INDIAN INSTITUTE OF INFORMATION TECHNOLOGY NAGPUR

A Project Report

on

Adavanced Driver Assistance System (ADAS)

Submitted for partial fulfilment for the minor project of

Embedded Systems

in

Department of Electronics and Communication Engineering

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Declaration

I hereby declare that the work reported in the B.tech report entitled "Adavanced Driver Assistance System" submitted at Indian Institute of Information Technology, Nagpur India is an authentic record of my work carried out under the supervision of Dr. Mayur Parate. I have not submitted this work elsewhere for any other degree.

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Acknowledgements

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ABSTRACT

The main objective of the Adavanced Driver Assitance System is to resolve traffic problems and minimize the number of accidents on the road. We have presented a advanced driver assistance system which is compact, autonomous and fully functional smart car. This system is built to sense any obstacle in its path, to avoid it and resume its running involving the pre-computation of an obstacle free path. Driver can sometimes fail to see the car approaching rapidly from behind or in the blind spot, especially in heavy traffic on multilane freeways or highways and in urban traffic as well. The Adavnced Driver Assistance System can monitor this area and take much of the strain off the driver and avoid hazardous situations. We have used Ultrasonic sensors to implement a real-time obstacle avoidance system, so that the car can continually detect surroundings, avoid obstacles, and move toward the area where there are no obstacles. We use an Arduino UNO with a Motor Driver along with DC Motors to make the car, and for sensing we incorporate an Ultrasonic Sensor which accurately and efficiently detects any obstacles in the car's path. The Arduino is coded such that the car stops when an obstacle arises in front of it and check for other lanes. If there are no obstacles in the other lane then the car changes the lane. Throughout the construction of this model, we learnt the Arduino coding language, the Motor Driver functionality, and the working of an ultrasonic sensor and its features. In conclusion, through this project, we aim to construct a model of a advanced driver assistance system that is beneficial to the driver to take particular safe action when an obstacle appears in front which can avoid accidents.

Chapter 1

Introduction

1.1 Arduino Uno

Arduino Uno is a microcontroller board based on the ATmega328P Microcontroller. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. Arduino is a open source platform that can be used to design various electronic projects. Arduino uses its own IDE which is a simplified version of C++, making it easier to learn to program.

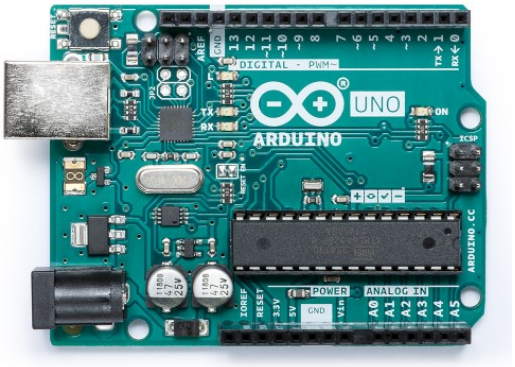

Figure 1.1: ARDUINO UNO

1.2 Ultrasonic sensors

In this project, we have used three Ultrasonic sensors. One Ultrasonic Sensor is at the front which can rotate with the help of servo motor. Other two Ultrasonic sensors are placed at back on the right and left side which is placed at a certain angle. These provide a cost-effective means to aid the users while driving. It uses a target and echo mechanism to determine the distance of an obstacle from it. An ultrasonic sensor sends out a target wave and receives that wave after reflection from an obstacle. The time taken for the wave to return gives an estimate of the distance of the obstacle from the sensor. Ultrasonic Sensors detects the obstacle and alerts the driver of any danger.

Figure 1.2: ULTRASONIC SENSOR

1.3 Servo Motor

A servo motor is an electrical device which rotate an object with great precision. If an object is to be rotated at some specific angles or distance, then servo motor can be used. It is made up of simple motor which run through servo mechanism. We can get a very high torque servo motor in a small and light weight packages. Due to these features they are being used in many applications like toy car, RC helicopters and planes, Robotics, Machine etc. We have used a servo motor to rotate an ultrasonic sensor present at the front which continuously monitors the presence of an obstacle.

Figure 1.3: SERVO MOTOR

1.4 DC Motor

DC is used in electronic circuits. DC motors are the most simple motors to use. They can reach a high rotational speed that is dependent on the input voltage. A portable dc power supply is required to drive the robot. DC motors are used in this project to rotate the wheels of the car.

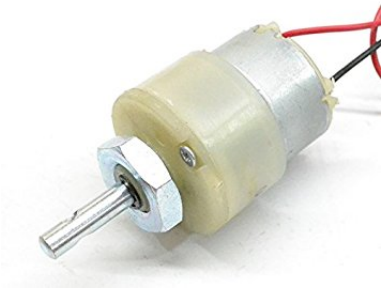

Figure 1.4: DC MOTOR

1.5 L293D Motor Driver

L293D IC is a typical Motor Driver IC which allows the DC motor to drive on any direction. This IC consists of 16-pins which are used to control a set of two DC motors instantaneously in any direction. This L293D IC works on the basic principle of H-bridge, this motor control circuit allows the voltage to be owing in any direction. As we know that the voltage must change the direction of being able to rotate the DC motor in both the directions. Hence, H-bridge circuit using L293D ICs are perfect for driving a motor. Single L293D IC consists of two H-bridge circuits inside which can rotate two DC motors separately. Generally, these circuits are used in robotics due to its size for controlling DC motors.

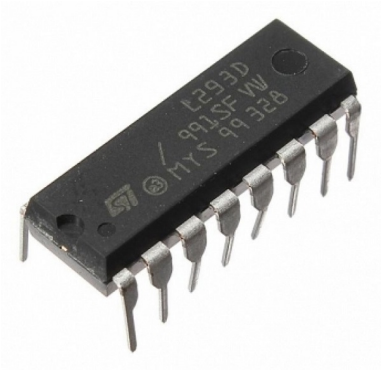

Figure 1.5: L293D Motor Driver IC

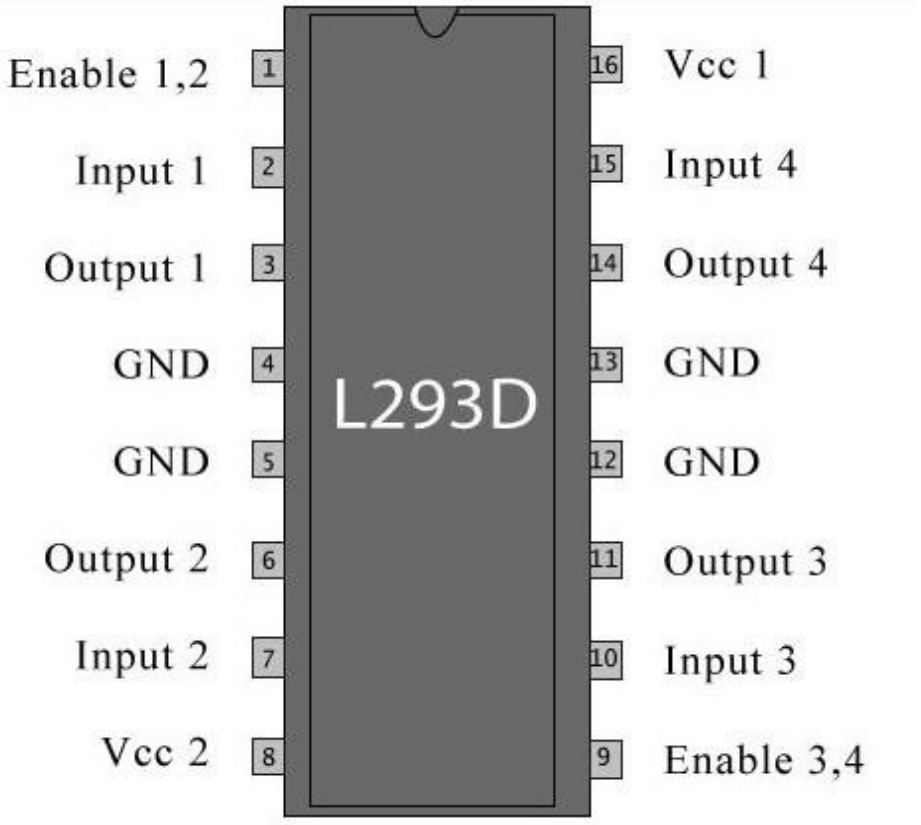

Figure 1.6: L293D Motor Driver IC Pin Diagram

Chapter 2

Problem Statement

While driving on the highways, there is possibility of collision with the vehicle resulting in life-threatening mishaps. Often people tend to struggle to cope with traffic on highways and adjust vehicle's speed accordingly. Sometimes drivers lose their attention and face the consequences which can cost their lives. Inorder to overcome this issue we have come up with ADAS(also known as advanced driver assistance system). Aim of our project is to maintain an safety distance from the forward vehicle and at the same time maintain the desired speed from the same vehicle. When the forward vehicle comes to a stop, our radar system analyzes the scenario and helps to safely overtake the forward car and again repeats the same process of maintaining the safety distance from the forward car. While executing this task, the car also keeps an eye on the cars in the blindspot of the car while overtaking. The primary aim is to keep the driving on highways a lot more safer than before.

Chapter 3

How it works

3.1 Methodology

We have come up with a small prototype of the Advanced Driver Assistance System . In this project we detect any obstacle present that can be dangerous and thereby alerting the driver and prevent accidents. We have used three ultrasonic sensors to detect the obstacle. One of the three ultrasonic sensors is present at the front which can rotate with the help of servo motor.The other two ultrasonic sensors are present on the back side of the car one on right side and other on left hand side. The ultrasonic sensors checks for any obstacle if present and if it is present then this system tells the driver the action to be taken i.e. to change a lane or stop the car. In this way, this system assists the driver by checking for obstacle which driver himself cannot see many times due to the presence of blind spots in the car and thus can be helpful to prevent dangerous accidents.

3.2 Circuit Diagram

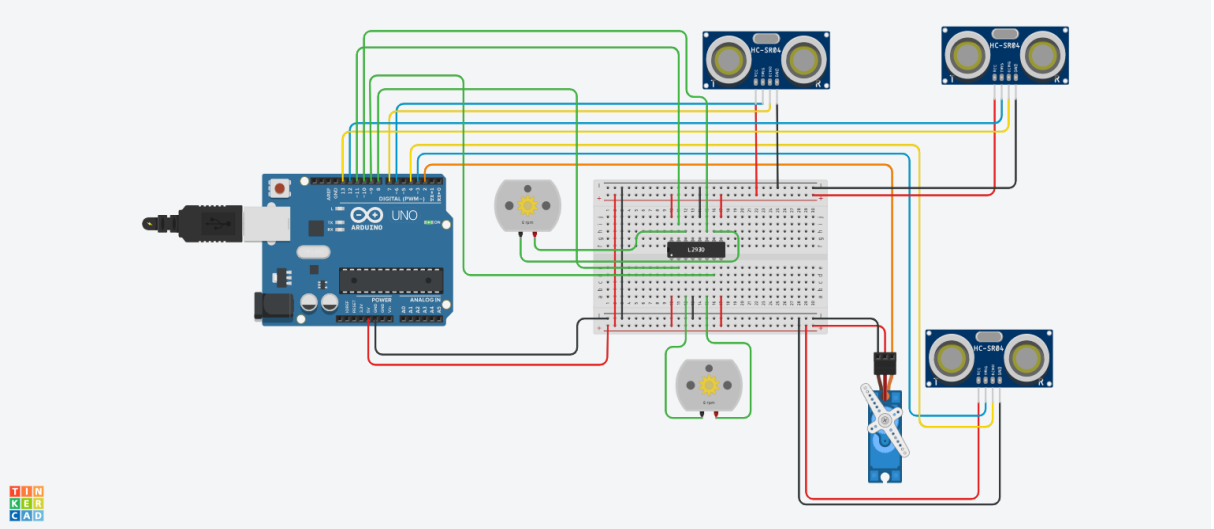

Figure 3.1: CIRCUIT CONNECTIONS

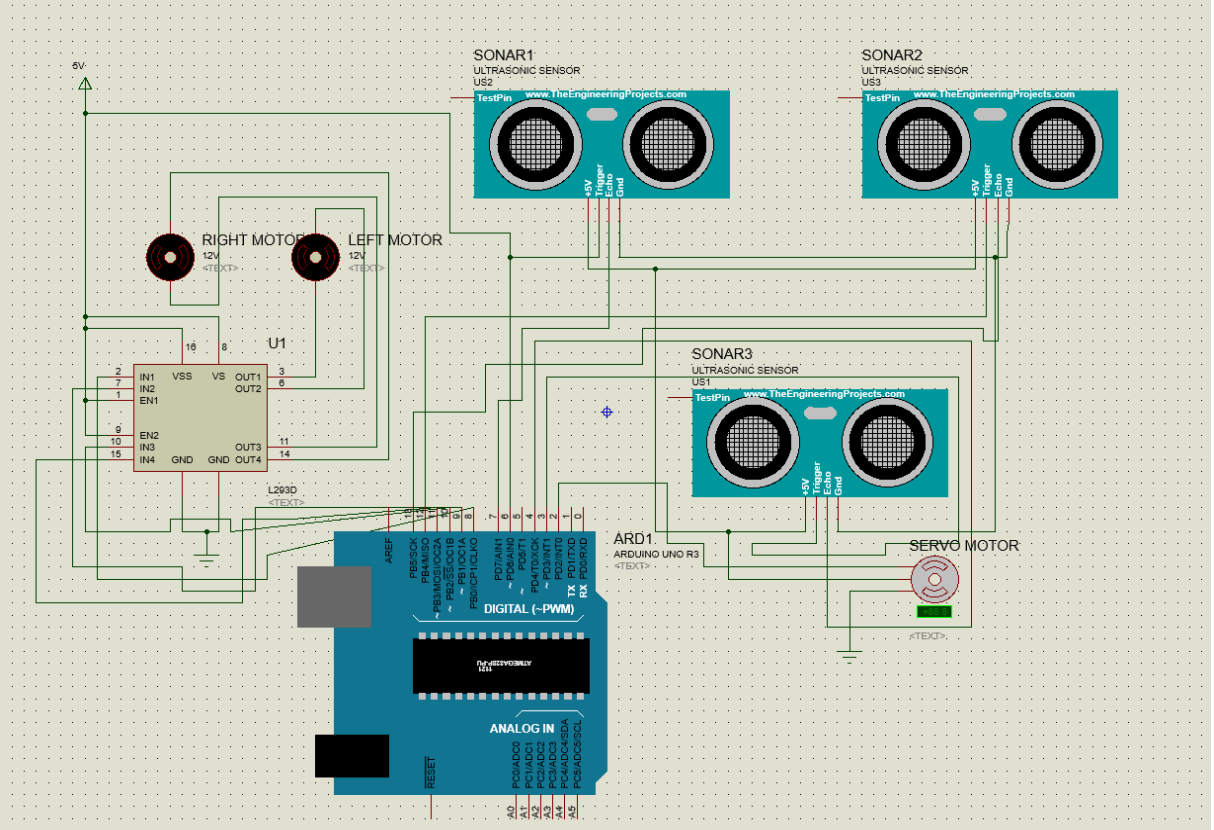

Figure 3.2: CIRCUIT DIAGRAM

3.3 Flowchart

FLOW OF CONTROL:

1. Car keeps moving in forward direction untill an obstacle is detected.
2. If the obstacle is detected by the ultrasonic sensor present at the front then the car stops moving.
3. Car checks if any obstacle is present in back right side of the car as well as front right side of the car.
4. If no obstacle is there on right hand side both at front and back then the car changes lane to right lane. Otherwise it checks for the left hand side.
5. Now car checks if any obstacle is present in back left side of the car as well as front left side of the car.
6. If no obstacle is there on left hand side both at front and back then the car changes lane to left lane.
7. If obstacle is there on back right side then the car cannot change lane from right hand side.
8. Similarly, if obstacle is there on back left side then the car cannot change lane from left hand side.
9. If obstacle is present at all there places i.e. at front and back right as well as back left side then car stops and doesn't move forward untill any obstacle disappers.

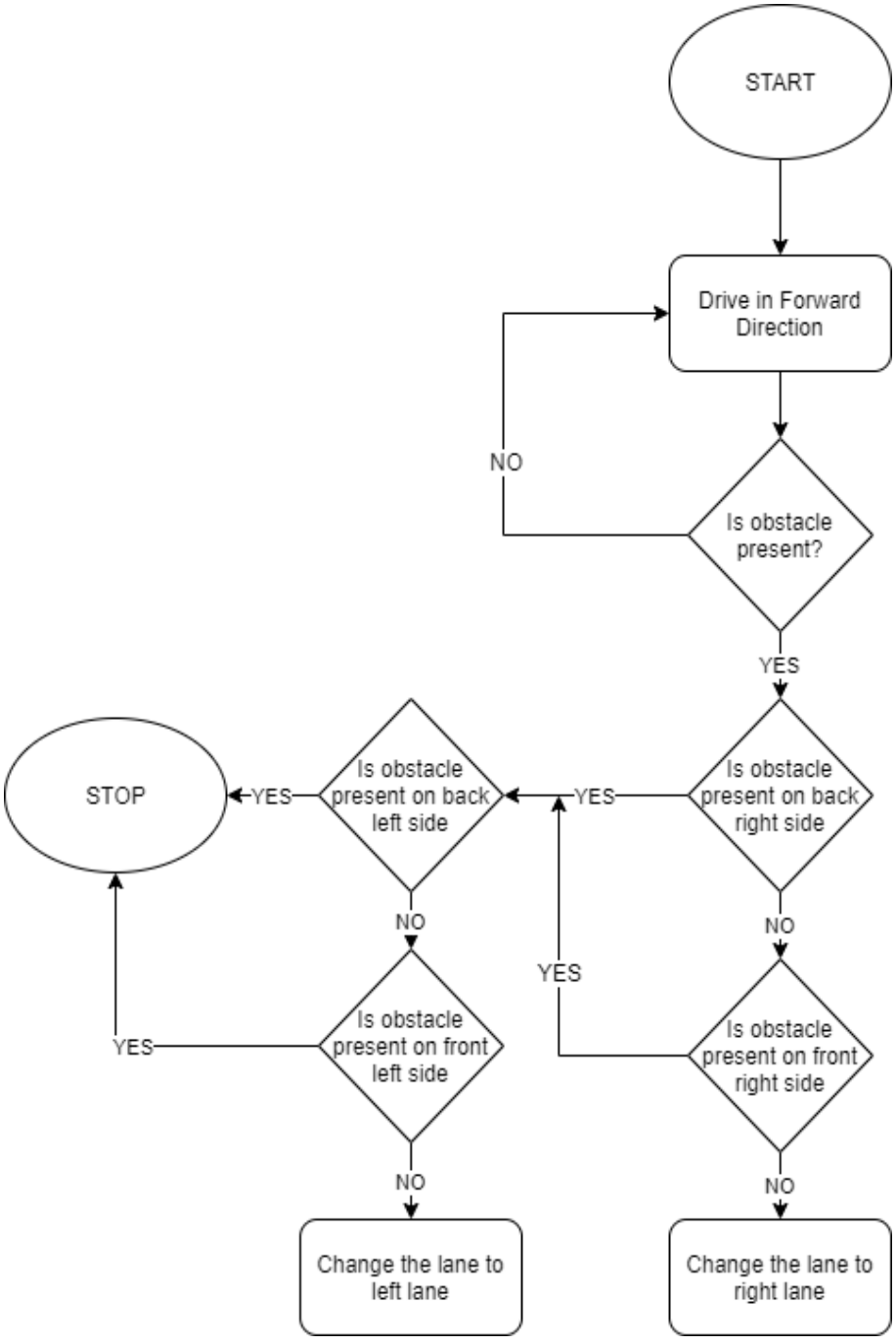

Figure 3.3: FLOW CHART

Chapter 4

Result

We have successfully implemented the Advanced Driver Assistance System that provides the much-needed inputs to the user by detecting the obstacles that can be dangerous if sometimes not noticed by the driver.

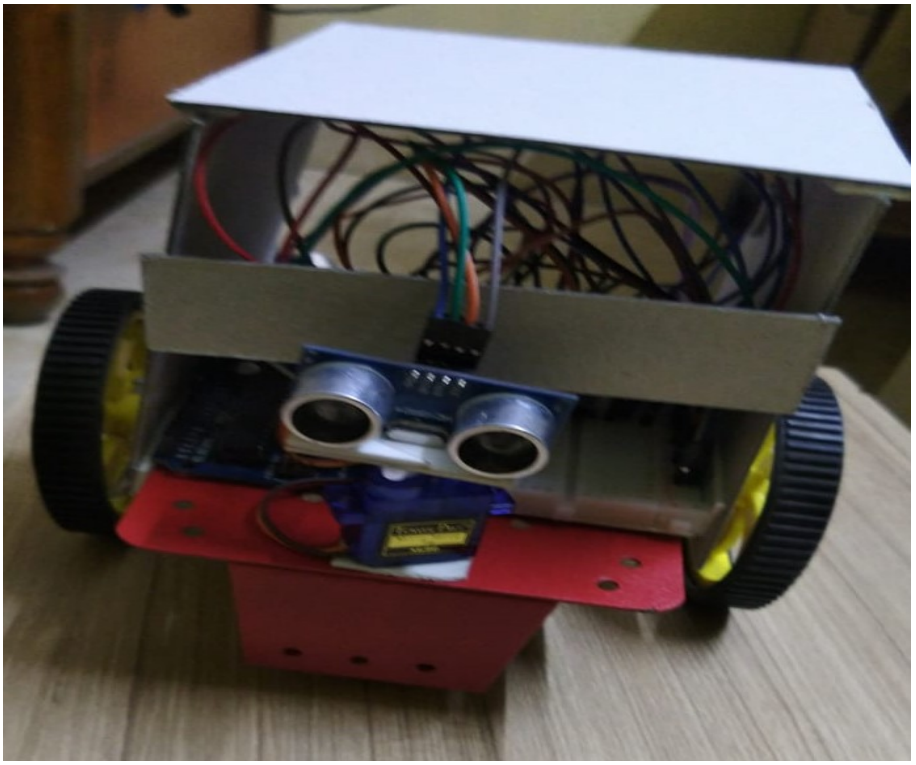

Figure 4.1: Car Used in Project (Front)

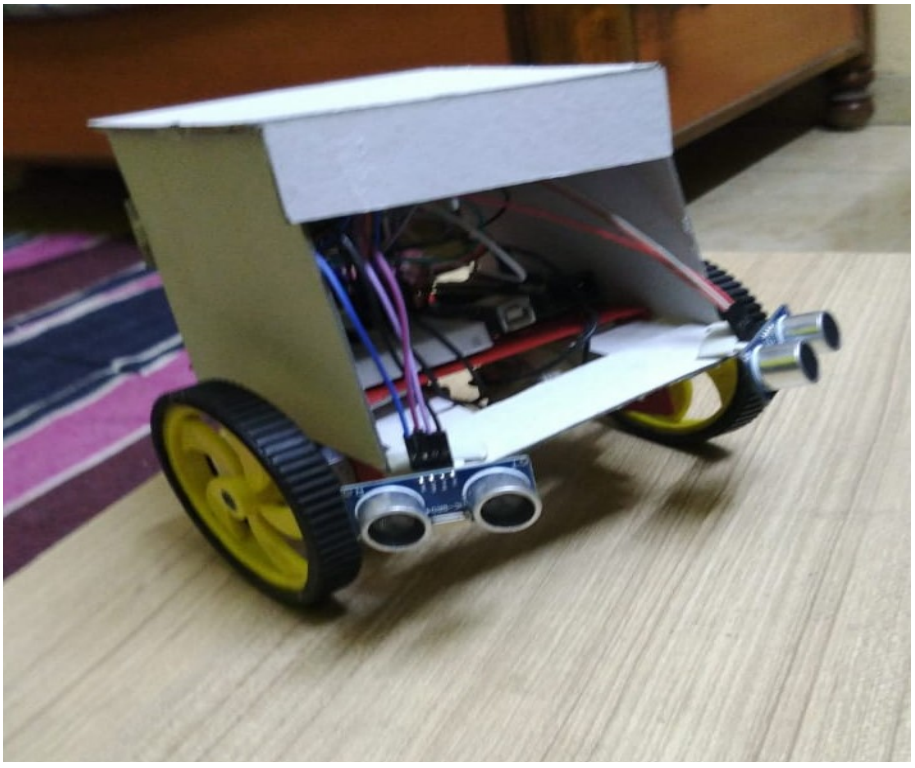

Figure 4.2: Car Used in Project (Back)

Chapter 5

Conclusion

The results after the successful completion of the project are as follows

- We have learned how to interface ultrasonic sensor and servo motor with Arduino.
- We came to know how to use ultrasonic sensor as radars to detect forward obstacles in the vicinity of the host vehicle.
- It had paved the way for increasing the safety on the roads while driving as a lots of accidents happening because of over-speeding and reckless driving of the drivers will be reduced

Chapter 6

Difficulties Faced

In our way to complete this project we encountered many difficulties that are mentioned below.

- The interfacing of servo meter with Arduino.
- Using one ultrasonic sensor such that it can rotate with the help of servo motor.
- Adding delay to the motor operation such that it perfectly changes the lane.

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