

# Accident Avoidance During Poor Visibility Conditions

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**Abstract** - T With the dramatic increase in population, the vehicles on the road have increased too. Hence, it has become a necessity to provide a means for a safer and more convenient travelling experience. The present paper focuses on providing a technology which will help people in navigating through roads where visibility conditions are poor and they are more prone to accidents like, in hilly areas where there are blind turns and in foggy weather conditions where visibility is nearly zero.

**Index Terms**— Vehicle to vehicle communication, Poor visibility conditions, Safer travelling experience, Blind Spot Detection .

## I. INTRODUCTION

Most of the road accidents occur when the visibility conditions are poor or the driver is unable to apply brakes on time. This may happen during winter and rainy seasons, when the visibility drops to zero due to fog and heavy rainfall, respectively. Other such situations providing inadequate visibility may be in hilly terrain, where even nearby vehicles may not be directly seen. In all such situations, an accident avoidance system can play a crucial role in preventing vehicle collisions and saving people's lives apart from avoiding damage to the vehicles. There are some systems available for avoidance of vehicle collisions, but they are limited in use as described in next section [1]. This paper explains in detail the implementation of an accident avoidance system designed using Arduino and ultrasonic sensors which can be installed in all the vehicles on the road. Its features, like image processing makes it possible to travel in extreme weather conditions, while the communication system helps interaction between drivers in conveying some crisis, like immediate health crisis or problem in braking. In the proposed system, an automatic brake system has also been incorporated to prevent collisions in such cases.

## II. EXISTING MODEL

There is an existing module, as per diagram in Fig. 1, which uses RF transceiver module and Raspberry Pi to alert user of upcoming obstacle. This model works on the principle of blind spot detection, and with the help of the transceiver module and GPS system, prevents accidents in certain situations. The main drawbacks of this model are-

its limited application as it is helpful in only detection of blind spots and its higher costs due to the use of Raspberry Pi. Hence, it can only be used in certain situations, like in hilly area where there are sharp turns and it is almost impossible to see the incoming vehicle [1].

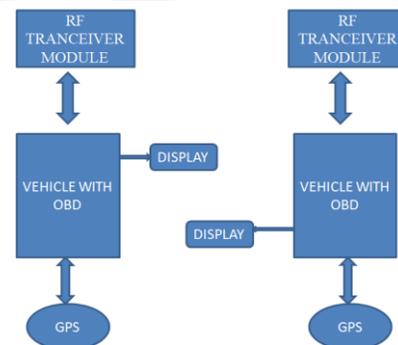


Fig.1 Existing Module

## III. METHODOLOGY

The proposed system is shown in figure 2. The top and bottom half of the diagram shows the two cars, which have the proposed module attached to them. The working of these blocks is explained as follows:

Let us assume the case of two cars which are close to each other. Each car is having the ultrasonic sensors attached to its front hood. The ultrasonic sensor emits the ultrasonic waves, which are reflected by an obstacle. This helps in determining the location and distance between the two cars or between a car and an obstacle, and will set

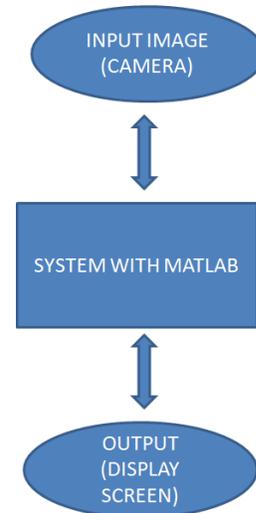
off a buzzer if reflector is within a pre-determined distance to alarm the driver of the upcoming obstacle.

There may be some situations in which the driver is not able to apply brakes on time and the distance between the two cars or the car and the obstacle reduces to less than 10 meters or any pre-determined distance. This would trigger the automatic braking feature using the DC motors installed in both the modules [2].

In another situation of low visibility due to fog, rain, sharp turn or hilly terrain, the above module makes the driving easier in places where visibility is less or there are hard turns by making use of the image processing (figure 3). A pre-saved image of the area is compared to the real-time image using MATLAB, and a clearer image is provided to the user making it easier to drive in such situations. Also, a push button is installed in each car to turn on and off the ultrasonic sensors to avoid unnecessary braking in places where the system is not really needed.

Another useful feature incorporated into the proposed model is a communication system. Suppose the driver experiences sudden health issues and is unable to drive or apply brakes. In this situation, a notification will be sent and displayed on LCD screen visible to outsiders informing the nearby drivers about the failing health conditions of the concerned driver [3].

The Fig. 3 depicts how the input image (the real-time image) will be compared with pre-saved image and help the user navigate in foggy weather.



**Fig.3 Image Processing**

**IV. HARDWARE DESCRIPTION**

All the hardware that are used in making of this model is as follows [3]:

**A. ARDUINO UNO R3**

It is a microcontroller board based on atmega328p. It has 14 digital I/O pins and 6 analog pins, a 16 MHz quartz crystal, USB connection, power jack and a reset button.

**B. LCD (16x2)**

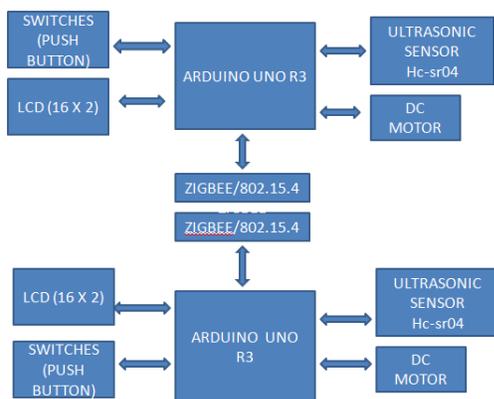
Liquid crystal display screen is an electronic module which is used to display data and has wide applications. It is named 16x2 because it has 16 columns and 2 rows. It has pins like VCC, GND, VEE, DB0-7, LED+, and LED-.

**C. SWITCHES**

These are used to provide data like emergency brake fail. Switches are used to open or close connection button. When they're not pressed, the system is disconnected from the circuit otherwise if the button is pressed then it's connected.

**D. ZIGBEE**

It is a wireless networking standard used to create a small connection or network. It aims at remote control and sensor applications. Zigbee technology is built on IEEE 802.15.4 technology.



**Fig.2 Proposed Model**

**E. ULTRASONIC SENSOR (HC-SR04)**

It is used for blind spot detection. The range of measuring is from 2 cm to 400 cm. It has 4 pins VCC, TRIG, ECHO, GND. It has a high accuracy rate and need to be installed on each module (in this case, car 1 and car 2).

**F. DC MOTOR**

It is used to bring variation in car speed if any obstacle appears. A DC motor works on the principle that when a current carrying conductor is placed in magnetic field, it undergoes torque and has a tendency to move.

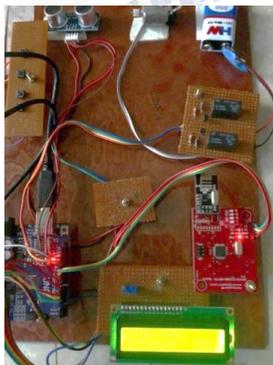
**V. RESULT AND ANALYSIS**

The prototype of complete assembled hardware is shown in Fig.4.



**Fig.4. Assembled Hardware**

Different case scenarios depicting the automatic braking system, navigation, and communication system are shown in Fig.5, Fig.6 and Fig.7.



**Fig.5 Automatic Braking System**



**Fig.6 Collision Detection**



**Fig.7 Health Alert System (Communication System)**

**CONCLUSION**

Cost is one of the key factors in designing any technology. Since the proposed model incorporates Arduino Uno R3 instead of Raspberry Pi, it cuts the cost of the model by a significant amount. Main aim is to equip all the vehicles and not just cars with this system so that accidents can be avoided and in some cases, better routes can be chosen while driving, in case there is a traffic jam ahead of them and hence lots of time can be saved. The proposed system is highly appropriate for driving in hilly areas where there are hard turns and in areas where the visibility drops to zero due to fog or heavy rains.

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