

A
Project Report
on
“OBSTACLE AVOIDING ARDUINO BASED CAR”

Submitted in partial fulfilment for the award of the degree of
Bachelor of Technology
in
Mechanical Engineering



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FARIDABAD
APRIL 2024**

DECLARATION

I hereby declare that the work, being presented in the project report entitled as **“OBSTACLE AVOIDING ARDUINO BASED CAR”** in partial fulfilment of the requirement for the award of the Degree in **Bachelor of Technology in Mechanical Engineering** and submitted to the Department of Mechanical Engineering of J.C. Bose University of Science and Technology, YMCA, Faridabad is an authentic record of my own work carried out during a period from January 2024 to April 2024 under the supervision of Dr. M.L AGRAWAL , Department of Mechanical Engineering. No part of the matter embodied in the project has been submitted to any other University / Institute for the award of any Degree or Diploma.

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CERTIFICATE

This is to certify that the project entitled, “**OBSTACLE AVOIDING ARDUINO BASED CAR**” submitted in partial fulfilment of the requirements for the degree in **Bachelors of Technology in Mechanical Engineering** is an authentic work carried out under my supervision and guidance.

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ACKNOWLEDGEMENT

We take this opportunity to express our deep sense of gratitude and respect towards our supervisor DR. M.L AGRAWAL, PROFESSOR, Department of Mechanical Engineering J.C. Bose University of Science & Technology, YMCA, Faridabad.

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ABSTRACT

Robots are more efficient if they can perform autonomously and without human interaction. Our paper presents the idea of a robot car that can sense any obstacle and manoeuvre around it. The current situation in world scenario demands of such more robots that can be employed in military uses, autonomous interconnected cars, in drones as delivery services and even as a general multipurpose safety device to avoid accidents.

Our project uses ultrasonic sensors in support with Arduino Uno development board, which houses ATmega328 microcontroller chip. It works on a very simple principle. An ultrasonic sensor has a source and an echo receiver. It sends bursts of ultrasonic signals and the echo receiver receives it and determines how far or how close any object reflecting the signals is in front of it. It is controlled by an Arduino Uno board, which is programmed to control the motors in the car, to stop or proceed as per information received by the sensor. The programming involved follows a very simple algorithm. If a distance is fixed as a threshold, say 10cm by the ultrasonic sensor, it will give a high signal if distance is more than it, otherwise it give a low signal. If the signal received is high, the Arduino signals the motor driver module to move forward, or else stop. If the signal received is low, that is, if any obstruction is found, first the car moves to right, and if the signal is still low, it moves to left. If the car is obstructed on both sides, it reverses back and then takes a turn.

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Chapter 1 INTRODUCTION

In the last decade, with the development of technology, sensors used with electronic devices have been used in many areas to facilitate life. Sensors are devices that convert energy forms into electrical energy. The sensors serve as a bridge connecting the environment and various electronic devices. The environment can be any physical environment such as military areas, airports, factories, hospitals, shopping malls, etc. Today, there are hundreds of types of sensors produced by the development of technology such as heat, pressure, obstacle recognizer, human detecting. Sensors were used for lighting purposes in the past, but now they are used to make life easier.

Today, robot systems are developed with the use of artificial intelligence algorithms. The robotics field is one of them. The most important part of the robot is the perception. Perceive of the environment will be important for a robot design. For instance, it is very important to identify explosives by a robot to detect a terrorist in the military field by using sensors. A robot has to perceive some variables (like heat changes) around it, interpret it, and then decide to act accordingly. In this article, robotic car has been presented in terms of obstacle detection and avoidance by using sensors which works automatically, the user leaves the robot control and the robot finds its way without hitting the obstacles. The robot detects living beings that are encountered and finds its way without hitting spot and when it comes to the obstacle it perceives and stops.

1.1 WORKING PRINCIPLE

. The obstacle avoidance robotic vehicle uses ultrasonic sensors for its movements. Arduino is used to achieve the desired operation. The motors are connected through motor driver IC microcontroller. The ultrasonic sensor is attached in front of the robot. Whenever the robot is going on the desired path the ultrasonic sensor transmits the ultrasonic waves continuously from its sensor head. Whenever an obstacle comes ahead of it the ultrasonic waves are reflected back from an object and that information is passed to the microcontroller. The microcontroller controls the motors left, right, back, front based on ultrasonic signals. In order to control the speed of each motor pulse width modulation is used (PWM).

1.2 COMPONENTS DESCRIPTION

1.Arduino Uno Arduino Uno is a development board housing an ATmega328 microcontroller, and has fourteen digital and 6 analog pins as input-output ports, for connections to different peripherals [3]. It has an open-sourced design which makes it much cost effective, and was introduced in 2005 to provide an easy and inexpensive way for students, hobbyists and professionals alike to create devices working with different actuators and sensors. It requires an external power source with voltage in the range of 9-12V. Apart from the fourteen digital and six digital pins, it also has a USB connection, a power jack, and a reset button

2.HC-SR04 Ultrasonic Sensor It is an ultrasonic range finder, which works on the principle of a RADAR, but instead of using radio waves, it uses ultrasonic sound waves. It consists of a transmitter

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which emits ultrasound of the frequency 40 KHz [4], and an echo receiver which receives reflected sound waves. The time difference between emitting and receiving of the waves gives the distance between the sensor and the surface off which waves are reflecting. It works in the range of 2-400cm in 15o effective measuring angle. It haspin one for +5V power supply, one neutral, or ground pin, one signal pin to trigger the transmitter and one echo pin to obtain the results.

3. LM298N Motor Driver Module LM298N is a motor driver module shield, which can be interfaced with Arduino Uno board. It is a high voltage, high current dual full bridge driver. It can be operated in the range of 5-35V and has a current output of 2-3A. It has a voltage drop of about 2V, which is due switching transistors in HBridge circuit. It can be used to run 2 DC motors at once.

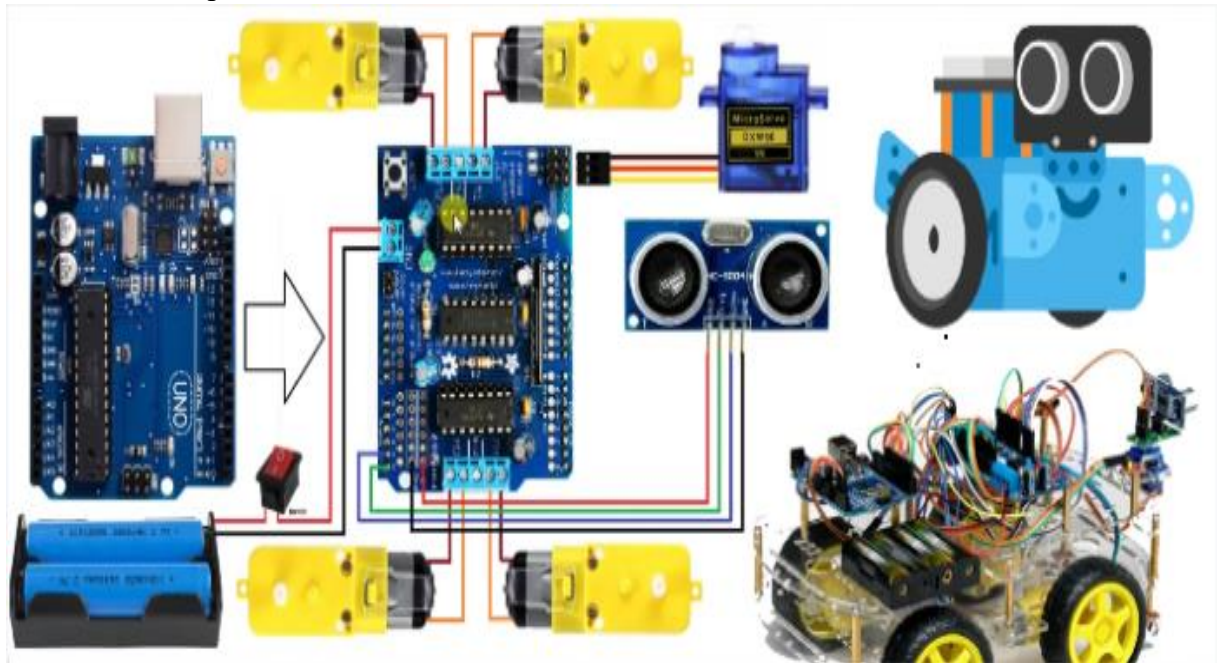
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1.3 APPLICATIONS

This device has application in surveying different landscapes and mapping them. It can also be used in commercial devices like

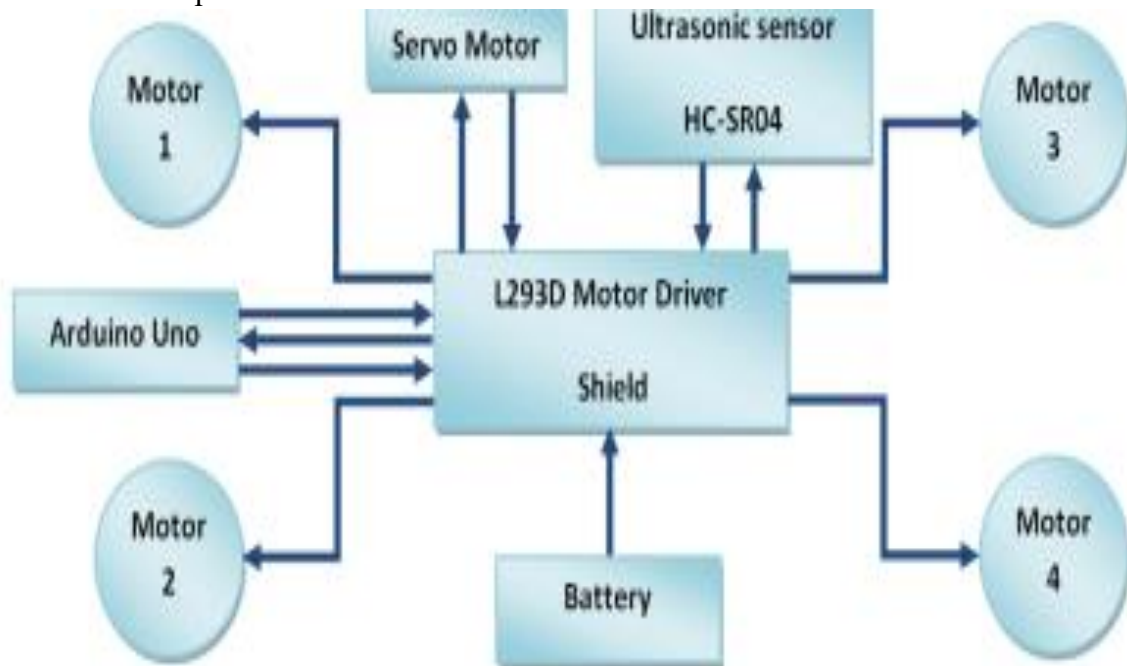
- Automated lawn mover.
- Smart room cleaner etc
- Obstacle avoiding robots can be used in almost all mobile robot navigation systems.
- They can also be used in dangerous environments, where human penetration could be fatal.
- Unmanned vehicle driving

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1.4 CIRCUIT DIAGRAM

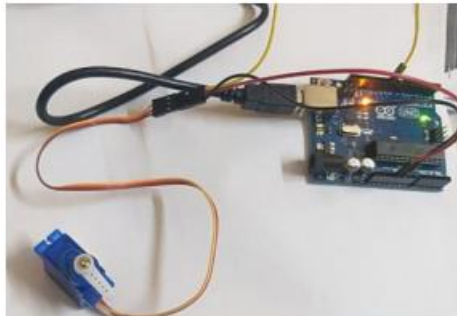
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1.5BLOCK DIAGRAM

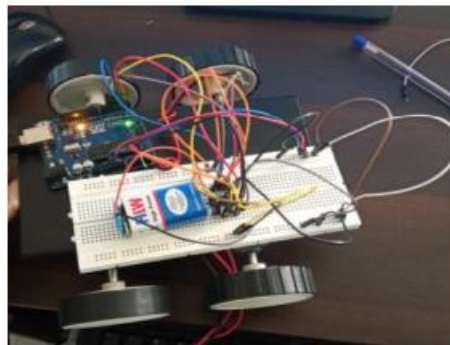
2 EXPERIMENT AND RESULTS

Testing of components is done individually and programming is done using Arduino IDE, following results are obtained as shown in figure

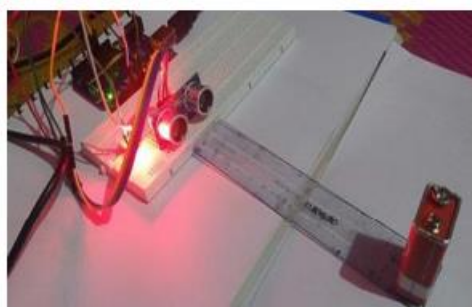


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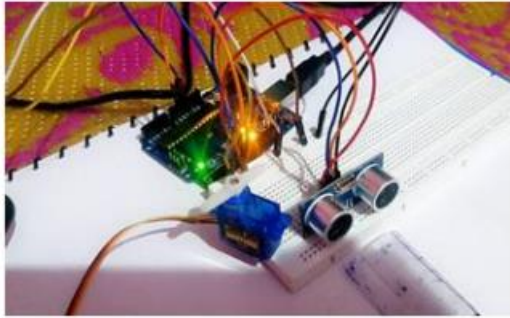
Fig(a) Servo Motor



Fig(b) DC Motor using driver IC



Fig(c) Ultrasonic Sensors



Fig(d) servomotor and Ultrasonic sensor

Result - The result is obtained for obstacle avoidance robot using Arduino, if the robot moves forward if any obstacle detect it check for other directions and moves where there are no obstacles it moves in forward direction, to sense the obstacle ultrasonic sensor is used. We used servo motor to rotate the ultrasonic sensor. The safe distance that can be sensed by the sensor is set to 15 cm



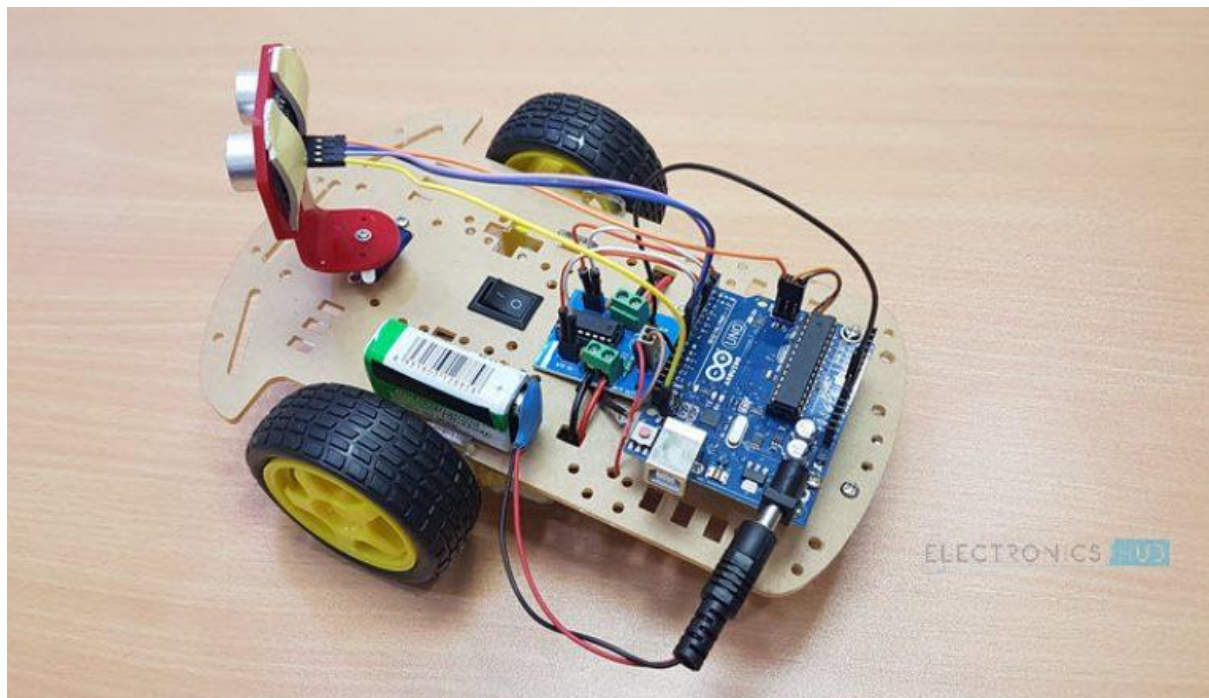
3 CONCLUSIONS

The above Arduino controller and ultrasonic sensor were studied and the HcSR-04 ultrasonic sensor was selected, as the controlling result are satisfying for its use in the automobile prototype system being developed. It was used to sense the obstacle and avoidance them. On successful implementation of obstacle avoidance algorithm was successfully carried out too with minimal errors, by coding the algorithm. Obstacle avoidance is a very good application to be used in vehicle preventing many accidents and loss of life.

Ultrasonic sensor HC-SR04 was chosen after reviewing many articles that pointed out the less accurate operation of IR and PIR sensor HC-SR501. The hardware project performed as per our expectations, and worked autonomously, that is, after feeding the code, it required no human interaction and could work on its own, even in unknown and dynamic environments.

4. FUTURE SCOPE

This model was a very basic one, saving both time and money, and clearly demonstrates the idea we had. For better and more accurate results, preferable three ultrasonic sensors can be used for a wider field of view, to cover a greater region. Alternatively, an ultrasonic sensor on a rotating servo motor can also be used to sweep through a larger coverage area. Also, otherwise it can be fitted with camera modules and AI can be implemented so that it can be used in real life applications, like on roads, judging other vehicles speed, pot holes, speed breakers, traffic light signals and even change lanes, which is same as the technology used in currently some of the most advanced autonomous driving cars made by tech giants. Further for military uses, it can be fixed with a GSM Module or a Radio Module and be provided with a manual control, for even better manoeuvres. We can conclude that this project of ours has a vast scope in future applications.



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