Obstacle avoiding car

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***Abstract*—This report gives us the fundamentals of components required to construct a obstacle avoiding car. it explains the construction and working of the obstacle avoiding car which is operated by Arduino**

I. Introduction

The main objective of this paper is to create an obstacle avoiding car. The car must be able to turn to other possible angles when an obstacle is encountered in front of the car. This is done using the help of ultrasonic sensors which will allow us to calculate the distance of the obstacle from the car, a L293D which allows us to drive the motors of the car both clockwise and anticlockwise, the DC motors will be connected to wheels of the car one at each side to enable the car to move straight, turn right, turn left, etc, Arduino is used to control the inputs to motor driver by analysing the output from ultrasonic sensors, a small castor wheel is used at the front to enable the car to turn freely on any direction. All these components are fixed in the chassis of the car to make it as a single unit to perform the required task.

II. Components

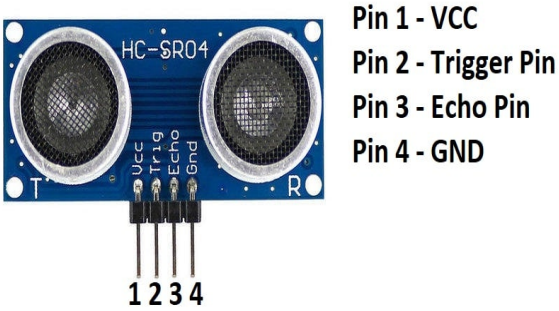
There are several components which was being used in this project as mentioned before. Now let us see the use and working of every component in detailed manner.

A. Ultrasonic sensor

An ultrasonic sensor is a type of electronic equipment that emits ultrasonic sound waves and converts the reflected sound into an electrical signal to determine the distance of a target item. Ultrasonic waves travel quicker than audible sound (i.e. the sound that humans can hear). The transmitter, which generates sound using piezoelectric crystals and the receiver, which encounters the sound after it has traveled to and from the target, are the two primary components of ultrasonic sensors.Ultrasonic sensors are mostly utilized as proximity sensors. They can be found in self-parking technology and anti-collision safety systems in automobiles.

Ultrasonic sensors operate by emitting a sound wave at a frequency that is above the range of human hearing. The distance can be calculated with the following formula:

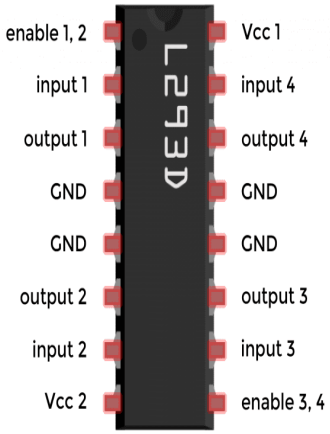
$Distance, L = 1/2 * T * C$ where L is the distance, T is the time between the emission and reception, and C is the sonic speed. (The value is multiplied by 1/2 because T is the time for go-and-return distance.)



- VCC - powers the sensor
- Trigger - This pin has to be kept high for 10us to initialize measurement by sending US wave.
- Echo - HIGH for the duration of sensing the return waves
- Ground - connected to the ground of the system

B. L293D motor driver

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It works on the concept of H-bridge. H-bridge is a circuit which allows the voltage to be flown in either direction.



- VCC - provides power to the drivers
- INPUT - controls the corresponding OUTPUT pins
- OUTPUT - gets connected to motors and driven by control inputs.
- Ground - connected to the ground of the system
- Enable - Enables whether the outputs should work or not

C. Arduino Uno

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

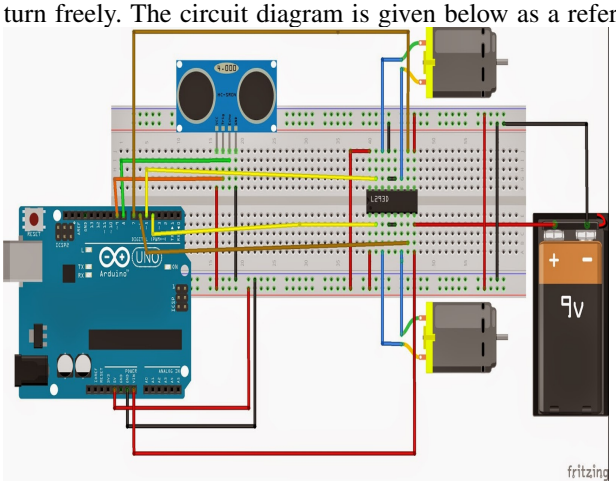
D. DC motors

A DC motor is an electric motor that runs on direct current power. It works on the fact that a current-carrying conductor placed in a magnetic field experiences a force that causes it to rotate with respect to its original position. It is driven by motor drivers in this case.

III. Circuit

A. Construction

The VCC and ground pins of ultrasonic sensors are connected to the VCC and ground pins of the Arduino UNO. The TRIGGER and ECHO pins of the ultrasonic sensors are connected to the digital pins 13 and 12 respectively. The input pins 1 and 2 of the L293D driver is connected to the digital pins 10 and 11 of the Arduino which is responsible for operating left wheel motor as the output pins 1 and 2 are connected to a DC motor which rotates the left wheel of the car. The input pins 3 and 4 of the L293D driver is connected to the digital pins 8 and 9 of the Arduino which is responsible for operating right wheel motor as the output pins 3 and 4 are connected to a DC motor which rotates the right wheel of the car. The VCC pin of the driver and Vin pin of the Arduino is connected to the positive terminal of a 9V battery whereas the negative terminal is connected to ground of whole system. The enable pins of the driver are connected to 5V pins of the Arduino as it enables the inputs of the driver to be active. The system is properly set on a chassis and a small castor wheel is fit at the front of the chassis to enable the car to turn freely. The circuit diagram is given below as a reference.



B. Working

First of all we set the TRIGGER pin of the ultrasonic sensor to HIGH for 10us to send a wave. We measure the duration of the ECHO pin when it is HIGH using the pulseIn function of the Arduino. Then with necessary calculations we will get the distance of the obstacle from the car. If the obstacle is present at a distance of more than 15cm, then we set both the motors to move forward using the input pins of the driver module and we continuously check for obstacle distance. if the obstacle is present at a distance of less than 15cm, then we take a left turn. This is done by setting the right motor to move forward while keeping the left motor to stay still. If the obstacle distance is less than 15cm even after making the first turn, then we come to original position by moving the right motor alone in backward direction then we move the left motor alone in the forward direction to turn right to the initial position. If the obstacle is still present nearer than 15cm, then we move the left motor alone in forward direction to achieve the opposite direction to the initial position. by this way we can move the car without hitting any obstacle. it is important to note that after making the turns both motors are set to be moving in forward direction.

IV. Conclusion

We have created an obstacle avoiding car using ultrasonic sensor and motor driver by driving the motors to turn in right directions whenever an obstacle is encountered at a distance of less than 15cm by the ultrasonic sensor.

V. References

1) https://www.apogeeweb.net/electron/what-is-an-ultrasonic-sensor.html
2) https://www.rakeshmondal.info/L293D-Motor-Driver#:~:text=L293D
3) https://create.arduino.cc/projecthub/electronicprojects/obstacle-avoidin