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Object Detection Robot Using Arduino

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ABSTRACT

The goal of the project is to create a robotic vehicle that can avoid obstacles by employing ultrasonic sensors to guide it. The requested operation is accomplished using an Arduino. A robot is a machine that can complete tasks manually or automatically. The proposal suggests a robotic vehicle that has an intelligence integrated into it so that it can steer itself around obstacles. Using Arduino, this robotic car was constructed. Any obstruction in front of it is detected by an ultrasonic sensor, which then instructs the Arduino. The Arduino controls the motors that are connected to it using a motor driver to command the robot to move in a different direction based on the input signal it receives. We can simultaneously manage the steering to carry out the function of obstacle avoidance. The robot automobile has rear wheel drive and front axle steering. Two DC motors with gear reduction systems power two driving tires.

Keywords: Obstacle, Robotics, Avoidance, Detection, Wheeled robot.

INTRODUCTION

Avoidance of obstacles Robots are made to prevent accidents while navigating over uncharted territory. Robot that avoids obstacles detects them in its route, avoids them, and then continues going. Robot navigation techniques include things like wall-following, edge recognition, line-following, and many others. Edge detection is a more generic and widely used approach for obstacle avoidance. Obstacle avoidance based on edge detection has the drawback of requiring the robot to halt in front of an obstruction to get a more precise assessment. All mobile robots include some kind of collision avoidance, from simple algorithms that detect an impediment and cause the robot to halt in order to prevent a collision to more complex algorithms that allow the robot to avoid collisions altogether. The latter methods require both the identification of a barrier and some type of quantitative measurement pertaining to the obstacle's size, making them more difficult. Once they are known, the robot must be guided around the obstruction via the obstacle avoidance algorithm before continuing its path toward the original destination. The robot won't have to halt in front of an obstruction while navigating thanks to the steering algorithm. Any obstruction in front of it is detected by an ultrasonic sensor, which then transmits an instruction to the microcontroller. As a result, the robots may be able to get around some of the issues with navigation that were outlined above and traverse without incident while operating. If the IR sensor were used Infrared radiation is used by infrared sensors to gauge an object's distance. There are restrictions on the sensor that are present when the light beam identifies an object and returns to the receiver at an angle after reflection. The inability of IR sensors to tolerate light reflections from bright objects or ambient light has hampered their performance. No object detection in the dead zone, such as the 0 to 4 cm dead zone of the Sharp GP2D12 IR distance sensor. Transparent or brightly colored materials might also result in false detection results from IR sensors. Results of detection are also influenced by the weather, and IR sensors' detecting accuracy declines with moisture and humidity.

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LITERARY SURVEY

A promising robot that avoids obstacles was developed by Md. Dinesh Kumar, Rakesh Chandra Kumar, and Saddam Khan .A project led by Sarmistha Mondal, Rajesh Biruaas well as Manas Kumar Parai. A walking robot was proposed that was able to do the basic movements of walking The gear motors are powered by two motors. This device can easily sense obstacles and by processing the signal it avoids them perfectly between them.[1]

Pavithra A C and Subramanya Goutham V designed a "obstacle avoidance robot using Arduino." They created a robot that uses the Arduino platform for data processing to recognize and then avoid obstacles in its route. Three ultrasonic sensors with a broader range of detection were employed to identify obstacles. The robot is totally self-sufficient.[2]

Vicky Barua, Md. ArifIsteik Neloy, Shahid Uddin Rahat, Mithun Das, Md. Shafiul Islam Joy, Abhijit Pathak, and NazmunNahar have designed and constructed "An Ultrasonic line follower robot to identify obstacles and edges for industrial rescue operations." They created a robot prototype for use in industry. Their robot is clever and sophisticated and offers extra advantages due to its low power consumption. Their robot travels along a predetermined path (line) and detects obstacles and edges with intelligence. Then, it avoids the obstruction and moves in accordance with the predetermined behavior for it. [3]

Aamir Attar, Aadilansari, Abhishekdesai, Shahid Khan, and Dipashrisonawale have designed and developed "line follower and obstacle avoidance bot using arduino" to create an autonomous robot that intelligently detects the obstacle in its path and navigates in accordance with the actions that user sets for it. By substituting robotic technology for experienced personnel, which can manage more patients in less time with higher precision and a cheaper per capita cost, this method offers an alternative to the current system.[7]

Paul Kinsky is the creator of the "Obstacle Avoidance Robot," which Quan Zhou described as a robot with a few mechanical parts to add two more functions to the primary body, namely the laptop holder and the camera holder. The AT89S52 development board, which was used to smoothly regulate the motors, was created, produced, and tested on a big scale. For proper computer vision calibration, the very inexpensive cameras are fixed and adjusted on the camera holder. Users set up a serial communication channel using a USB port between the higher laptop and the bottom development board. The development board will receive a signal from the laptop indicating the motor status.

IMPLEMENTATION

The obstacles avoiding robot block diagram is given below as following**:**

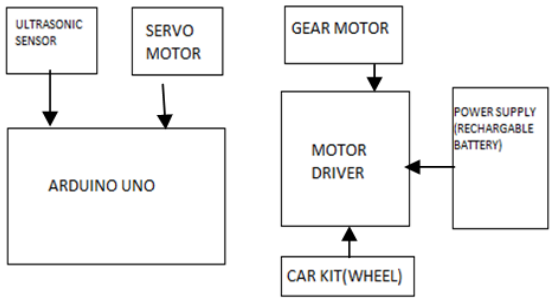


Figure.1: Block Diagram Of Obstacles Avoiding Robot

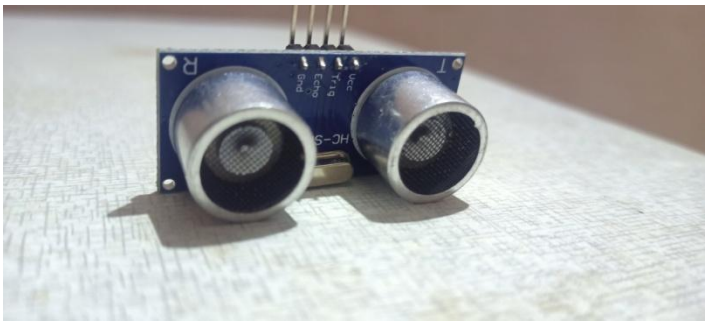
The ultrasonic sensor uses a sonar system to measure distance to an object, similar to how bats do it. From around 2 cm to 400 cm, or 1 foot to 13 feet, it provides outstanding non-contact range detection. Neither sunshine nor dark objects have an impact on its operation. The signal is brief and high frequency and is sent by the ultrasonic sensor. If they identify an item, they return the echo signal that is input to the sensor through the Echo pin by reflecting it. First, the operator sets the Trigger and Echo pins to a low beginning position before moving the robot forward. When an obstruction is identified, the echo pin will provide a high-level input to the microcontroller.Pulse For estimating the time of distance from the barrier, in function is employed. Every time the function starts timing as it waits for the pin to go high, timing is terminated when the pin goes low. If a complete pulse was not received within the timeout, it returns the pulse length in microseconds. The timing has been established, which means it provides the pulse's duration and will reveal timing issues in shorter pulses. Pulses of a duration of 10 microseconds to 3 minutes are considered. It translates into a distance after the time has been established. When an item is somewhat distant, the robot slows down and makes a left turn. If an obstacle is on the left side, the robot does a right turn. When the target comes close, the

robot's speed decreases and it turns backward before moving left or right. A microprocessor was mounted on an Arduino development board, which was used to construct this robot.

The motor driver board connects the Arduino board to the DC motor and powers the actuators. Robots may be moved forward, backward, left, and right using actuators. The table above provides a quick summary of the input pins for the robot's movement. When a barrier that can be identified by ultrasonic sensors is present in its route, the robot's progress will stop. The microcontroller receives time in length as an input from ultrasonic sensors for additional operations.

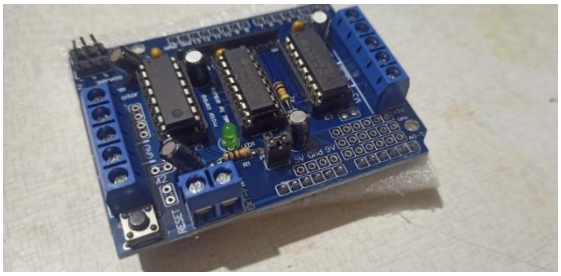
RELATED WORKS

1. **Ultrasonic Sensor**



Obstacle-avoidance sensors There are several different sensors that may be used to detect barriers. Among the most well-liked sensors are: Sonar, cameras that can be utilized for computer vision, infrared (IR) sensors, and ultrasonic sensors. It can measure the distance between roughly thousands and hundreds of points in its area of view. Ultrasonic sensors are being used in the robot's design for obstacle recognition and avoidance. When an obstruction is recognized, the ultrasonic sensors constantly transmit frequency signals, which are then reflected back and used as input by the sensor.

2. **Servo Motor Shield**

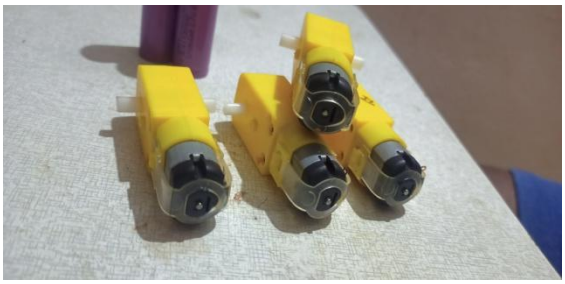


A high voltage, monolithic integrated 4-channel, high current driver is the servo motor L293D. In essence, this indicates that we can operate DC motors with this device. Using the chip and a power source of up to 36 Volts can provide up to 600mA of current per channel. Another name for the L293D chip is HBridge. Typically, the H-Bridge is an electrical device. circuit that permits the application of a voltage across aany load applied in any direction to an output, such as a motor.

3. **Servo Motor**

A servo is made up of a motor gear assembly, a potentiometer, and a controlling circuit. First, we lower RPM by using a gear assembly. and to boost the motor's torque. say at first the location of the servo motor shaft, the There is no potentiometer knob on the device because electricity coming from the output port of the potentiometer. the electrical an additional input terminal of the is supplied a signal. amplifier with error detector. Now, the feedback mechanism will process the difference between these two signals—one coming from a potentiometer and the other coming from another source—and deliver an output in the form of an error signal. This erroneous signal serves as the motor's input, and the motor begins to rotate. Currently, a potentiometer is attached to the motor shaft, and while the motor turns, a signal is produced by the potentiometer and the motor. Consequently, the output feedback signal of the potentiometer varies as its angular position does. After some time, the potentiometer's position reaches a point where its output matches the supplied external signal. There won't be an output signal from the amplifier to the motor input in this situation since there is no distinction between the externally applied signal and the potentiometer's signal output, and the motor ceases to rotate in this circumstance.

4.**Dc Motor**



A Direct current (DC) motors are rotating electrical devices that convert DC electrical energy into mechanical energy for equipment boards.[8] As DC voltage is given to an inductor's terminal, the coil within the DC motor generates a magnetic field that causes rotational motion. An iron shaft that is covered with a coil of wire is located inside the motor. Two North and South fixed magnets are positioned on either side of this shaft, producing an attractive and a repelling force that causes torque.[9]

5. **Arduino Uno:**

The Arduino Uno is an open source microcontroller board created by Arduino.cc that is based on the Microchip ATmega328P microprocessor[5]. Various expansion boards (shields) and other circuits can be interfaced with the board's sets of digital and analog input/output (I/O) pins.[4]. The board features 6 analog I/O pins, 14 digital I/O pins, and 14 digital I/O pins. It can be programmed using the Arduino IDE (Integrated Development Environment) with a type B USB connector. [6]. It can be programmed using the Arduino IDE (Integrated Development Environment) with a type B USB connector. It accepts voltages between 7 and 20 volts, but it may also be powered by an external 9-volt battery or by a USB connection.

CONCLUSION

This offers an obstacle-avoiding robot that can sense impediments in its route and steer clear of them by changing course. Arduino is used to build the robot, which distributes information to various components. Ultrasonic sensors have been utilized for object detection because they have a larger field of vision. The sensor has been rotated using a servo motor. Two geared motors enable the robot to move. It is skillfully dodging any impediments that are in its way.

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