Computer Simulation to Detect the Blind Spots in Automobiles

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Abstract

During driving Changing lanes can be very hazardous on a busy highway. There is region called "blind spot" which is a problem for every car driver since it's not covered by the driver's mirrors. Relying solely on the mirrors while changing lane can lead to a collision with another vehicle. This paper focuses on this situation by ensuring that the blind spots of the vehicle are clear prior to the driver attempt to change lanes. This computer simulation incorporates the need for detection and warning of objects present within the blind spot on either side of the vehicle to the driver along with distance measurement of the object relative to the vehicle, incase the driver decides to change lanes. This simulation is constructed using the theory of embedded systems and will alert the driver if there is another car on the blind area.

Keywords: blind spot, computer simulation, embedded system, automobile.

1. Introduction

The blind spot is the place behind your vehicle that the driver cannot see in the rear or side view mirrors or even by turning your neck out the driver's side window. Generally speaking , All vehicles have a blind spots & the larger the vehicle, the larger the blind spot, [6]. Blind spots for shorter drivers tend to be significantly larger as well. In addition, the elevation of the driver's seat, the shape of a vehicle's windows and mirrors, and the slope of a driveway can affect the size of the blind spot behind a vehicle. Blind spots are areas in adjacent lanes of traffic that are blocked by various structures in the automobile. The physical constraints in eye movement and head and body rotation make certain areas invisible to the driver. The blind spots in cars depend on their construction, figure 1. The direct blind spots are:

- Area covered by the A-pillar, between the front door and windshield
- Area covered by the B-pillar, behind the front door
- Area covered by the C-pillar, ahead of the rear windshield

Apart from these, there are certain indirect blind spots like the region between the driver's peripheral vision on the sides and the area that is covered by the rear view mirror. The unseen areas are immense for drivers of medium and heavy trucks as compared to drivers of passenger vehicles. Areas directly to the right of the cab extending past the trailer, directly behind the trailer, to the immediate left of the cab and directly in front of the cab are blind spots for truck drivers.

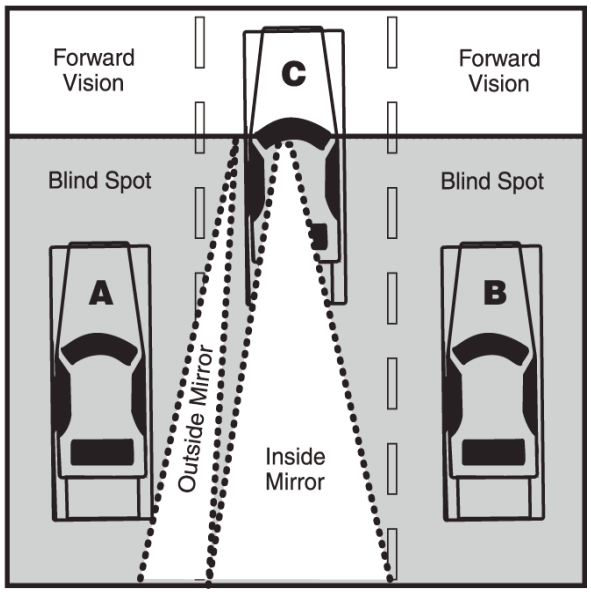

Fig. 1: blind spots[6]

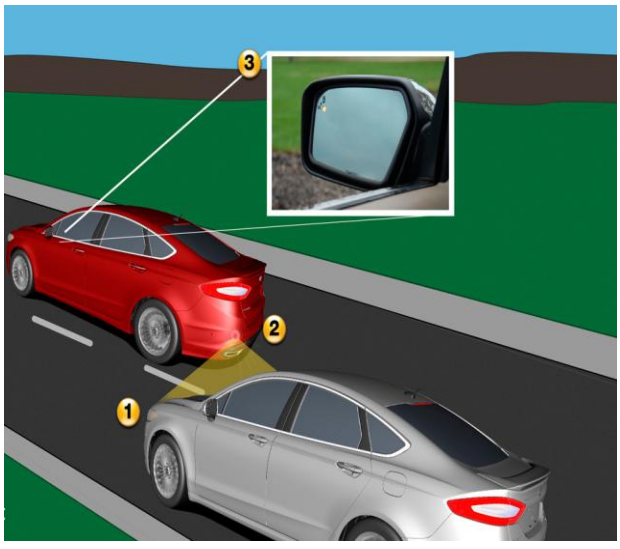

Fig.2: blind spot seen by two drivers

There are little literature discussed such issue, R. Andrew, et al. 2005, designed a passenger side mirror for an automobile that does not have a blind spot and that does not distort the image. The model consists of a coupled pair of partial differential equations that do not have a common solution. Using a best mean-square-error functional, they find approximate solutions using nonlinear optimization. In one case a local minimum provides a mirror that solves the problem, but it does not reverse the image, [10]. Christoph M., et al. 2000, discussed their findings of transit buses driving through very cluttered surroundings and being involved in many different types of accidents where currently available CWS do not work effectively. One of the focuses of their work is pedestrians around the bus and their detection,[11].

2- Results and discussion

The working principle of the our system simulation depends on :

Inputs ⟶ processing & ⟶ comparison Outputs

The PIC receives inputs from the turn signal & the ultrasonic sensor . then processes this input data & compares them with the data stored in its memory, depending on the comparison process , the PIC will activate or deactivate the warning systems . There are 3 cases explain the simulation working in details :

Case 1 : No received signal from the turn signal to the PIC

In this case the turn signal is " off " . therefore , the system can't work because no received signal to the PIC (the switch is open) . therefore , the PIC sends order to the LCD to display : " No signal ": this case is shown in figure 3.

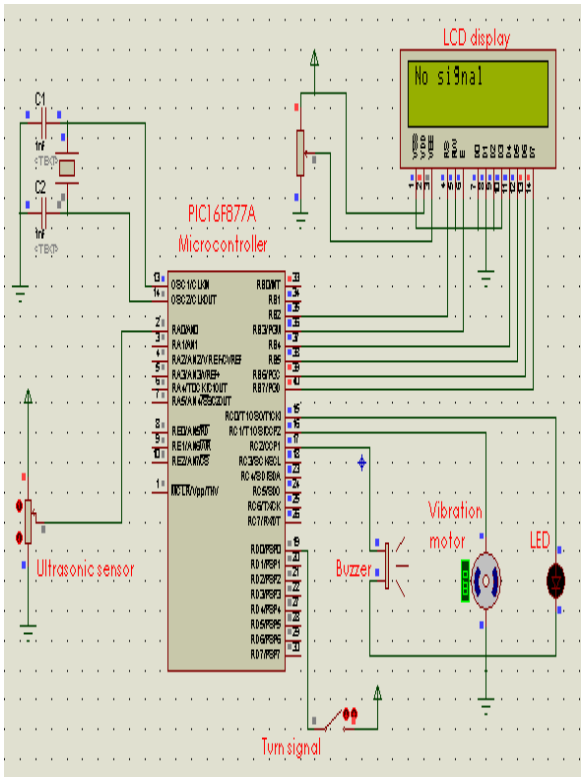

Fig.3: Case 1: No received signal from the turn signal to the PIC.

Case 2 : the turn signal is " on " & the measured distance is less than 300 cm

In this case the turn signal is " on " (by pressing on the switch to close) . therefore , the PIC receives input from the turn signal , then the system starts to run then the PIC receives input from the ultrasonic sensor which measures the distance of object in the blind spot . we will input the distance manually into the PIC by varying position of the wiper of the potentiometer to down . for example , the input distance is 154 cm . the PIC will compare this distance with 300 cm . the result of comparison shows that the measured distance is less than 300 cm . therefore , the PIC will display on the LCD that there is object in the blind spot & display its distance

(154 cm) , as well as , activate the warning systems which represented by buzzer , vibration motor & LED . in details , the buzzer will emit an intermittent sound , & the vibration motor will vibrate the steering wheel & the LED will emit a red light, this case is shown in figure 4.

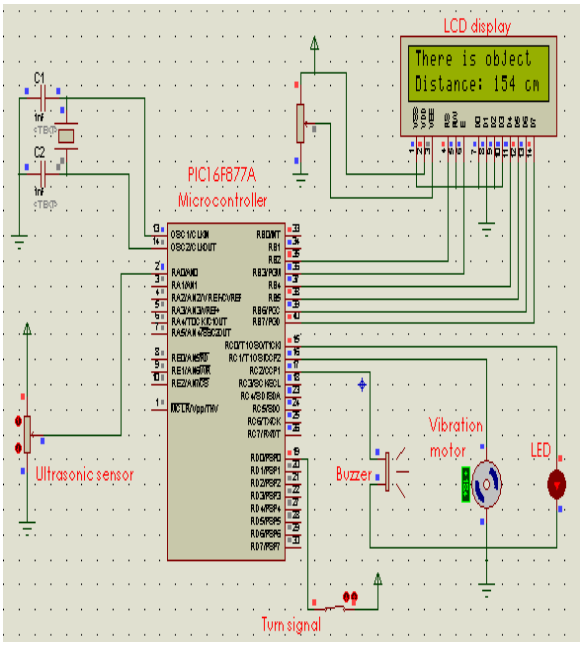

Fig.4 : Case 2 the turn signal is " on " & the measured distance is less than 300 cm.

Case 3 : the turn signal is " on " & the measured distance is more than 300 cm

In this case also the turn signal is " on " (by pressing on the switch to close) . therefore , the PIC receives input from the turn signal , then the system starts to run then the PIC receives input from the ultrasonic sensor which measures the distance of object in the blind spot . we will input the distance manually into the PIC by varying position of the wiper of the potentiometer to up . for example , the input distance is 350 cm . the PIC will compare this distance with 300 cm . the result of comparison shows that the measured distance is more than 300 cm . therefore , the PIC will display on the LCD that there is " No object " in the blind spot & display " The road is safe " , as well as , deactivate the warning systems which represented by buzzer , vibration motor & LED . in details , the buzzer will not emit an intermittent sound , & the vibration motor will not vibrate the steering wheel & the LED will not emit a red light, this case is shown in figure 5.

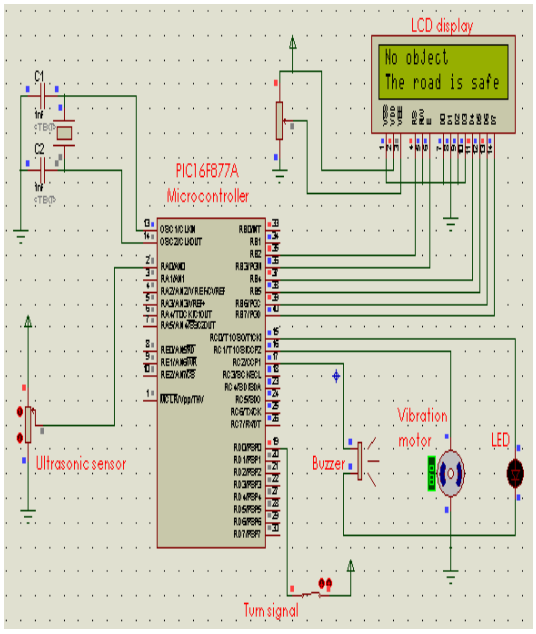

Fig.5: Case 3 the turn signal is " on " & the measured distance is more than 300 cm.

3. Conclusion

From results of the simulation the following conclusions can be estimated:

- The system detects presence of objects in the blind spot .
- The system measures the distance of objects by the sensor.
- The system displays the measured distance on an LCD if an object is present else it displays that there is no object.

The system gives out audible warning, vibration warning and lighting warning if an object is present in the range and the turn-signal is high.

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