

OBSTACLE AVOIDING ROBOT

A PROJECT REPORT

Submitted by

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in partial fulfilment for award of

the degree of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

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OCTOBER 2023

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ACKNOWLEDGEMENT

We thank our beloved **Chairman Shri. P. SRIRAM** and all the trust members of Chennai Institute of Technology at this high time for providing us with a plethora of facilities to complete my project successfully.

We take the privilege to express my thanks to our Principal **Dr A. RAMESH, M.E., Ph.D.**, who has been a bastion of moral strength and a source of incessant encouragement to us.

We express our sincere thanks to **Dr. S.PAVITHRA, M.E., Ph.D.**, Project Guide and Project Supervisor **Mr. K . P . ASWATHI, M.E.**, . We take immense pleasure to have them also as our mentor providing valuable suggestions, excellent guidance, and constant support all through the course of our project.

We also thank the teaching and non-teaching staff members of the Information Technology Department and all our fellow students who stood with us to complete our project successfully. Finally, we extend our deep gratitude to our beloved family members for their moral coordination, encouragement, and financial support to carry out this project

ABSTRACT

Obstacle avoidance is one of the most important aspects of mobile robotics. Without it, robot movement would be very restrictive and fragile. This project proposes robotic vehicle that has an intelligence built in it such that it directs itself whenever an obstacle comes in its path. So, to protect the robot from any physical damages. This can be design to build an obstacle avoidance robotic vehicle using ultrasonic sensors for its movement. A micro-controller (AT mega 328P) is used to achieve the desired operation. An ultrasonic sensor is used to detect any obstacle ahead of it and sends a command to the micro- controller. Depending on the input signal received, the micro-controller redirects the robot to move in an alternate direction by actuating the motors which are interfaced to it through a motor driver.

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Chapter1

Introduction

- Robotics is part of Today's communication. In today's world ROBOTICS is fast growing and interesting field. It is simplest way for latest technology modification. Now a days communication is part of advancement of technology, so we decided to work on ROBOTICS field, and design something which will make human life simpler in day today aspect. Thus we are supporting this cause.
- An obstacle avoiding robot is an intelligent device, which can automatically sense and overcome obstacles on its path. Obstacle Avoidance is a robotic discipline with the objective of moving vehicles on the basis of the sensorial information. The use of these methods front to classic methods (path planning) is a natural alternative when the scenario is dynamic with an unpredictable behaviour. In these cases, the surroundings do not remain invariable, and thus the sensory information is used to detect the changes consequently adapting moving. It will automatically scan the surrounding for further path.
- This project is basic stage of any automatic robot. This ROBOT has sufficient intelligence to cover the maximum area of provided space. It has a ultrasonic sensor which are used to sense the obstacles coming in between the path of ROBOT. It will move in a particular direction and avoid the obstacle which is coming in its path. We have used two D.C motors to give motion to the ROBOT. The construction of the ROBOT circuit is easy and small The electronics parts used in the ROBOT circuits are easily available and cheap too

Chapter 2

Literature Review

2.1 InternetOfThins:

(INTERNATIONAL;JOURNALOFCOMMUNICATIONSYSTEM)
byFengXia,Laurence

We are witnessing the dawn of a new era of internet of things also known as internet of objects. generally speaking, IOT refers to the networked interconnection of everyday objects, which are often equipped with ubiquitous intelligence. Iot will increase the ubiquity of the internet by interrelating every object for integration via embedded system which leads to a highly distributed network of a device. Thanks to rapid advances in underlying technologies. Iot is opening tremendous opportunities for a large number of novel applications that promise to improve the quality of our lives.

In recent years, IOT has gained much attention from researchers and practitioners from around the world.

2.2 Iot based obstacle detection:

We reviewed different obstacle detecting robot mechanisms that have been built by a lot of students and other practitioners that are in existence. For an autonomous mobile robot performing a navigation-based task in a vague environment, to detect and to avoid encountered obstacles is an important issue and a key function for the robot body safety as well as for the task continuity. Obstacle detection and avoidance in a real world environment that appears so easy to humans is a rather difficult task for autonomous mobile robots and is still a well-researched topic in robotics. In many previous works, a wide range of sensors and various methods for detecting and avoiding obstacles for mobile robot purpose have been proposed. Good references related to the developed sensor systems.

Chapter3

HardwareComponents

To make a odstacle avoiding robot components we need is:

- ArduinoUno
- UltrasonicSensor Module
- MotorDriverIC
- JumperWires
- Servomotor
- L293DMotor Driver Shield
- DC Motor

3.1. ArduinoUno:

Arduino Uno is a versatile and widely used microcontroller board designed for
amyriadofelectronicsprojectsandprototypingapplications. At its core, it features the
Atmel ATmega328P microcontroller, boasting 14 digital input/output pins, 6 of
which can produce pulse-width modulation (PWM) signals, and 6 analog input
pins for reading varying voltage levels. With a clock speed of 16 MHz and
ample memory (32 KB flash, 2 KB SRAM, and 1 KB EEPROM)



Fig.3.1 Arduino uno

3.2. UltrasonicSensorModule:

An ultrasonic sensor module is a versatile device widely used in various applications, employing ultrasonic waves to measure distances and detect the presence of objects. Its operation relies on the transmission of high-frequency ultrasonic pulses, typically at 40 kHz, which bounce off objects and are received by a built-in sensor.

They find application in robotics for obstacle avoidance, parking assistance in vehicles, level sensing in tanks, security systems, and more. However, challenges such as reflections, limited range in certain conditions, and potential multipath interference need to be considered during their deployment.

Ultrasonic sensor modules are often integrated with microcontroller platforms like Arduino and single-board computers like Raspberry Pi to create interactive and intelligent systems, and on going advancement in sensor technology continues to expand their capabilities.



Fig:3.2.UltrasonicSensor

3.3. ServoMotor:

Servomotors are pivotal components in there alomofrobotics ,automation,andmechatronics,knownfortheirprecisionandversatilityincontrolling angularor linearmotion.

These motors are fundamentally different from typical DC motorsastheyencompassaclosed-loopcontrolsysteM.Atypicalservomotorcomprisesseveralkeyelements:aDCmotor,afeedbacksensor(usuallyapotentiometer orencoder),and acontrolcircuit.



Fig:3.3.ServoMotor

3.4. MaleToMaleJumperWirers:

Male-to-male jumper wiresare essential components in electronics and prototypingprojects.These wires consist of connectorsatbothends,typically I n the form of male pins or pins with exposed metal tips.



Fig:3.4MaletoMaleJumperWires

They are used to establish electrical connections between various components on a breadboard, PCB, or other electronic platforms. One end of the wire can be easily plugged into header pins, sockets, or other female connectors, while the other end can similarly connect to male pins or components like sensors, microcontrollers, or other electronic modules.

3.5 L293D Motor Driver Shield:

The motors typically cannot be driven directly by Arduino or another microcontroller. This is because of their higher current and power ratings, so motor shields or driver ICs are used instead. These shields or ICs isolate a motor's power supply and use control logic from the microcontroller circuitry.

The full-featured L293D motor driver shield can control up to four bi-directional DC motors with 8-bit speed

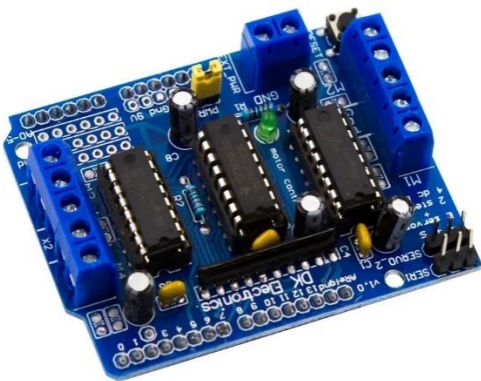


Fig:3.5 L293D Motor Driver Shield

3.6 DC Motor

A DC motor is an electrical motor that uses direct current (DC) to produce mechanical force. The most common types rely on magnetic forces produced by currents in the coils. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current in part of the motor.



Fig 3.6 DC Motor

3.7 OBSTACLE AVOIDING ROBOT

Obstacle Avoiding Robot is an intelligent device that can automatically sense the obstacle in front of it and avoid them by turning itself in another direction. This design allows the robot to navigate in an unknown environment by avoiding collisions, which is a primary requirement for any autonomous mobile robot.

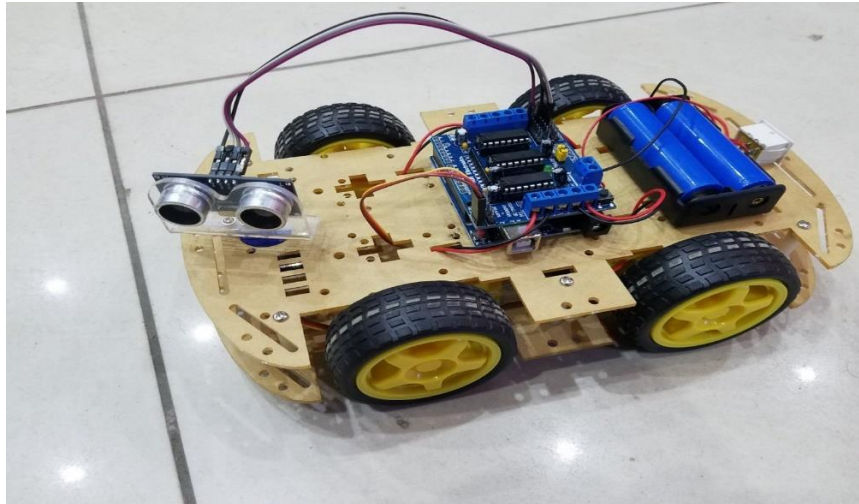


Fig:3.7 OBSTACLE AVOIDING ROBOT

Chapter 4

Software requirements

4.1. Arduino IDE setup:

1. Download Arduino IDE:

- Visit the official Arduino website at <https://www.arduino.cc/en/software>.
- Click on the "Download the Arduino IDE" button for Windows.
- Download the installer to your computer.

2. Run the Installer:

- Locate the downloaded installer file (e.g., "arduino-x.x.x-windows.exe").
- Double-click the installer to run it.
- If prompted for administrative permissions, grant them.

3. Installation Wizard:

- Follow the on-screen instructions in the installation wizard.
- You can leave most settings at their default values.

4. Driver Installation (if needed):

- During the installation, you may be prompted to install drivers for Arduino boards. Follow the prompts to complete this step.

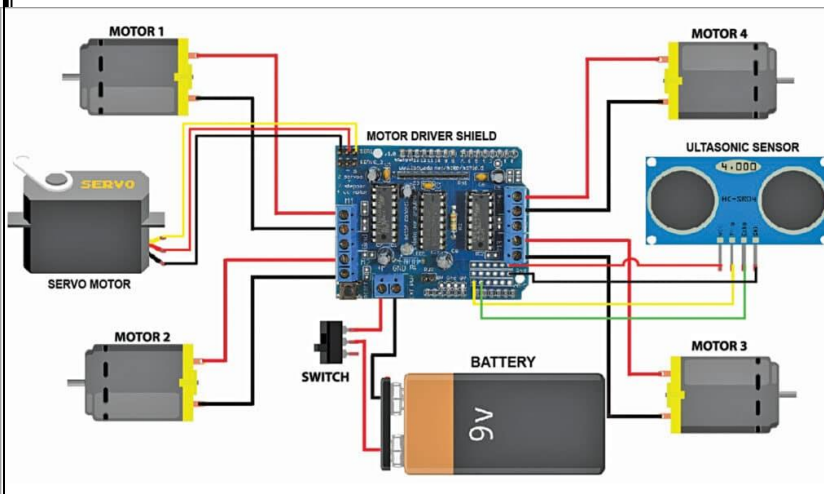
5. Complete Installation:

- Once the installation is complete, click the "Close" button

Chapter5

Methodology

5.1. BlockDaigram:



5.1. Configuration with components using code:

```
#include<Servo.h>
#include<NewPing.h>
#include<AFMotor.h>

#define TRIG_PIN A0;
#define ECHO_PIN A1;
#define MAX_DISTANCE 300;
#define COOLIDE_DIST 30;
#define MAX_SPEED 160;
#define MAX_SPEED_OFFSET 40;

AF_DCMotor LEFTMOTOR1(1,MOTOR12_1KHZ);
AF_DCMotor LEFTMOTOR2(2,MOTOR12_1KHZ);
```



```

AF_DCMotor RIGHTMOTOR1(3,MOTOR12_1KHZ);
AF_DCMotor RIGHTMOTOR2(4,MOTOR12_1KHZ);

Servo myservo;
NewPing sonar(TRIG_PIN,ECHO_PIN,MAX_DISTANCE);
int CURR_DIST=0;
int LEFTDISTANCE,RIGHTDISTANCE;

void setup()
{
  myservo.attach(10);
  myservo.write(90);
  delay(1000);
}

void loop()
{
  myservo.write(90);
  delay(90);
  CURR_DIST=readPing();

  if(CURR_DIST<COLLIDE_DIST)
  {
    changePath();
  }
  moveForward();
  delay(500);
}

void changePath()
{
  moveStop();
  myservo.write(36);
  delay(500);
  RIGHTDISTANCE=readPing();
  delay(500);
  myservo.write(144);
  delay(500);
  LEFTDISTANCE=readPing();
  delay(500);
}

```

```

myservo.write(90);
compareDistance();
}

void compareDistance(){
  if(LEFTDISTANCE>RIGHTDISTANCE){
    turnLeft();
  }
  else if(RIGHTDISTANCE>LEFTDISTANCE){
    turnRight();
  }
  else{
    turnAround();
  }
}

void readPing()
{
  delay(70);
  unsigned int us=sonar.ping();
  int cm=us/US_ROUNDTRIP_CM;
  return cm;
}

```

Chapter6

Conclusionand Future Work

Conclusion:

The goal of our project is to create a autonomous robot which intelligently detects the obstacle in his path and navigate according to the actions we set for it. 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 bring 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 in python. Obstacle avoidance is a very good application to be used in vehicle preventing many accidents and loss of life. This project developed an obstacle avoiding robot to detect and avoid obstacles in its path. The robot is built on the Arduino platform for data processing and its software counterpart helped to communicate with the robot to send parameters for guiding movement. For obstacle detection, three ultrasonic distance sensors were used that provided a wider field of detection. The robot is fully autonomous and after the initial loading of the code, it requires no user intervention during its operation. When placed in unknown environment with obstacles, it moved while avoiding all obstacles with considerable accuracy. In order to optimize the movement of the robot, we have many considerations for improvement. However, most of these ideas will cost more money and time as well. In future cameras can be used to detect the obstacle however, it is better to get CCD or industrial use ones to get clear and fast pictures. Even the ones we mentioned in the camera holder part will be better because of the special software.

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
- Mining Vehicle that uses Obstacle Detection