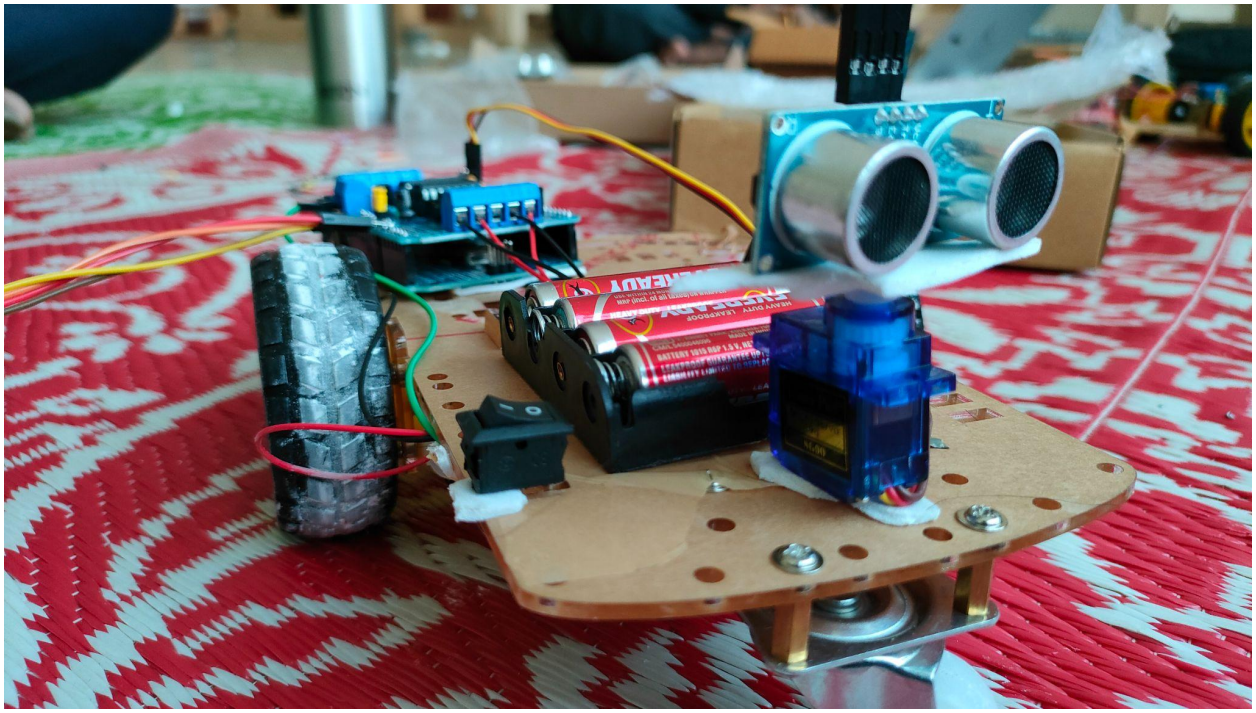
DIGITAL SYSTEMS CS227

MINI PROJECT

REPORT



OBSTACLE AVOIDANCE ROBOT

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CONTENTS

What Is “Robotics”?

The word robotics is used to collectively define a field in engineering that covers the mimicking of various human characteristics.

It must be able to perform certain tasks we set for it.

The desired task must be achieved within some given limitations.

It may be human controlled or automatic.

Robots are widely used in such industries as automobile manufacture.

ABSTRACT

In today’s world ROBOTICS is a fast growing and interesting field. ROBOT has sufficient intelligence to cover the maximum area of provided space. It has an infrared 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. Autonomous Intelligent Robots are robots that can perform desired tasks in unstructured environments without continuous human guidance. The minimum number of gear motors allows the walking robot to minimize the power consumption while constructing a program that can produce coordination of multi-degree of freedom for the movement of the robot. It is found that two gearmotors are sufficient to produce the basic walking robot and one voltage regulator is needed to control the load where it is capable of supplying enough current to drive two gearmotors for each wheel.

Goals

1. To automate the driving of the car on the road.
2. Avoiding obstacles in the path of robots to avoid collisions.
3. Ultimately reducing the number of accidents.

Specifications

The Ultrasound sensor helps us to find the obstacle in the path using the deviation of the distances of the objects and the servo motor helps to rotate the sensor in 180° to avoid accidents in a more directed way.

The system is very reliable. And also tested in very different conditions.

The system is very low cost.

It is also very power efficient as it uses very less power.

ITEM USED:

1) ARDUINO UNO

Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.

The whole code of the following line and the obstacle detection is written on the arduino and powering it properly will give us the desired results.

All other components like IR sensor and ultrasonic sensor are also connected to the board.

2) SERVO MOTOR

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration.

It consists of a suitable motor coupled to a sensor for position feedback.

3) ULTRASOUND SENSOR

The help of the ultrasound helps us to detect if there is any obstacle in front of us or not as then we can look for abnormal distance change recorded by the sensor that there is something in the path that can hinder its movement then the car soles down to prevent the uncanny.

4) Motor Driver

It can control the rotation direction and speed of four DC motors, two Servo motors, and two Stepper motors.

It is easy to connect with an Arduino UNO or MEGA.

This shield especially uses Arduino projects like robotics and CNC.

What Is an Obstacle Avoiding Robot?

Obstacle avoidance Robot is designed in order to navigate the robot in an unknown environment by avoiding collisions.

DIAGRAM

I. BLOCK DIAGRAM

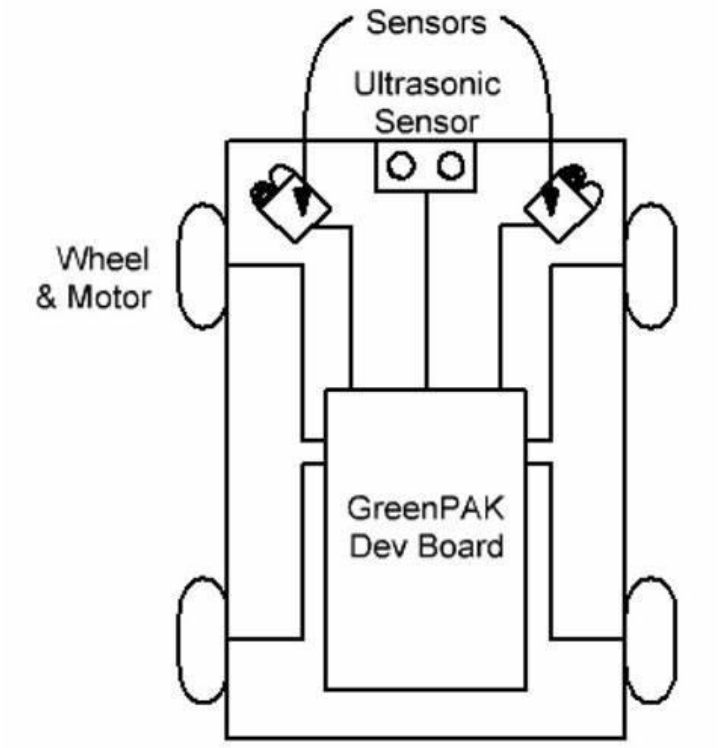
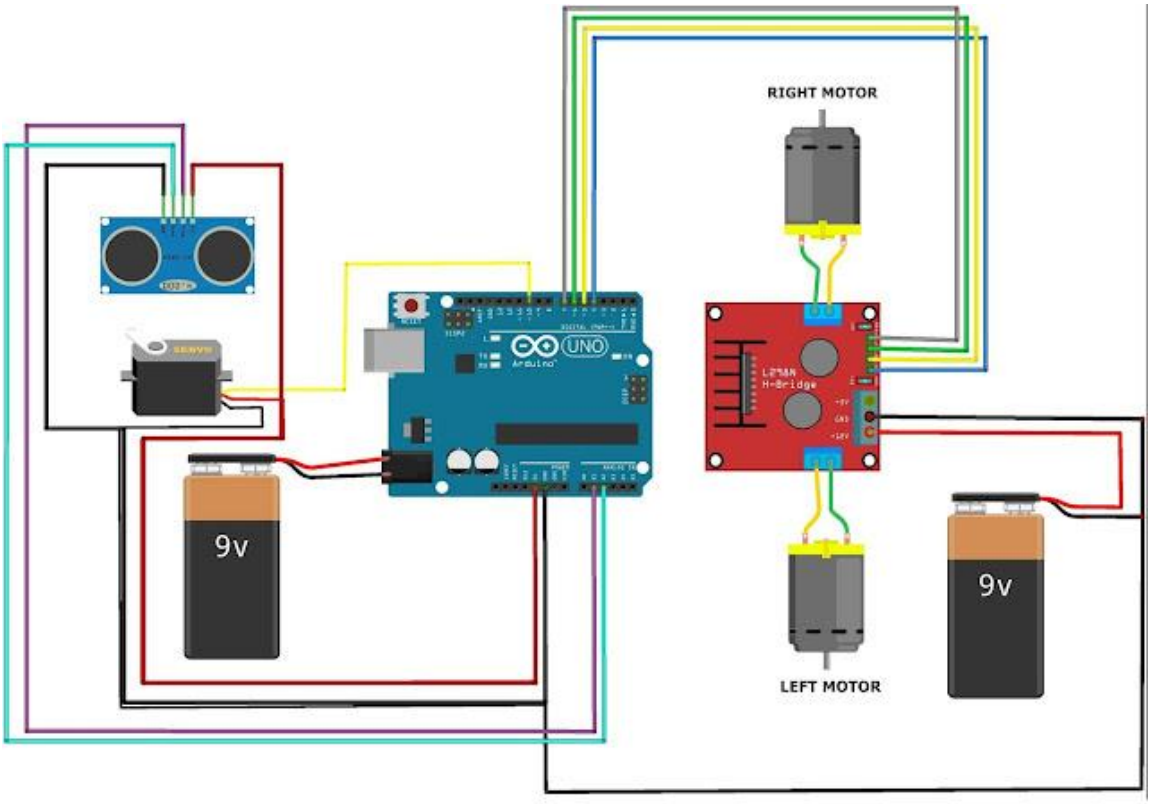


Figure 1. Autonomous Vehicle Design

II. CIRCUIT DIAGRAM

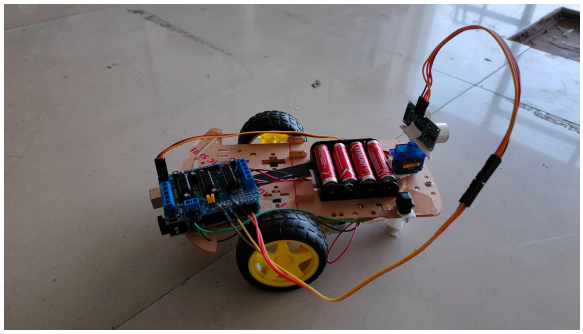


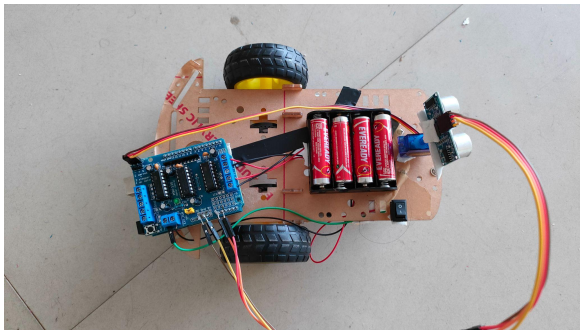
APPLICATIONS

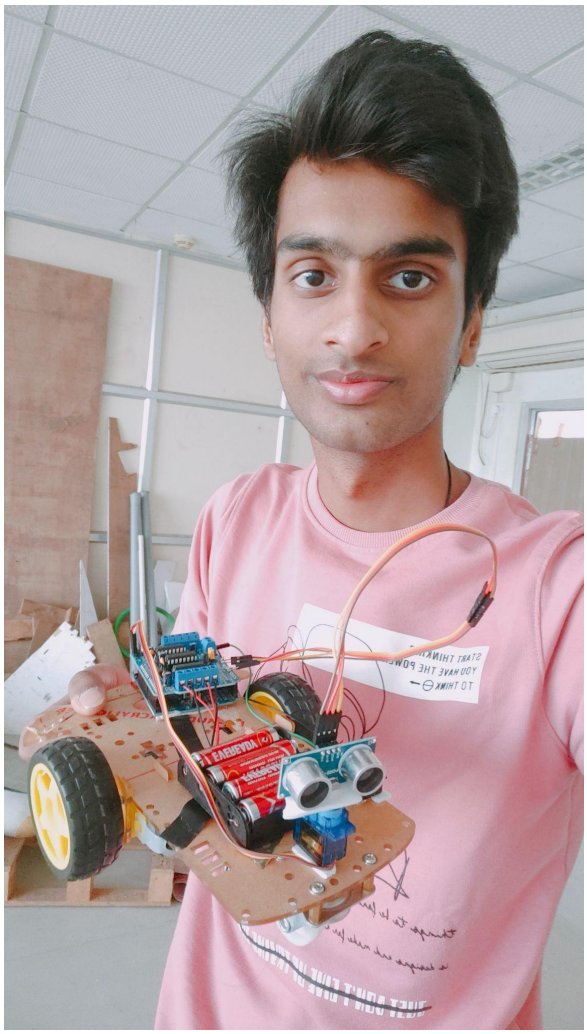
1. Used in mobile robot navigation systems
2. Used for household work like automatic vacuum cleaning
3. Used in dangerous environments, where human penetration could be fatal.
4. Automatic changeovers of traffic signals
5. Intruder alarm system

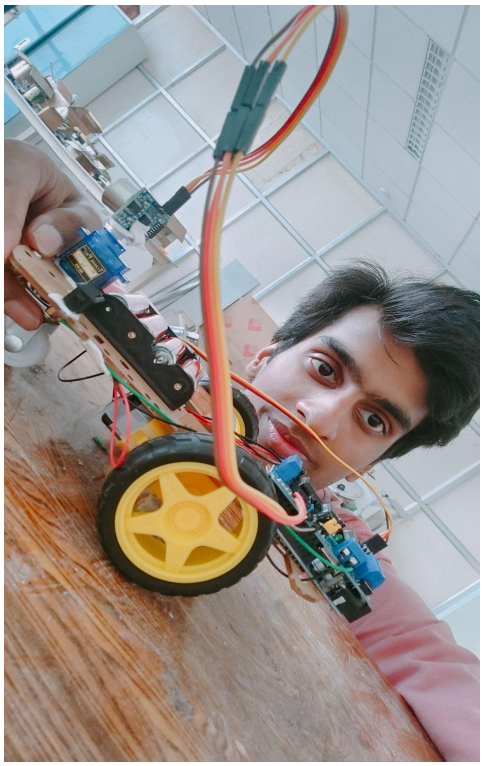
6. Counting instruments access switches parking meters
7. Back sonar of automobiles
8. In mines

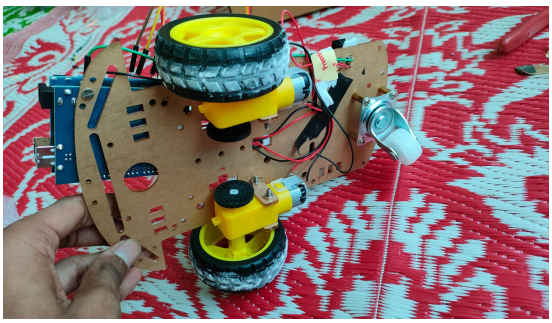
PHOTOS











Code

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

#define TRIG_PIN A1
#define ECHO_PIN A0
#define MAX_DISTANCE 200
#define MAX_SPEED 255  // sets speed of DC  motors
#define MAX_SPEED_OFFSET 20

NewPing sonar(TRIG_PIN, ECHO_PIN, MAX_DISTANCE);

AF_DCMotor motor3(3, MOTOR34_1KHZ);
AF_DCMotor motor4(4, MOTOR34_1KHZ);
Servo myservo;

boolean goesForward = false;
int distance = 100;
int speedSet = 0;
```

```
void setup() {

  myservo.attach(10);
  myservo.write(115);
  delay(2000);
  distance = readPing();
  delay(100);
  distance = readPing();
  delay(100);
  distance = readPing();
  delay(100);
  distance = readPing();
  delay(100);
}
```

```
void loop() {
  int distanceR = 0;
  int distanceL = 0;
  delay(40);

  if (distance <= 15) {
    moveStop();
    delay(100);
    moveBackward();
    delay(300);
    moveStop();
    delay(200);
    distanceR = lookRight();
    delay(200);
    distanceL = lookLeft();
    delay(200);

    if (distanceR >= distanceL) {
      turnRight();
      moveStop();
    } else {
      turnLeft();
      moveStop();
    }
  } else {
    moveForward();
  }
  distance = readPing();
}
```

```
int lookRight() {
  myservo.write(50);
  delay(500);
  int distance = readPing();
  delay(100);
  myservo.write(115);
  return distance;
}

int lookLeft() {
  myservo.write(170);
  delay(500);
  int distance = readPing();
  delay(100);
  myservo.write(115);
  return distance;
  delay(100);
}
```

```
int readPing() {
  delay(70);
  int cm = sonar.ping_cm();
  if (cm == 0) {
    cm = 250;
  }
  return cm;
}

void moveStop() {

  motor3.run(RELEASE);
  motor4.run(RELEASE);
}

void moveForward() {

  if (!goesForward) {
    goesForward = true;

    motor3.run(FORWARD);
    motor4.run(FORWARD);
    for (speedSet = 0; speedSet < MAX_SPEED; speedSet += 2)  // slowly bring the speed up to avoid loading down the batteries too quickly
    {

      motor3.setSpeed(speedSet);
      motor4.setSpeed(speedSet);
      delay(5);
    }
  }
}
```

```
void moveBackward() {
  goesForward = false;

  motor3.run(BACKWARD);
  motor4.run(BACKWARD);
  for (speedSet = 0; speedSet < MAX_SPEED; speedSet += 2)  // slowly bring the speed up to avoid loading down the batteries too quickly
  {

    motor3.setSpeed(speedSet);
    motor4.setSpeed(speedSet);
    delay(5);
  }
}

void turnRight() {

  motor3.run(FORWARD);
  motor4.run(BACKWARD);
  delay(500);

  motor3.run(FORWARD);
  motor4.run(FORWARD);
}

void turnLeft() {

  motor3.run(BACKWARD);
  motor4.run(FORWARD);
  delay(500);

  motor3.run(FORWARD);
  motor4.run(FORWARD);
}
```

RESULT

The result is obtained for an obstacle avoidance robot using Arduino, if the robot moves forward if any obstacle detects 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 a servo motor to rotate the ultrasonic sensor.

CONCLUSION

Almost all navigation robots demand some sort of obstacle detection, hence obstacle avoidance strategy is of most importance. Obstacle Avoidance Robot has a vast field of application. They can be used as service robots, for the purpose of household work and so many other indoor applications. Equally they have great importance in scientific exploration and emergency rescue, there may be places that are dangerous for humans or even impossible for humans to reach directly, then we should use robots to help us. In those challenging environments, the robots need to gather information about their surroundings to avoid obstacles. Nowadays, even in ordinary environments, people require that robots detect and avoid obstacles. For example, an industrial robot in a factory is expected to avoid workers so that it won't hurt them. In conclusion, obstacle avoidance is widely researched and applied in the world, and it is probable that most robots in the future should have an obstacle avoidance function.

FUTURE SCOPE

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 helps to communicate with the robot to send parameters for guiding movement. For obstacle detection, 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 an 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.

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