ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 8, Issue 7, July 2022

Obstacle Avoidance Robot using Arduino

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***Abstract*— In this paper, we propose the building of an Obstacle avoidance robot using Arduino. The robot is meant to move in a particular direction and ignore obstacles in its way. If it has an obstacle in front, left, and right of it, then it moves in the backward direction. The robot uses an ultrasonic sensor to detect an object and send a signal to the Arduino. The Arduino helps the robot move in a defined direction. The microcontroller controls the motors left, right, back, front, based on ultrasonic signals[1]. The Mechanism and Working of this robot are summarized in this work. This robot also has a wide range of applications and can be extremely useful to mankind.**

Keywords: Obstacle avoidance, Arduino, Microcontroller, Ultrasonic sensor

INTRODUCTION

We have designed an obstacle-avoiding robot that navigates even in an unknown environment by avoiding collisions. It senses obstacles in the path, avoids them, and resumes its running. We use sensors to achieve this objective. It can be used in search and rescue of things where normally, people can't go for example small crevice or space to find something or to deliver food in the time of the natural disaster, etc.

I. LITERATURE SURVEY

1. "Obstacle avoidance with ultrasonic sensors," designed by J. Borenstein and Y. Koren to create a robot system that is helpful for physically handicapped people. It uses an obstacle avoidance algorithm for the mobile robot. It uses ultrasonic range finders for detection. It provides an alternate way to replace humans for assisting the bedridden.
2. "Obstacle Avoiding Robot", has been designed by F.Tabassum, S.Lopa, M.M.Tarek, proposes the study of obstacle avoidance, Monte Carlo localization (MCL) method, motion planning in dynamic networks for mobile robots. This paper helps to learn how the robot changes its directions to prevent itself from collisions depending on three ultrasonic sensors and the localization of the mobile robots depending on the recorded data from RHINO and MINERVA robots.

II. EXISTING SYSTEM

Obstacle-avoiding robot senses obstacles in the path, avoid them, and resumes its running. There are some very popular methods for robot navigation like wall-following, line-following, and many more. Also, for the situations we are working upon, mostly helicopters and choppers are used. [2] proposed a novel method for secure transportation of railway systems has been proposed in this project. In existing methods, most of the methods are manual resulting in a lot of human errors. This project proposes a system which can be controlled automatically without any outside help.

III. NOVELTY

The novel application of this robot is that it can be used for the transportation of products and needs during any natural calamities such as floods, earthquakes, and Tsunami. They can be operated for moving goods in the defined pathways. The main idea is to develop the robot on a small scale and look upon the conversion into a larger scale which would indeed help society. Mass production of this robot can displace lakhs of humans and help in extreme situations.

IV. FEATURES

1. Avoids obstacles
2. Additional load it can carry
3. Can be applied on a bigger scale as well
4. Very easy to use
5. Microcontroller used is Arduino
6. The efficient coding in the software tool called as Arduino IDE

V. PROPOSED MODEL

The obstacle avoidance robotic vehicle uses ultrasonic sensors for its movements. The motors are connected through the motor driver IC to the 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 from an object and that information is passed to the microcontroller. The microcontroller controls

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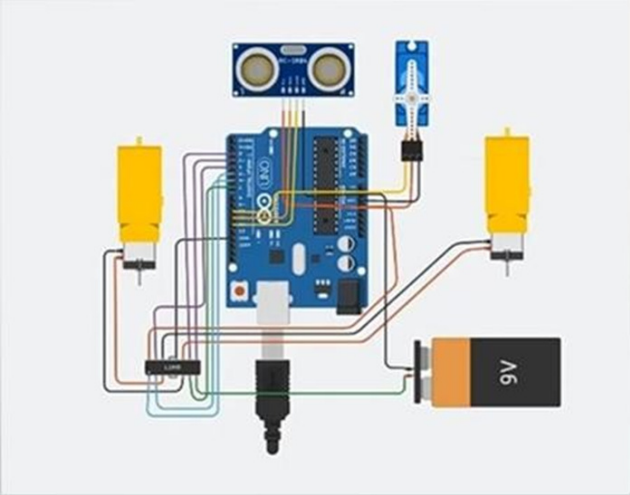
the motors left, right, back, front, based on ultrasonic signals. To control the speed of each motor pulse width modulation is used.

VI. ROBOT DESIGN/CIRCUIT



VII. SOFTWARE SPECIFICATIONS

A. *CODE*

```
#include <HCSR04.h>
#include <Servo.h>

const int M_L_F = 2;
const int M_L_B = 3;
const int M_R_F = 4;
const int M_R_B = 5;
#define Echo  7
#define Trig  8
int F_D = 0;
int L_D = 0;
int R_D = 0;
int Max_D = 45;
UltraSonicDistanceSensor distanceSensor(Trig, Echo);
Servo S_1;
int pos = 0;

void setup() {
  Serial.begin(9600);
  pinMode(M_L_F, OUTPUT);
  pinMode(M_L_B, OUTPUT);
  pinMode(M_R_F, OUTPUT);
  pinMode(M_R_B, OUTPUT);

  S_1.attach(9);
  int pos = 90;
  S_1.write(pos);
  delay(1000);


}

void loop() {

   F_D = distanceSensor.measureDistanceCm();
   if (F_D < Max_D)
   {
     Stop();
     Get_D();
     if(R_D > Max_D)
     {
       Right();
       delay(400);
       Forward();
     }
     else if ( L_D > Max_D)
     {
       Left();
       delay(400);
       Forward();
     }
     else  {
       Back();
       delay (500);
       Stop();
      }
```

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```
    }
    else{
     Forward();
    }
}


void Forward(){
  digitalWrite(M_L_F, HIGH);
  digitalWrite(M_L_B, LOW);
  digitalWrite(M_R_F, HIGH);
  digitalWrite(M_R_B, LOW);

  }

void Right(){
   digitalWrite(M_R_F, LOW);
  digitalWrite(M_R_B, LOW);
  digitalWrite(M_L_F, HIGH);
  digitalWrite(M_L_B, LOW);

  }

void Left(){

  digitalWrite(M_L_F, LOW);
  digitalWrite(M_L_B, LOW);
  digitalWrite(M_R_F, HIGH);
  digitalWrite(M_R_B, LOW);

  }

void Back(){
  digitalWrite(M_L_F, LOW);
  digitalWrite(M_L_B, HIGH);
  digitalWrite(M_R_F, LOW);
  digitalWrite(M_R_B, HIGH);

  }

void Stop(){
  digitalWrite(M_L_F, LOW);
  digitalWrite(M_L_B, LOW);
  digitalWrite(M_R_F, LOW);
  digitalWrite(M_R_B, LOW);

  }

void Get_D(){
    S_1.write(0);
    delay(500);
    R_D = distanceSensor.measureDistanceCm();
    S_1.write(90);
    delay(500);
    F_D = distanceSensor.measureDistanceCm();
    S_1.write(180);

delay(500);
L_D = distanceSensor.measureDistanceCm();
S_1.write(90);
delay(250);
}
```

VIII. HARDWARE SPECIFICATIONS

A. *Hardware Components*

1. Ultrasonic distance sensor
2. Motor shield
3. Arduino
4. Wires
5. Servo motor
6. Rubber Wheels
7. Battery Holder
8. Batteries
9. Ultrasonic Ranging Module HC - SR04
10. BO Motor L Type
11. Caster Wheel

IX. EXPERIMENTAL DISCUSSION

The Arduino is an open-source device that has been the brain for numerous projects. The Arduino has everything that is required by the user which includes its inbuilt converter, vo pins, etc. With the help of Arduino, like home Lightings, air conditioners, and many more thro ugh our cell phones. The Arduino can also contribute at large to the Smart Home system. By doing this Project we found out a lot about the Arduino, and how it has made us easier to convert digital signals into physical movements. One more advantage of Arduino is that once a program is burned, we don‘t need to worry about the program getting erased as long as it is not RESET.

Arduino has also over all other microcontrollers because of its efficiency and user-friendly property.

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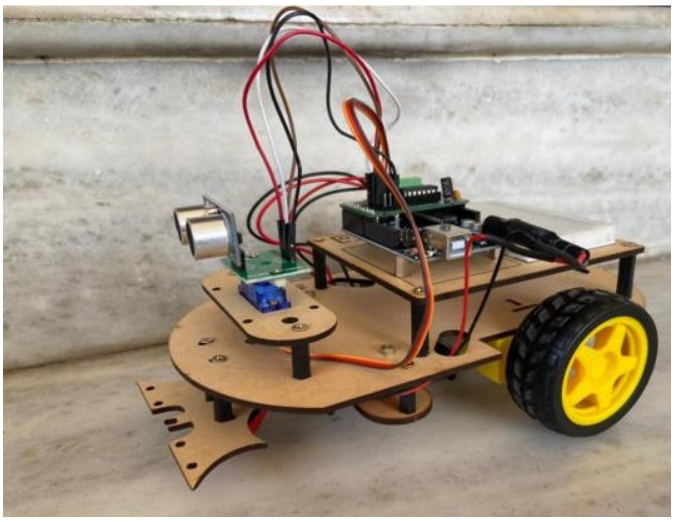

Journal of Pure and Applied Mathematics, Volume 117, Issue 15, 2017, (1215-1221)

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X. CONCLUSION

1. The robot was built and implemented.
2. The prototype developed can move very accurately
3. The preliminary test results are promising.

XI. FUTURE WORK

1. Voice operated system can be implemented
2. Adding confirmation commands to the voice recognition system.
3. Integration of GSM or mobile server to operate from a distance.
4. Design and integration of an online web control panel.
5. The Basic design of the Obstacle Avoiding Robot is taken into making a household vacuum cleaning robot like ROOMBA

REFERENCES

[1]. J. Borenstein and Y. Koren, "Obstacle avoidance with ultrasonic sensors," in *IEEE Journal on Robotics and Automation*, vol. 4, no. 2, pp. 213-218, April 1988, doi: 10.1109/56.2085.

[2]. Christo Ananth, K.Nagarajan, Vinod Kumar.V., "A SMART APPROACH FOR SECURE CONTROL OF RAILWAY TRANSPORTATION SYSTEMS", International