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Vehicle's blind spot detector

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Abstract
Generally, all drivers will face blind spot while driving. Blind spot was the real situation where the drivers could not be able to detect any vehicles through side mirrors while overtaking in order to avoid accidents. Blind spot was one of the main factors of the accidents since the drivers had no clear vision of any vehicles which were closed to them. The project was proposed in order to help the drivers to have clear information with the blind spot assistance system known as vehicle 's Blind Spot Detector (VBSD). Basically, main component ultrasonic sensor was used to detect the moving vehicles in blind spot area. The driver would be assisted by three colours of Light Emitting Diode, Liquid Crystal Display and buzzer. The operation started where the ultrasonic sensor would send the input to the microcontroller Arduino Mega to process the information signal and send the output to perform actions based on programme written in Proteus and Arduino Software. These actions would lead the Light Emitting Diode to blink in different colours based on different distances accordingly and the buzzer will buzz at the same time to assist the driver. The vehicle 's Blind Spot Detector had been installed on the prototype car for testing and it was successfully working where it could be seen to help most of the drivers regardless age, ability and the traffic.

Keywords: Component, blind spot detector, Arduino software, LED, LCD, buzzer

Introduction
The blind spot detector can also be known as the blind spot monitor where basically it is a vehicle-based sensor device that detects other vehicles located to the driver 's side and rear and the warnings can be visual, audible, vibrating or tactile. However, blind spot monitors are an option that may do more than monitor the sides and rear of the vehicle. They may also include "Cross Traffic Alert", "which alerts drivers backing out of a parking space when traffic is approaching from the sides. A lot of vehicle accidents happened due to the carelessness of the drivers. It happened because they did not focus on the road, texting while driving or due to blind spot while changing from one lane to another lane. Studies have shown there are three times more likely a driver to involve in an accident when changing the lanes compared to continuing driving in the same lane. The fatal accidents could happen which is caused by the collisions due to erroneous attempt of lane change and merging. Drivers could not avoid what they could not see and the blind spot keeps the drivers from seeing the things that they desperately need to avoid. The previous research used line frequency modulated radar system to monitor the moving object in the blind spot where the technology of radar is used to monitor the moving object during daytime and night time but only the alarm as the output. The other project used camera to monitor the movement at the blind spot where the infrared camera had been used for day and night at the both sides of the vehicle and it will show digital display in the vehicle. This project also set the alarm as the output to alert the driver. Next is the same blind spot detector but this project is used the infrared sensor to detect the moving object. The used of infrared sensor can be more accurate but it cannot display the distance to the driver. This project also set the car alarm as the output. If there is always have the moving object, then the car alarm will not stop and it will distract the driver. In addition, this project is called the efficient multiclass object detection which is the project used the blind spot camera to monitor the moving object. This project used the large lens to get more clear and more accurate display from the camera. This innovation can be another solution to measure the accuracy of the camera but it is still set car alarm as the output. The project is also about the blind spot detector but only for sedan vehicle using vision-based vehicle detection system to assist the driver.

Methodology

Figure 1 shows the flow operation of vehicle ‘s Blind Spot Detector. The flow chart indicates how the system operates which is tested based on three (3) distance conditions. These conditions consider a distance above 4 cm, a distance between 4 cm and 3 cm and a distance below 3 cm. The real calculation will be recorded and displayed in feet measurement.

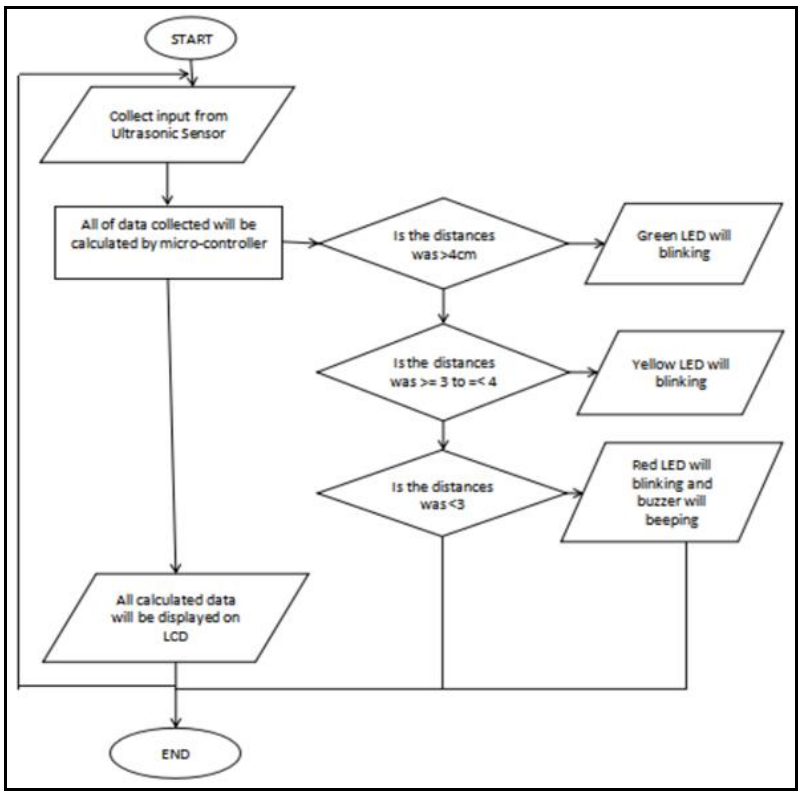

Fig 1: Flow chart of Vehicle ‘s Blind Spot Detector

Figure 2 shows the block diagram of how the Vehicle ‘s Blind Spot Detector works based on the flow chart process. The ultrasonic sensor will send the reading of the reflected wave that glance off from the obstacles on blind spot area. The information will be sent directly to microcontroller Arduino Mega. The microcontroller will process the information signal and send the output to perform action based on program written in Proteus and Arduino software. The green Light Emitting Diode (LED) will flash if the distance reading is above 4 cm. If the reading distance is between 4 cm and 3 cm, the yellow LED will blink but the red colour LED will flash if the system detects reading distance below 3 cm and the buzzer will turn simultaneously with the red LED indicator as an extra precaution. The Liquid Crystal Display (LCD) will display all the calculations in feet that had been coded in the microcontroller Arduino Mega for both right and left blind spot area.

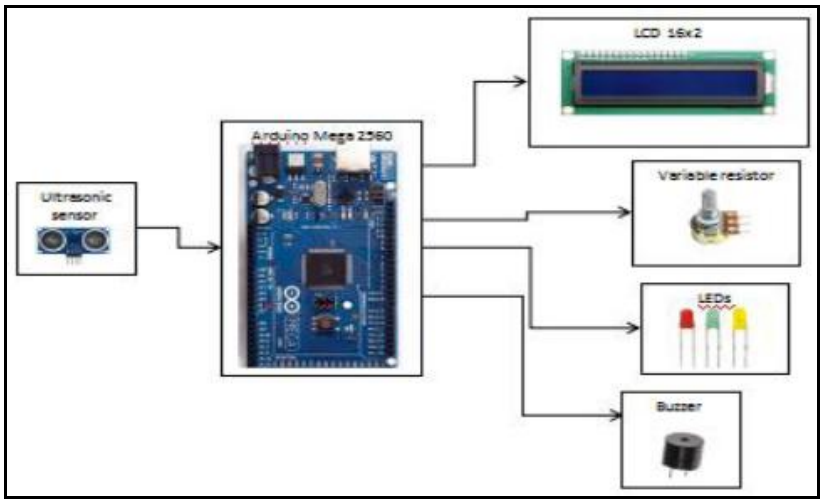

Fig 2: Block diagram of Vehicle's Blind Spot Detector

Figure 3 shows full schematic diagram and complete circuit connection of each component for Vehicle's Blind Spot Detector project. In this project, there are two sets of input and output which refers to right side and left side accordingly.

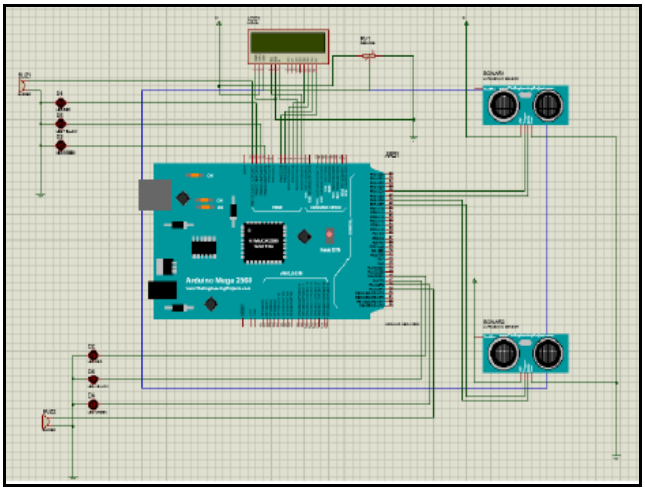

Fig 3: Schematic diagram of Vehicle's Blind Spot Detector

Figure 4 shows the prototype of Vehicle's Blind Spot Detector. The Printed Circuit Board (PCB) layout of the project was installed on hardware of the remote control car prototype.

Fig 4: Remote control car prototype with Vehicle's Blind Spot Detector

Results and Discussion

The hardware simulations of vehicle‘s Blind Spot Detector shown in the following figures where the LCD displays the real calculations in feet based on three conditions.

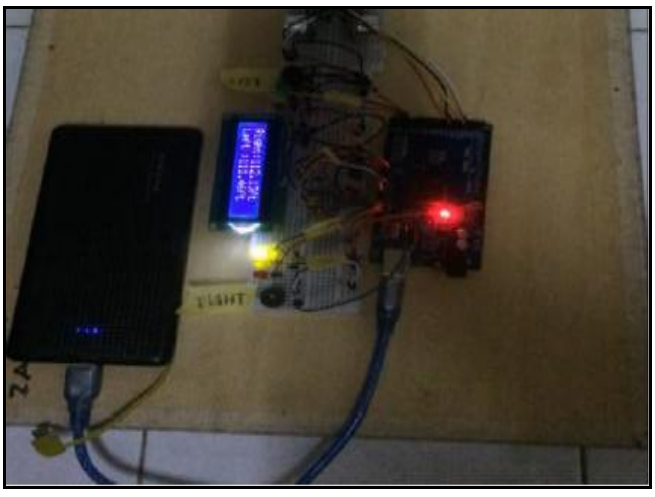

Fig 5: No object within 3 feet distance

Figure 5 shows initial or normal condition where the ultrasonic sensor could not detect any object or obstacle within 3 feet distance, thus the green light blinks indicating the situation is safe.

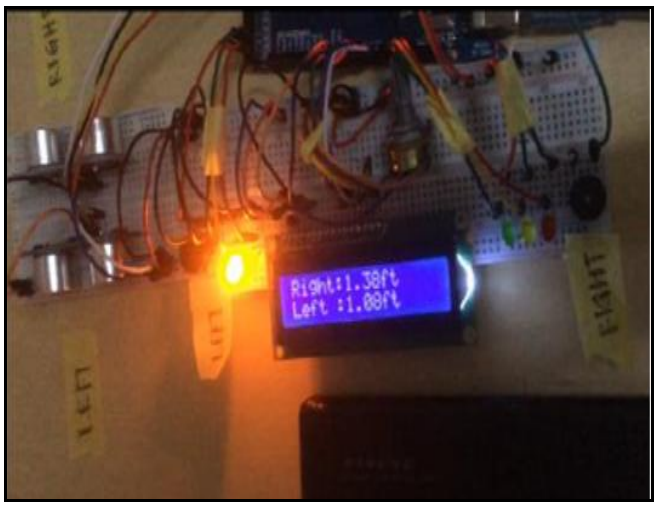

Fig 6: Sensor detects object between 1 feet to 2 feet distance

Figure 6 shows the ultrasonic sensor detects an object between 1 feet to 2 feet distance. The LCD displays the distance of 1.30 feet and 1.03 feet for right and left respectively thus the yellow LED will turn on to alert the driver.

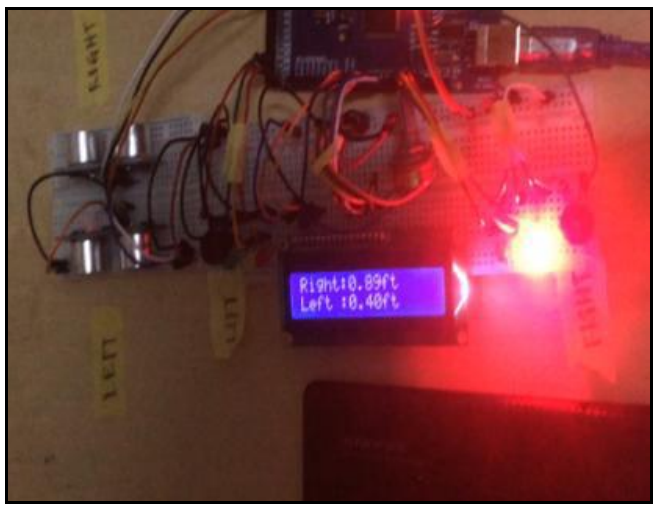

Fig 7: Sensor detects object less than 1 feet distance

Figure 7 shows the red LED colour turns on when the ultrasonic sensor detects an object less than 1 feet distance and the buzzer releases the precautious sound as a warning to the driver. The LCD can be seen showing reading 0.09 feet for right side and 0.04 feet for left side of the car. The final result obtained from hardware and software simulation proved that the vehicle ‘s Blind Spot Detector successfully run. The simulation had been tested for several times because of some troubleshooting problems. One of the problems was the calculation for the ultrasonic sensor to get the accurate reading. In this simulation, feet unit had been used for real scale distance. Another problem was the buzzer. The buzzer had been undergone some modifications by delaying the coding in order to produce friendly alert to the driver.

Conclusion

The vehicle ‘s Blind Spot Detector becomes the main project with the unique additional functions as it can help the driver to enhance the vision of the driver at the blind spot. Even with minor additional features, this system could help a lot of people while driving. The project meets the objective where all the electronic parts and simulation run successfully after several attempts. Overall, the desired output produced with correct LED colours and distance display on LCD. The additional features can be adding such as Figure 7 Sensor detects object less than 1 feet distance Figure 7 shows the red LED colour turns on when the ultrasonic sensor detects an object less than 1 feet distance and the buzzer releases the precautious sound as a warning to the driver. The LCD can be seen showing reading 0.09 feet for right side and 0.04 feet for left side of the car. The final result obtained from hardware and software simulation proved that the vehicle ‘s Blind Spot Detector successfully run. The simulation had been tested for several times because of some troubleshooting problems. One of the problems was the calculation for the ultrasonic sensor to get the accurate reading. In this simulation, feet unit had been used for real scale distance. Another problem was the buzzer. The buzzer had been undergone some modifications by delaying the coding in order to produce friendly alert to the driver.

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