Obstacle Avoiding Robotics Car using Arduino

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Abstract- Obstacle avoidance is one of the most important aspects of mobile robotics. Without it, robot movement would be restrictive and fragile. Third project propose robotic vehicle that has an intelligence built in it such that it directs itself whenever an obstacle comes in its path. So, to protect the robot from any physical damages. This can be designed to build an obstacle avoidance robot vehicle using ultrasonic sensor for its movement .A microcontroller (ATmega 328p) is used to achieve the desired operation. An ultrasonic sensor is used to detect any obstacle ahead of it and sends a command to the microcontroller. Depending on the input signal received ,the microcontroller redirects robot to move in an alternate direction by actuating the motors which are interfaced to it through a motor driver.[4]

Keywords :*Arduino microcontroller ,Ultrasonic Sensor, arduino software*

Introduction: Robotics is part of Todays communication. In today's world ROBOTICS is fast growing and interesting field. It is simplest way for latest technology modification. Now a days communication is part of advancement of technology, so we decided to work on ROBOTICS field, and design something which will make human life simpler in day today aspect. Thus we are supporting this cause. An obstacle avoiding robot with voice control is an intelligent device, which can automatically sense and overcome obstacles on its path. Obstacle Avoidance is a robotic discipline with the objective of moving vehicles on the basis of the sensorial information. The use of these methods front to classic methods (path planning) is a natural alternative when the scenario is dynamic with an unpredictable behavior. This ROBOT has sufficient intelligence to cover the maximum area of provided space. It has a ultrasonic 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. We have used four D.C motors to give motion to the ROBOT. [3]

Literature Review: This paper presents a novel obstacle avoidance constraint and a mixed integer predictive control (MIPC) method for space robots avoiding obstacles and satisfying physical limits during performing tasks. Firstly, a novel kind of obstacle avoidance constraint of space robots, which needs the assumption that the manipulator links and the obstacles can be represented by convex bodies, is proposed by limiting the relative velocity between two closest points which are on the manipulator and the obstacle, respectively. Furthermore, the logical variables are introduced into the obstacle avoidance constraint, which have realized the constraint form is automatically changed to satisfy different obstacle avoidance requirements in different distance intervals between the space robot and the obstacle. Afterwards, the obstacle

avoidance constraint and other system physical limits, such as joint angle ranges, the amplitude boundaries of joint velocities and joint torques, are described as inequality constraints of a quadratic programming [4]

Recent years, the flight control technology over quad copter has been boosted vigorously and acquired the comprehensive application in a variety of industries. However, it is prominent for there to be problems existed in the stable and secure flight with the development of its autonomous flight. Through comparing with the characteristics of ultrasonic ranging and laser Time-of-Flight(abbreviated to ToF) distance as well as vision measurement and its related sensors, the obstacle detection and identification sensors need to be installed in order to effectively enhance the safety flying for aircraft, which is essential for avoiding the dangers around the surroundings..[5]

This paper presents a new formulation of the artificial potential approach to the obstacle avoidance problem for a mobile robot or a manipulator in a known environment. Previous formulations of artificial potentials for obstacle avoidance have exhibited local minima in a cluttered environment. To build an artificial potential field, harmonic functions that completely eliminate local minima even for a cluttered environment are used. The panel method is employed to represent arbitrarily shaped obstacles and to derive the potential over the whole space. Based on this potential function, an elegant control strategy is proposed for the real-time control of a robot. The harmonic potential, the panel method, and the control strategy are tested with a bar-shaped mobile robot and a three-degree-of-freedom planar redundant manipulator.[7]

An obstacle avoidance system is being proposed. The system will combine available flight controller with a proposed avoidance method as a proof of concept. Quadcopter as a UAV is integrated with the system which consist of several modes in order to do avoidance. As the previous study, obstacle will be determined using ultrasonic sensor and servo. As result, the quadcopter will move according to its mode and successfully avoid obstacle.[6]

Circuit Diagram
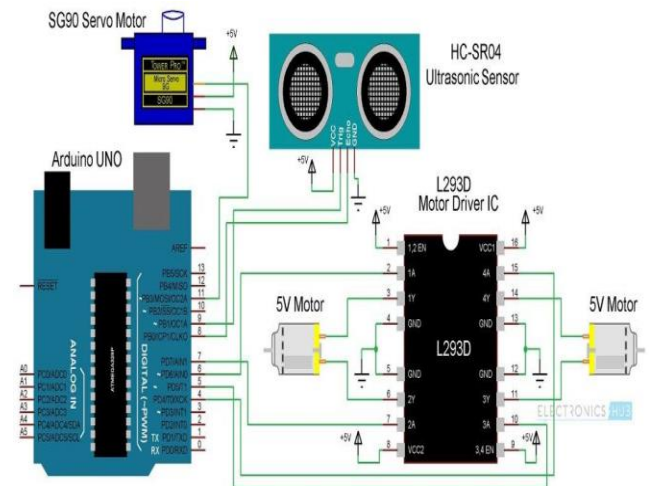
Working of Project

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 10µs. 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 calculate 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 Robot stops and scans in left and right directions for new distance using Servo Motor and Ultrasonic Sensor. If the distance towards the left side is more than that of the right side, the robot will prepare for a left turn. But first, it backs up a little bit and then activates the Left Wheel Motor in reversed in direction. Similarly, if the right distance is more than that of the left distance, the Robot prepares right rotation. This

process continues forever and the robot keeps on moving without hitting any obstacle. Assemble the circuit as shown in the schematic given below. You can use the battery pack for powering driver circuit which I have mentioned in the components section or you could try out some other battery pack, but keep it mind it should deliver between 7-12V and atleast 3500mAh. Also, use different battery/battery-packs for powering Arduino and the Motor-Driver module, but ensure they share a common ground**.** Compile the code given below in the Arduino-IDE and hit upload. Turn on the toggle switch and watch the robot avoiding obstacles [1]

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.[8]

Conclusion

The goal of our project is to create a autonomous robot which intelligently detects the obstacle in his path and navigate according to the actions we set for it. It is to create a autonomous robot which intelligently detects the obstacle in his path and navigate according to the actions that I set for it. 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 helped to communicate with the robot to send parameters for guiding movement. For obstacle detection, the 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 unknown environment with obstacles, it moved while avoiding all obstacles with considerable accuracy.[2]

Future Scope

It can easily recognize the voice commands and runs smoothly. Further enhancement in project can be used for Home security and military purposes where the commands can be given to robot without risk by increasing the range and by installing cameras. This robot is able to produce the basic walking movements using two gear motors. They developed the robot with a very good intelligence which is easily capable to sense the obstacle and by processing the signal coming from the sensor it is perfectly avoiding the obstacle coming in the path[2]

References

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