.
- Then, it takes automatic action.
- The microcontroller detects from which direction the signal has arrived and with the help of sensors in opposite side, it either changes the lane or slows down with an alarm.
- In emergency cases, where the controller is unable to take any of the above mentioned actions then the vehicle can be stopped automatically on that spot.

Hence, the system will help in preventing automobile accidents in most cases and in some cases reduces at least the severity of the accidents and acts as a defensive mechanism for both the automobile and the driver.

4. CONCLUSION

Preventing mishaps and protecting lives with economic modification for already manufactured or in manufacturing process of vehicle is the main aim of this project. Here, the vehicles moving in fast lane can easily move ahead without causing traffic problems and also preventing crashes. This system will certainly prevent the accidents happening at the midnights due to sleep deprivation or drowsiness and also due to consumption of alcohol which will obviously hamper vision due to dizziness.

Future Scope: Researches have revealed the fact that accident avoidance systems has much scope for growth in upcoming years. Familiar automobiles like Mercedes, Honda Accord, Outback Wagon, Volvo had already implemented successfully some features of proposed accident avoidance systems like back over prevention, forward collision, back sensors to aid in parking the vehicle etc. Features with GPS and GSM models are being tested. Thus, accident free environment will be brought well with the help of accident avoidance systems in the near future.

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