

Obstacle Avoiding Robot Car

Introduction

Robotics is an interesting and fast growing field. Being a branch of engineering, the applications of robotics are increasing with the advancement of technology.

The concept of Mobile Robot is fast evolving and the number of mobile robots and their complexities are increasing with different applications.

There are many types of mobile robot navigation techniques like path planning, self – localization and map interpreting. An Obstacle Avoiding Robot is a type of autonomous mobile robot that avoids collision with unexpected obstacles.

In this project, an Obstacle Avoiding Robot is designed. It is an Arduino based robot that uses Ultrasonic range finder sensors to avoid collisions.

What is a Robot?

A **robot** (also called a **droid**) is a machine especially one programmable by a computer capable of carrying out a complex series of actions automatically. Robots can be guided by an external control device or the control may be embedded within. Robots may be constructed to take on human form but most robots are machines designed to perform a task with no regard to how they look. The branch of technology that deals with the design, construction, operation, and application of robots, as well as computer systems for their control, sensory feedback, and information processing is robotics.



About our Project:

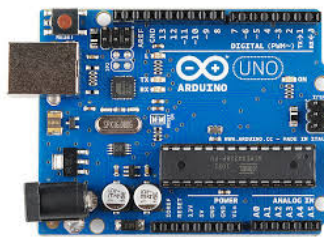
Now day's many industries are using robots due to their high level of performance and reliability and which is a great help for human beings. The obstacle avoidance robotics is used for detecting obstacles and avoiding the collision. This is an autonomous robot. The design of obstacle avoidance robot requires the integration of many sensors according to their task.

The obstacle detection is primary requirement of this autonomous robot. The robot gets the information from surrounding area through mounted sensors on the robot. Some sensing devices used for obstacle detection like bump sensor, infrared sensor, ultrasonic sensor etc. Ultrasonic sensor is most suitable for obstacle detection and it is of low cost and has high ranging capability.

Components Used:

- Arduino UNO
- Ultrasonic Sensor
- L298N Motor driver Module
- Geared Motors
- Car Chassis
- Male-Male Connecting wires
- Male –Female Connecting Wires
- Mini Servo Motor
- Mini Bread-Board

Arduino Uno:



Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online.

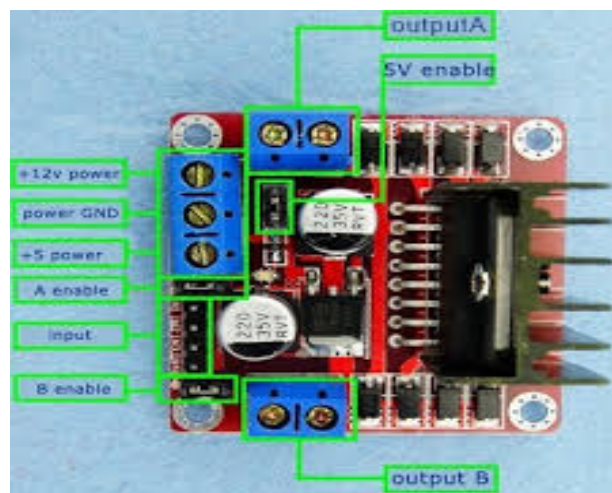
The Arduino Uno R3 is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs).

Ultrasonic Sensor:



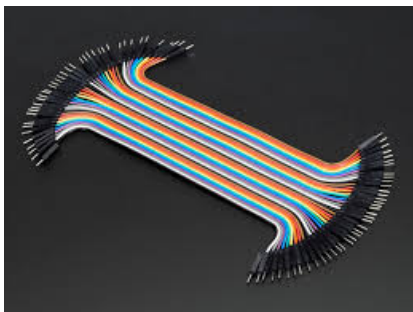
An **Ultrasonic sensor** is a device that can measure the distance to an object by using sound waves. ... By recording the elapsed time between the sound wave being generated and the sound wave bouncing back, it is possible to calculate the distance between the **sonar sensor** and the object. The ultrasonic receiver shall detect signal from the ultrasonic transmitter while the transmit waves hit on the object. The combination of these two sensors will allow the robot to detect the object in its path. The ultrasonic sensor is attached in front of the robot and that sensor will also help the robot navigate through the hall of any building. The HC-SR04 ultrasonic sensor uses sonar to determine distance to an object like bats do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package. From **2cm to 400 cm or 1" to 13 feet**.

L298N Motor Driver Module:

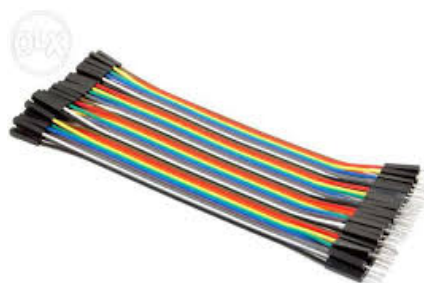


The **L298** is an integrated monolithic circuit in a 15-lead Multi watt and Power SO20 packages. It is a high voltage, high current dual full-bridge **driver** designed to accept standard TTL logic levels and drive inductive loads such as relays, solenoids, DC and stepping **motors**. It can control two motors at time. Controlling the motors means we can control the speed as well as direction of the motors.

Connecting Wires:



Male-Male Connectors



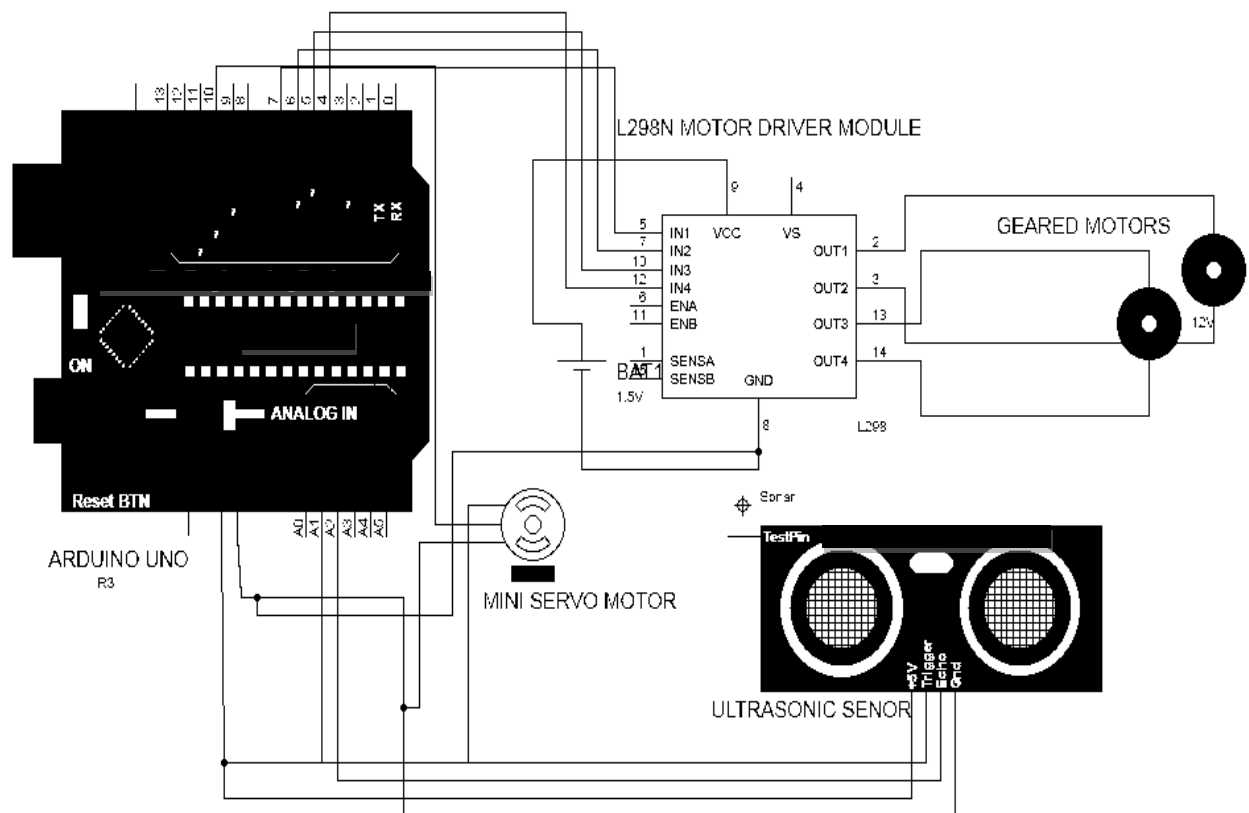
Male-Female connectors

Servo Motor:

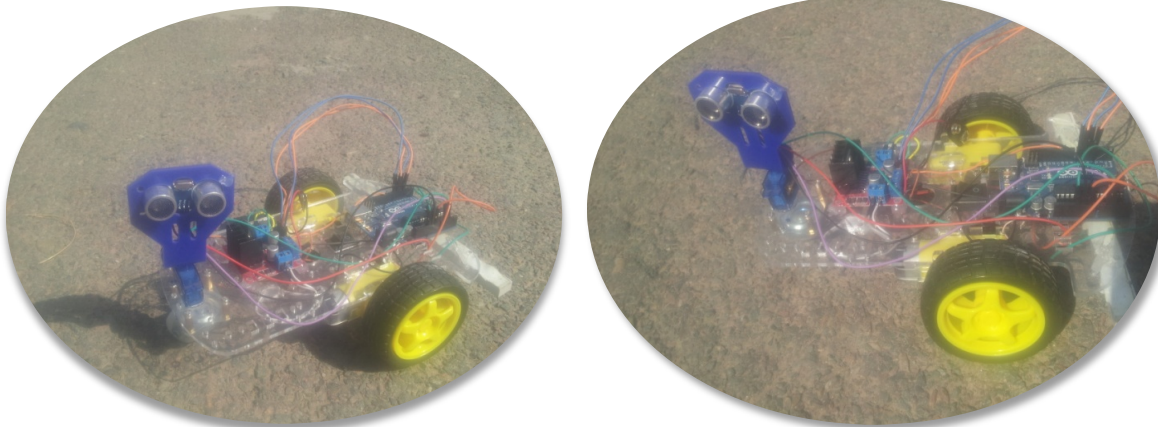


A **servomotor** is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable **motor** coupled to a sensor for position feedback.

Circuit Diagram:



Project Photograph:



Design of Obstacle Avoiding Robot using Arduino

Arduino is the main processing unit of the robot. Out of the 14 available digital I/O pins, 6 pins are used in this project design. The ultrasonic sensor has 4 pins: Vcc, Trig, Echo and Gnd. Vcc and Gnd are connected to the supply pins of the Arduino. Trig is connected to the 11th pin and Echo is connected to 10th pin of the Arduino. L293D is a 16 pin IC. Pins 1 and 9 are enable pins. They are connected to Vcc. Pins 2 and 7 are control inputs from microcontroller for first motor. They are connected to pins 9 and 8 of Arduino respectively.

Similarly, pins 10 and 15 are control inputs from microcontroller for second motor. They are connected to pins 4 and 3 of Arduino. Pins 4, 5, 12 and 13 of L293D are ground pins and are connected to Gnd. First motor (consider this as the motor for left wheel) is connected across the pins 3 and 6 of L293D. The second motor, which acts as the right wheel motor, is connected to 11 and 14 pins of L293D. The 16th pin of L293D is Vcc1. This is connected to 5V Vcc. The 8th pin is Vcc2. This is the motor supply voltage. This can be connected anywhere between 4.7V and 36V. In this project, pin 8 of L293D is connected to 9V supply. Motor Driver boards are available with on – board 5V voltage regulator. A similar one is used in the project.

Working

Before going to working of the project, it is important to understand how the ultrasonic sensor works. The basic principle behind the working of ultrasonic sensor is as follows:

Using an external trigger signal, the Trig pin on ultrasonic sensor is made logic high for at least 10 μ s. A sonic burst from the transmitter module is sent. This consists of 8 pulses of 40KHz.

The signals return back after hitting a surface and the receiver detects this signal. The Echo pin is high from the time of sending the signal and receiving it. This time can be converted to distance using appropriate calculations.

The aim of this project is to implement an obstacle avoiding robot using ultrasonic sensor and Arduino. All the connections are made as per the circuit diagram. The working of the project is explained below.

When the robot is powered on, both the motors of the robot will run normally and the robot moves forward. During this time, the ultrasonic sensor continuously calculates the distance between the robot and the reflective surface.

This information is processed by the Arduino. If the distance between the robot and the obstacle is less than 15cm, the left wheel motor is reversed in direction and the right wheel motor is operated normally.

This will rotate the robot towards right. This rotation continues until the distance between the robot and any obstacle is greater than 15cm. The process continues forever and the robot keeps on moving without hitting any obstacle.

Applications

- Obstacle avoiding robots can be used in almost all mobile robot navigation systems.
- They can be used for household work like automatic vacuum cleaning.
- They can also be used in dangerous environments, where human penetration could be fatal.