Obsatacle Avoidance Robotic Vehicle Using Hc-Sr04 Ultrasonic Sensor

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Abstract: This paper reports regarding an self-determining hurdle avoiding robotic vehicle which is directed with help of a ultrasonic sensors . Arduino micro-controller manages the hurdle deviator and is constructed bythe ultrasonic sensor. In front part of the deviator the ultrasonic sensors is firmed . By help of the sensors held in front side deviator fetches the data . Thus the sensor recoginizes the hurdle and alters the way to choose the free way . The I/P is sent by sensing element to controller and compares by assistance of the controller to determine the motion of the obstacle deviator.
Keywords: Arduino Uno, Motor driver, Obstacle avoidance, Ultrasonic sensor, Servomotors.

1.   Introduction

This project represents the building and design of an obstacle vehicle avoider using ultrasonic sensors for the movements. Arduino- uno is used for achieving the required operations. Obstacle Avoiding Robot Vehicle is a mixture of software and hardware parts like motors. Software involves the program command given by the end-user. Our work justifies that a vehicle that consists of built-in ability in order to guide by itself whenever an
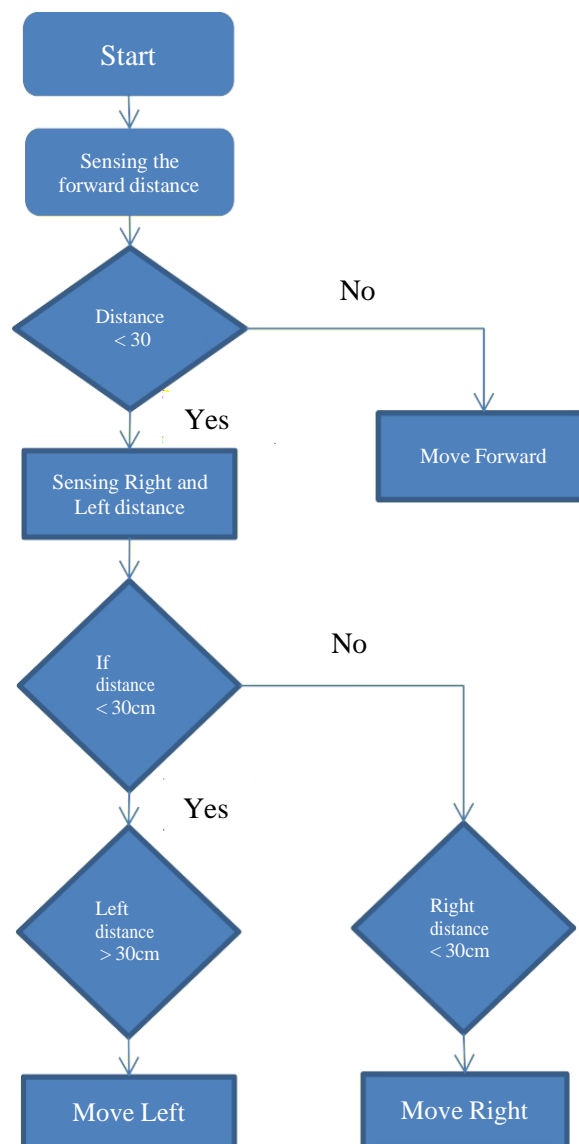

Fig.1 Flowchart of Obstacle Avoiding Robot

obstacle appears . Detection of the hurdle is the main requirement of this self-determining vehicle. The obstacle avoider gets the information and data from nearby through the mounted sensors on the robot vehicle. These days according to the fast-moving technology, this type of projects has various merits like it has enough intelligence in covering the area of available space.Self-determining obstacle avoiding robot can perform the tasks without the help of any person. Thus, this type of automation can be used in cars and any kind of vehicles according to the requirements, so that it can automatically senses the hurdle and diverges to free path so any type of accidents or destruction may not happen.

2. Basic operation

The robot vehicle has been arranged to discover the objects in the particular space. If it finds outs the object then the vehicle will diverge from it. When the sensor senses the object in moving direction then it stops and checks if any hurdle is present in left or right direction. If any hurdles are present to the right-side direction with near space,then it diverges to hurdle free path. Similarly, the self-determining hurdle avoid-er does if any object is present in left side direction.

2.1HADWARE COMPONENTS

- ◆ Motor Driver IC – L293D
- ◆ Geared Motors x 2
- ◆ Ultrasonic Sensor – HC – SR04
- ◆ Servo Motor (Tower Pro SG90)
- ◆ Power Supply
- ◆ Arduino Uno

2.1.1 COMPONENTS DESCRIPTION:

Ultrasonic Sensor HC-SC04: An Ultrasonic device passes the ultrasonic movement from sensor and again receives the ultrasonic signals reflected by the body .Ultrasonic sensor is dense and has a very high conducting.

Fig.2 Structure of HC-SC04 Ultrasonic sensor

Motor Driver Module(L298D): L298N H-bridge module is used with motors that have the voltage in the middle of5v and 35v DC. The motor supervision is managed by sending LOW or HIGH signal to drive for of the motor or channel.

Fig.3 Motor Driver L298D

Arduino uno: Arduino uno acts as micro controller which is built on ATmega328P. It has a 14 digital I/P or O/P pins. Out of 14, 6 pins are used as usb port ,16Mhz quartz crystal ,six analog inputs.

3.   Methodology

In our project HC-SR04 ultrasonic sensor is used to determine the distance of an object or obstacle. HC-SC04 offers excellent features like contactless range observation from 2 cm to 400 cm or 1feet to 13 feet .The frequency signal would be emitted by Ultrasonic device. If vehicle notices any hurdle, then they strike back the echo signal which is gethold of the I/P to the sensor direct echo pin. The user initializes the activate and echo pin as 0 and by which vehicle goes in onward observation. When hurdle is found the echo pin will signal I/P as 1 to micro controller. Through the hurdle the time space is measured by pulse signals . Each time the task holds till the pin goes big and then starts timing, the regulation will be

stopped when the pin becomes small .The pulse length in microseconds is been given until the full pulse is not collected within the time it is stipulated.

The meaning of timing is set, is it provides extent of pulse and mistakes appear in short pulses. The Pulse duration from 10ms to 3 minutes in point are taken over into consideration. After the time is set, it converts into space. If the space of the object is small then the pace of robot is decreased and would take diversion towards the left , if hurdle is existing in left portion, then it is observed that the right turn is intimated. If the space is too less between deviator and object then motion of vehicle is decreased and then turns in reverse way and then can go in left or right supervision.

Micro controller manages the left, right, reverse and forward supervision of hurdle avoid-er based on signals or I/P stated by ultrasonic sensor. In order to manage the pace of motors PWM is used.
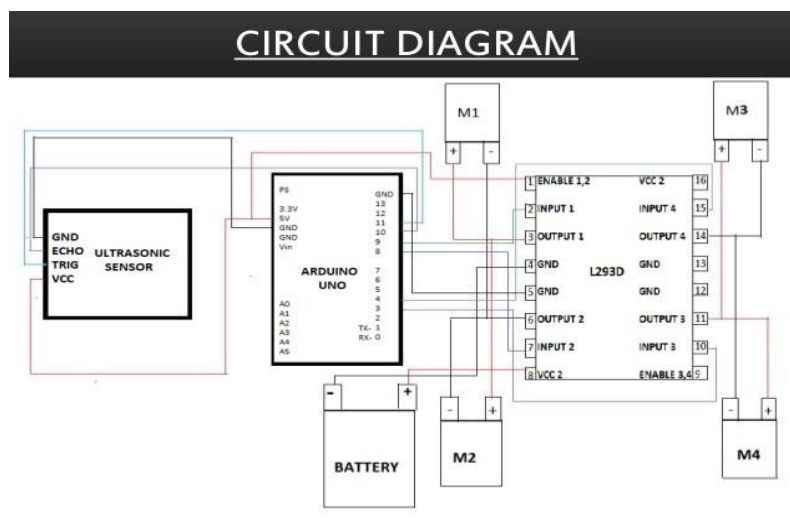

Fig.4 Working Diagram of Obstacle Avoiding Robotic vehicle

Operation of Obstacle avoider use software, which involves the program which assist in fixing up the HC-SR04 sensorand outcoming signals to motor pins to go in wanted supervision. Initially, we adjust the trig and echo pin of HC-SR04in the program plan. Hardware connection trig pin is given to pin nine of Arduino panel and echo pin is set as I/P. If space is more then it means no hurdle is there and goes in forward supervision.

If the space is less, then it decides as there is hurdle in way, so that the robot vehicle stops and looks over whether there is hurdle on other side, if no it starts going forward.

3.1 Operation of Ultrasonic Sensor (HC-SR04)

When an electric pulse of more voltage is given to the ultrasonic transducer then it vibrates and makes sound waves. When the hurdles are discovered by ultrasonic sensor the sound waves are throw back as a signal and makes an electric pulse. The ultrasonic recipient will discover signal from ultrasonic transmitter and transmitted waves falls on the hurdle. Combination of these 2 makes the vehicle to discover the hurdle in the way it is going.

4. Block digram of obstacle avoiding robotic vehicle

power

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                          ┌─────────────────────┐
                          │  Ultrasonic sensors │
                ┌────────>│     (HC-SR04)       │
                │         └─────────────────────┘
                │                    │
                │                    ▼
┌──────────────────┐       ┌─────────────────────┐
│    Battery       │       │    Arduino UNO      │
│  (6V UM 3R-6)    │──────>│   Micro controller  │
└──────────────────┘       └─────────────────────┘
                │                 │       │
   Power for DC motors           ▼       ▼
                │         ┌─────────────────────┐
                │         │    Motor Driver     │
                └────────>│     (L293D )        │
                          └─────────────────────┘
                                    │
                                    ▼
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                          │     DC Servo        │
                          │      motors         │
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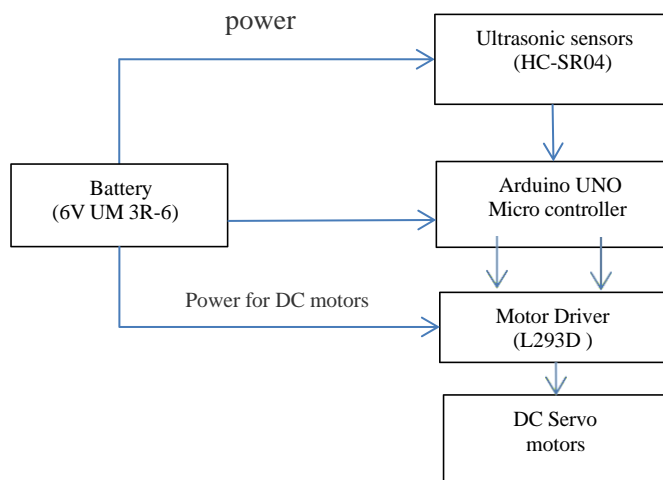
Fig.5 Block Diagram of Obstacle Avoiding Robot

5. RESULTS and OUTCOMES

The outcome defines how systematically the projects. Mainly when the robot switches ON it look over, whether the begin signal is collect or not. self-determining hurdle avoider was trailed by **Pre-set test** which defines the hurdles are placed in definite angles and space so that to look over that robot vehicle is working properly without any struggles. Even the hurdle avoiding vehicle was trailed by **Free style test.** Vehicle also works easily even in free distance without setting any hurdles allover vehicle.
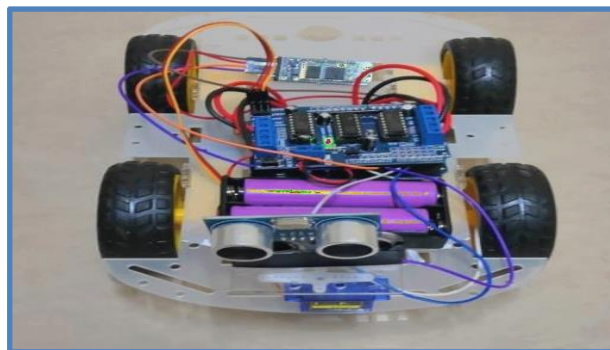

Fig.6 Obstacle Avoiding Robot

6. Conclusion

From this project, the Obstacle Avoiding Robotic Vehicle has achieved the objectives that is stated.The Obstacle Avoiding Robotic vehicle was developed by good intelligence so that it can easily determine the obstacles and process the signal from sensor at perfect timing without any delay to micro-controller so that it deviates by the

obstacle perfectly without any collision. The following technology can be handled in different fields like mobile robot navigation systems, It is handled for house work like automatic vacuum cleaning, Used in dangerous environments, In Back of sonar automobiles.

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