



IJEAST

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY



VOLUME : 5 ISSUE : 1 Print / Issue Publication Date: 13-Jul-2020



ISSN : 2455-2143



DOI : 10.33564/IJEAST.2020.v05i01.042

Indexed In



WWW.IJEAST.COM

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OBSTACLE AVOIDING ROBOTIC VEHICLE USING ARDUINO

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Abstract— Aim of this project is to design an Obstacle Avoiding Robotic Vehicle using Arduino. The working is based on Arduino micro-controller, motor driver and ultrasonic sensor. In this study, design and implementation of a robotic vehicle have been presented with regards to hardware, software capable of obstacle detection and obstacle avoidance. The idea is to first code the entire working using our previous knowledge of programming. The code will then be simulated on software and later be interfaced with the hardware. All the controls of the vehicle will be based on program embedded into Arduino. We chose this for our major project as robotics has become a major part of our everyday lifestyle and also have a wide scope in the engineering field. It plays a vital role in the development of new technology.

Keywords— Ultrasonic Sensor, Arduino Uno, Motor Driver Shield, and Servo Motor.

I. 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.

II. PROPOSED ALGORITHM

The sonar system is used in HC-SR04 ultrasonic sensor to determine distance to an object like bats do. It offers excellent non-contact range detection from about 2 cm to 400 cm or 1'' to 13 feet. Its operation is not affected by sunlight or black material. The ultrasonic sensor emits the short and high frequency signal. If they detect any object, then they reflect back echo signal which taken as input to the sensor through Echo pin.

Firstly we initialize Trigger and Echo pin as low and push the robot in forward direction. When obstacle is detected Echo pin will give input as high to micro-controller. `pulseIn()` function is used for calculating the time of distance from the obstacle. Every time the function waits for pin to go high and starts timing, then timing will be stopped when pin go to low. It returns the pulse length in microseconds or when complete pulse was not received within the timeout it returns 0.

The timing has been determined means it gives length of the pulse and will show errors in shorter pulses. Pulses from 10microseconds to 3 minutes in length are taken into consideration. After determining the time, it converts into a distance. If the distance of object is moderate then speed of robot get reduced and will take left turn, If obstacle is present in left side then it will take right turn.If the distance of object is short then speed of robot get reduced and will turn in backward direction and then can go in left or right direction.

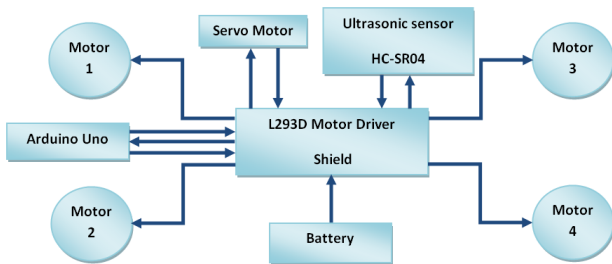


Fig. 1. Block Diagram

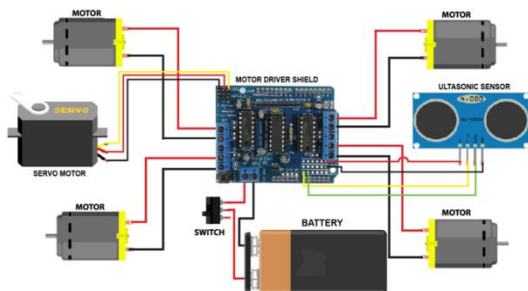


Fig. 2. Circuit Diagram

this process, after that apply the inverse wavelet transform to the image for find out watermark image.

III. 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).

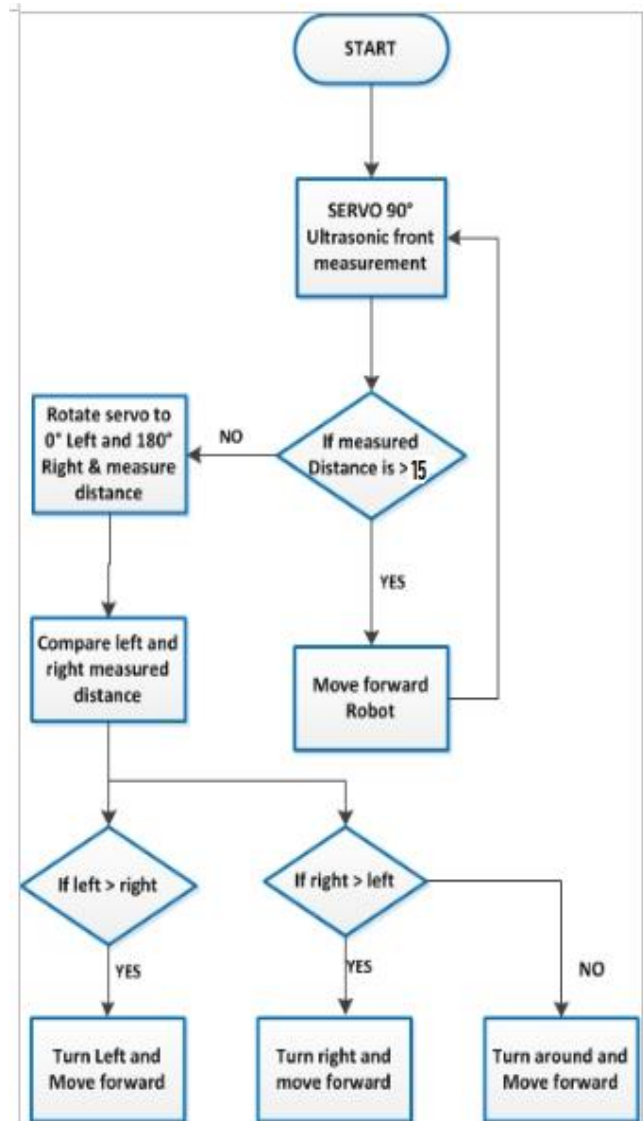
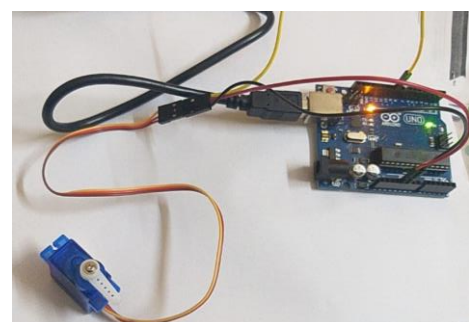


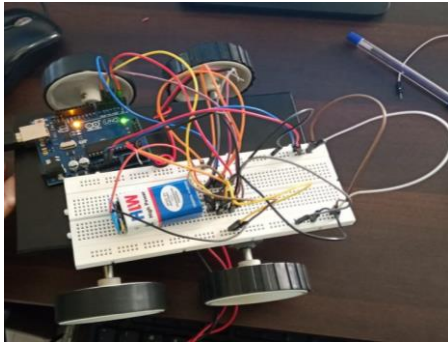
Fig. 3. Flow Chart

IV. EXPERIMENT AND RESULT

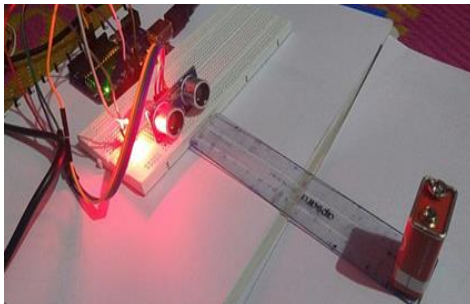
Testing of components is done individually and programming is done using Arduino IDE, following results are obtained as shown in figure below



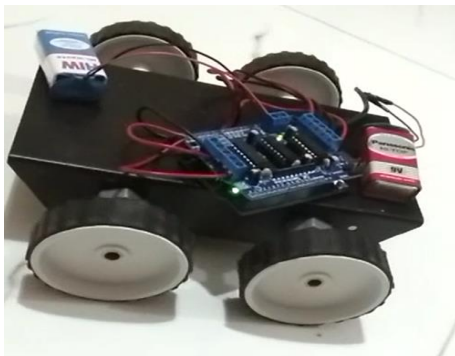
(a)



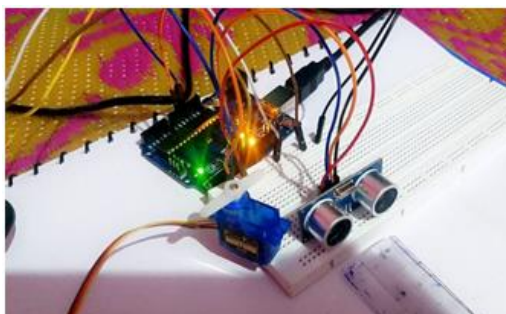
(b)



(c)



(d)



(e)

Fig. 4. (a) Servo Motor (b) DC Motor Using Driver IC (c) Ultrasonic Sensor (d) DC Motor Using Driver Shield (e) Servo Motor and Ultrasonic Sensor

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 is 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.

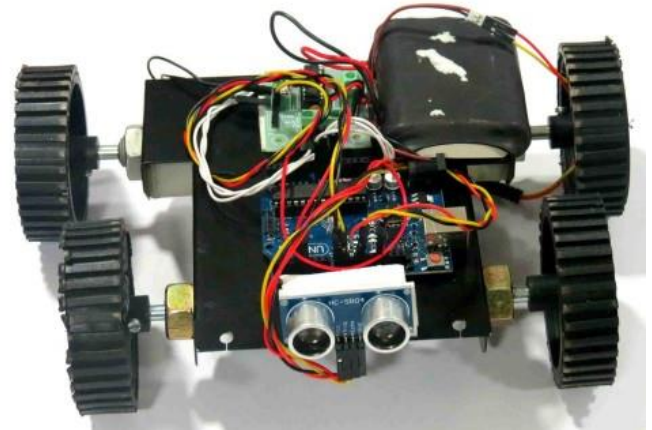


Fig. 5. Robotic Vehicle

V. CONCLUSION

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.

VI. ACKNOWLEDGEMENT

I would like to thank to our project guide Prof. Naresh Varathe and project coordinator Prof. Dharendra Deode, who with their friendly nature helped us to complete this project, guided us continuously and for giving their valuable time. We are thankful to our Head of the Department, Prof. Sandeep Mahajan, who coordinated with us.

We express our special gratitude to our honorable principle Dr. Amit J. Modak, who gave us an opportunity to work on this project. Being the students of Electrical and Electronics Department of Shri Balaji Institute of Technology & Management, it was our pleasure working on this project and it made us learn lot of new things.

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2455-2143