

# Automatic Accident Avoiding Car by Using Arduino Uno

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**ABSTRACT** - Recently, the world is growing very fast in term of technology. One of the main goals of technology is to make life easier. Technology plays a very important role in every life sector such as health, security, education, safety, and etc. Human safety is one of the most important features that matters in the community. In this project, we present the importance and role of technology in protecting human life regarding vehicle and road safety. The aim of this project is to create a robotic vehicle that avoids accidents by detecting other nearby vehicles then either changing its path to a lane where it is safe or stopping in worse case where there are cars in all nearby lanes. Car accidents have become one of the main causes of human death and various studies have shown that the driver interference is a cause for most of the car accidents. This project will be built using Arduino hardware. In the future the robot can be developed more using more accurate sensors and motors.

Keywords, vehicle; accident; path following; insert .

## 1. INTRODUCTION

In the modern world, the ongoing development of technology has changed people's life vision and concept. Everyone is looking for an easy and safe life which can be achieved with the help of technology if it is used in a proper way. As the world population is increasing substantially and people are living in an improved standard which has caused a dramatic increase in the number of vehicles on the road. The massive number of vehicles have resulted in higher ratio of car accidents compared to few years ago[1-3]. Severe car accidents may cause serious injuries to human body and lead to death. This project can be used for other purposes as well, such as in wheel chair for disabled people, industrial robotics, as well as in marine

applications for large ships in which controlling them is hard in unstable weather, and etc. The break

system is one of the very important aspects of this project. Vehicle accident avoidance is a very new technology in Kurdistan region, working on this topic will help in

developing all of life sectors in the region[4-into Due to world growth and development, it is very important and essential to use technology for hard works and safety. Vehicle accident-avoidance robot is important for decreasing the ratio of car accidents and death, for the drivers who falls sleeping during driving and parents that have loud children in the car and cannot focus on the driving all the time. This robot can help and save lives in these situations. To solve these problems, robots can help and most likely protect human from any tragic accidents[7-9].

The aim of the project is to develop a vehicle accident- avoidance robot to detect nearby vehicles and stop or change the path of the vehicle. The objectives are: -

- 1-To understand robotic by applying theoretical concepts into practice.
- 2- To design and use robots for vehicle accidents avoidance.
- 3- Investigation of the use of robots in avoiding or reducing vehicle accident.

## 2. LITERATURE REVIEW

Vehicle mechanism and technology have developed especially in term of breaking and system sensing. According to another study that has been published by [10- 11] from the university of South Korea vehicle accidents can be reduced by having some range measurements for the collision perdition. It has also shown that the performance of robots has been improved and more qualified by controlling the motion of the robots using a path that controls the distances within improvement in the motion of the robot which is increasing the smoothness of the motion. Corresponding to improvement and development of braking system technologies, sensing systems are also very developed,

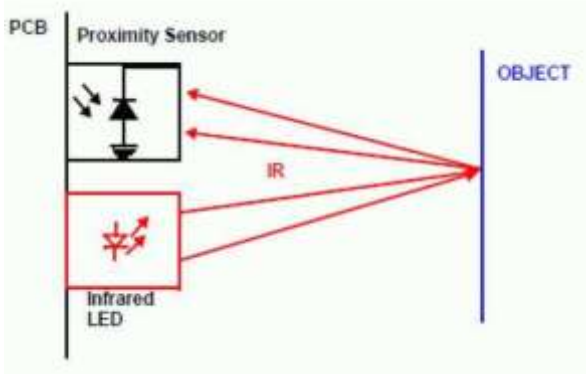


Figure 1. Infrared Sensor

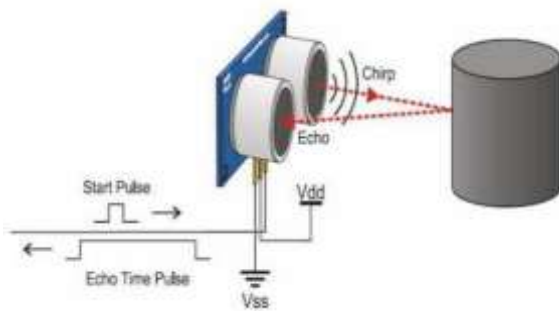


Figure 2. Ultrasonic Sensor

### 3 METHODOLOGY

#### A. Research Methodology (Heading 2)

For building any hardware project or any robotic projects, there are many different ways and methods to develop the device. Vehicle Accident-Avoidance robot will be developed and built using Arduino software and hardware. This robot can be built in many different ways because different types of motors can be used for moving the robot and different sensors can be used to detect other vehicles. A prototype of a robot with the abovementioned characteristics is expected from our project.

#### B. Data Analysis Method

Data collection is one of the most essential aspects of building and developing the content of the project, especially for the hardware part, data analysis is needed for supporting the idea of the project. To know how to get the required data and information data analysis method is used. At first this project will be built as a prototype which means the quality of the device is not important as much as the codes and the materials. After building, the prototype can be more developed for further uses. Data analysis confirms the quantitative research method.

#### 4. SYSTEM DESIGN AND IMPLEMENTATION

The main parts of vehicle accident-avoidance robot are microcontroller, ultrasonic sensor, and photoelectric sensor.

TABLE I. HARDWARE REQUIREMENTS

Hardware requirements	nx
Arduino	1x
Arduino board	1x
Ultrasonic sensor	1x
Ultrasonic sensor holder	1x
Infrared sensor	4x
Infrared sensor holder	1x
Stepper motor	4x
F to F jumpers	-
M to M jumpers	-
Car kit	1x
Motor shield	1x
Battery	6x

#### A. Working Principle

This section will show how this robot works, firstly as it is shown in the we have two types of sensors ultrasonic sensor and infrared sensor. Both sensors always send signal to target and receive signal from target. The received signal of the sensors will be sent to Arduino (microcontroller) in order to be processed. According to the signal sent from the sensors to microcontroller, the microcontroller will send signal to the motors in order to work or to stop. The signal sent from the sensors to the microcontroller is either ultrasonic sensor signal for obstacle detection to detect if there is an obstacle or there is not and the signal sent from infrared sensor is for line detection if the surface is black or white. For this project the surface should be white.

Software is an indication of programs that control computers and other devices that belong to. Arduino is the platform of developing electronic circuits. It is both software and hardware. Arduino IDE runs on computers and any type of Arduino board can be programmed; a USB cable will be used to put the codes onto microcontroller. Microcontroller uses C++ or C the advantage of Arduino IDE is that it has many libraries which simplifies coding upload to the board.

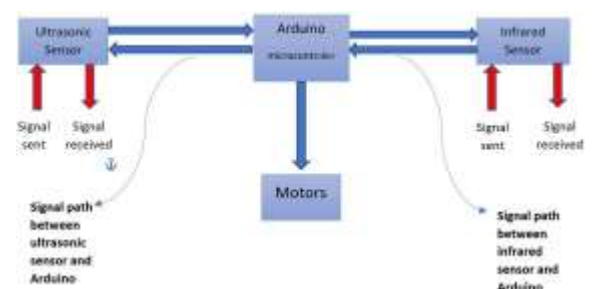


Figure 3. System Working Principle

**B. Obstacle Detection**

Obstacle detection requires battery and microcontroller. It is achieved through a sensor which is called ultrasonic sensor that measures the distance the distance by calculating the time between emission and reception of the signal. The sensor is attached on the front of the car and it is directly connected to microcontroller by using jumpers. When the sensor sends signal to target and receives signal from target, it sends the received signal to the microcontroller to process the signal and if there is any obstacle detected the microcontroller will send STOP signal to the motor and the motors will stop the vehicles. The motors are also directly connected to the microcontroller. Battery is required to activate the motors.

**C. Line Detection**

Line detection is achieved by using a sensor called infrared sensor. It is designed to follow the made plot line. This sensor detects the path by following the plotted line. It is based on colour detection. Infrared sensors continuously send signals and receive signals. They send the received signals to the microcontroller which they are directly connected to in order to process the signal, then the microcontroller send signals to the motors to specify which motor should move and which motor should stop based on the path design. Those sensors will sense the path, if they detect white coloured line they will move, but if they detect black coloured line they will stop and try to follow the white coloured line by stopping some motors and activating some other motors. Four infrared sensors are used in order to keep track of the plotted line and to make the movement precise. They are placed in the front of the car below the ultrasonic sensor on the infrared sensor holder. Battery is required to activate the motors.

**D. Line Following**

This is about the motors of the project and how do they keep track of the designed path. When Arduino receives signals from both sensors which are ultrasonic sensor and infrared sensor then processes them, after processing it will send signals to the motor in order to follow the designed path. Motors are also directly connected to the microcontroller using jumpers. Battery is required to activate the motors.

**E. Main Components Relationship**

as it is shown in figure 14 there is not any connection between both sensors which are ultrasonic sensor and infrared sensors, but both of them are connected Arduino

(microcontroller).

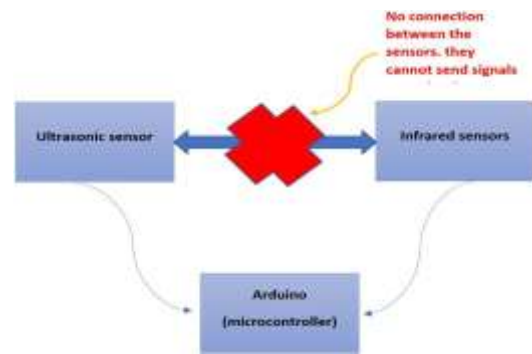


Figure 4. Components Relationship

**5. TESTING AND ERROR CORRECTION**

This chapter demonstrates the evaluation of abilities and performance of the system by focusing on some specific test cases that are essential to complete the requirements of the system. As it has been shown previously that all the components of the project are connected together using jumper wires so that the system functions as it is required and to obtain the necessary needs, despite that the testing for each component of the system is done separately to measure the performance of each component independently.

**A. Test Cases**

The test case is done to evaluate the performance of each component such as ultrasonic sensor, infrared sensor, and motors. Each of them has a main function which needs to be tested. The table below shows all of the information.

Test ID	Name of the tested component	Description about the test
1	Ultrasonic sensor	Does the sensor detect obstacles?
2	Infrared sensor	Does the sensor detect the line before changing the line because of obstacles?
3	Infrared sensors	Do the sensors easily detect the plotted line again after moving away from the line because of obstacle detection by ultrasonic sensor?
4	Motors	Do the motors rotate in an angle with respect to amount of power provided by Arduino?

TABLE II. TEST CASES

**B. Test Case Results**

The importance of this result is to find the accuracy of the vehicle accident-avoidance sensors and motors. The following table shows that not all components are working in high performance this is because of the quality of the components, some of them may not be original. Also, jumpers which are used for connection between components may not work very precise.

TABLE III. TEST CASE RESULTS

Test ID	Desired percentage	Result of the component performance
1	50%	80%
2	40%	90%
3	70%	45%
4	45%	95%

**C. Errors And Corrections**

During the design and implementation of this project many errors were faced. The main reason of the problems was because of the quality and originality of the required components. The table below shows some faced problems and the way they were solved.

No.	Problem name	Solution
1	Difficulty in finding the sensors	Ordering from other cities and online shopping
2	Sensor quality and accuracy	They have been changed but they are still not original that has 100% performance
3	Arduino receiving the signals from both sensors at the same time.	This has been solved by adding different statements and functions to the code.

TABLE IV. ERRORS AND CORRECTIONS



Figure 5. The overall hardware structure of the system

**6. CONCLUSION**

To sum up and summarize the work that has been done for implementing this project, the purpose of implementing this project is to develop a robotic vehicle that avoids accidents by detecting other nearby vehicles then either changing its path to a lane where it is safe or stopping in worse case where there are cars in all nearby lanes. Another purpose of this project is line following. The robot is very essential for those people who falls sleeping during driving, it can decrease the death and accident ratios. It is important to assert that the robot senses the path it is following by receiving signals from both ultrasonic sensor and infrared sensors. This robot has many different applications in many different areas for instance it can be used as services robot for indoor applications, in emergency rescue such as in dangerous environments or places that are not reachable by human directly unless by robot help and many other applications. The robot is implemented using two different types of sensors which are ultrasonic sensor and infrared sensor as well as a microcontroller for processing the signal sent from the sensors in order to activate or stop the motors. All of the components are connected using jumpers. All the components and connections are checked and tested in order to be sure about the accuracy of the project.

The future work could be

- 1- Using original sensors for 100% accuracy
- 2- Try to make the power 100% stable
- 3- Using cameras to be more professional.
- 4- Using Wi-Fi, or Bluetooth

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