INTERNATIONAL RESEARCH JOURNAL OF ENGINEERING AND TECHNOLOGY (IRJET) E-ISSN: 2395-0056
VOLUME: 07, SPECIAL ISSUE | JUNE 2020 WWW.IRJET.NET P-ISSN: 2395-0072
International Conference on Recent Trends in Science & Technology-2020 (ICRTST - 2020)
Organised by: ATME College of Engineering, Mysuru, INDIA

Obstacle Avoiding Vehicle

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Abstract- The ability to detect and avoid obstacles in real time is an important design requirement for any practical application of autonomous vehicles. Therefore, a significant number of solutions have been proposed for this problem. Unfortunately, most of these solutions demand a heavy computational load, which makes them difficult, if not impossible, to implement on low cost, microcontroller based, control structures, This paper proposes a novel, reactive algorithm for real time obstacle avoidance, compatible with low cost ultrasonic sensor, fast enough to be implemented on embedded microcontrollers. We called this algorithm "*the bubble rebound algorithm*". According to this algorithm, only the obstacles detected within an area called "sensitivity bubble" around the robot are considered. Upon detection of an obstacle, the robot "rebounds" in a direction having the lowest density of obstacles, and continues its motion in this direction until the goal becomes visible, or a new obstacle is encountered. The performances and drawbacks of the method are described, based on the experimental results with simulators and real robots.

Key Words: Obstacle Avoidance; Ultrasonic sensor; Reactive Algorithm.

1. INTRODUCTION

The capacity to recognize and evade obstacles continuously is a significant plan necessity for any down to earth use of independent vehicles. In this way, a noteworthy number of arrangements have been proposed for this issue. Sadly, the greater part of these arrangements request an overwhelming computational burden, which makes them troublesome, if not impossible, to implement on low cost, microcontroller-based, control structures. The latter algorithms are more complex, this system provides an alternate way to the existing system by replacing skilled labour with robotic machinery involve detection of an obstacle as well as some kind of quantitative measurements concerning the obstacle's dimensions. Once these have been determined, the obstacle avoidance algorithm needs to steer the robot around the obstacle and resume motion toward the original target

This paper presents the results an algorithm for obstacle avoidance relying on low cost ultrasonic or infrared sensors, and involving a reasonable level of calculations, so that it can be easily used in real time control applications with microcontrollers

2. LITERATURE REVIEW

"line follower and obstacle avoidance bot using arduino" has been designed and developed by Aamir attar, Aadilansari, Abhishekdesai, Shahid khan, Dipashrisonawaleto make a self-governing robot which brilliantly distinguishes the hindrance in its way and explores as indicated by the activities that client set for it. So this framework gives a substitute route to the current framework by supplanting gifted work with automated hardware, which in turn can handle more patients in less time with better accuracy and a lower per capita cost [1].

"Obstacle-avoiding robot with IR and PIR motion Sensors" has been designed and developed by Aniket D. Adhvaryu et al has proposed that created robot stage was not intended for explicit undertaking however as a general wheeled self-governing stage. It can hence be utilized for instructive, investigate or mechanical usage. Understudies can utilize itto learn the microcontroller programming using C++, Arduino Uno 1.6.5 compiler, IR and PIR sensors characteristics, motor driving circuit and signal condition circuit design. Research on hindrance shirking robot at the polytechnic level can assist understudies with developing correspondence, specialized abilities and cooperation. The structure of such robot is entirely adaptable and different techniques can be adjusted for another execution. It shows that PIR sensors are progressively touchy contrasted with IR sensors while recognizing individual [2].

"Obstacle Avoidance Robotic Vehicle Using Ultrasonic Sensor, Android and Bluetooth for Obstacle Detection" has been designed and developed by Vaghela et.al has mentioned that enormous amount of work has been done on wireless gesture controlling of robots. Various methodologies have been analyzed and reviewed with their merits and demerits under various operational and functional strategies. Thus, it can be concluded that features like user friendly interface, light weight and portability of android OS based smart phone has overtaken the sophistication of technologies like

programmable glove, static cameras etc., making them obsolete. Although recent researches in this field have made wireless gesture controlling a ubiquitous phenomenon, it needs to acquire more focus in relevant areas of applications like home appliances, wheelchairs, artificial nurses, table top screens etc. in a collaborative manner [3].

"Obstacle Avoidance Robot" has been designed and developed by Paul Kinsky, Quan Zhou mentioned that robot with a couple of mechanical segments to add two additional capacities to the principle body, to be specific the PC holder and the camera holder. AT89S52 development board is designed, developed and tested in a large scale, which was utilized to control the engines easily. The cameras with generally minimal effort are fixed and balanced on the camera holder for good alignment of the PC vision. Users set up the sequential specialized strategy between the upper PC and the lower improvement board with USB port. The PC will convey a sign of the engine condition to the improvement board [4].

3. IMPLEMENTATION AND METHODOLOGY

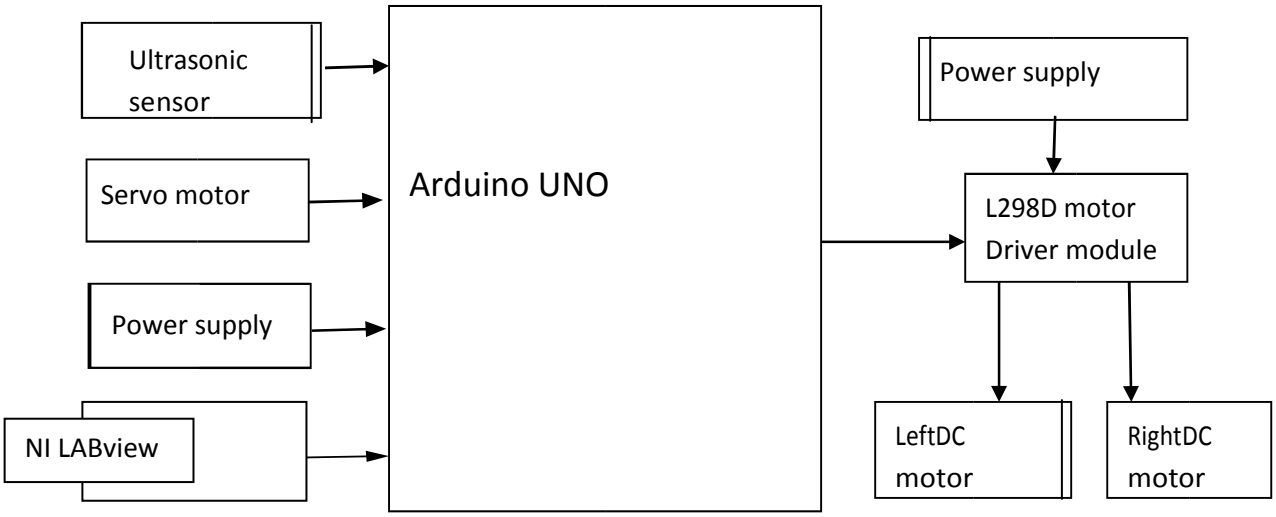

FIG 1: BLOCK DIAGRAM OF OBSTACLE AVOIDING VEHICLE

The ultrasonic sensor produces the short and high recurrence signal. These proliferate noticeable all around at the speed of sound. On the off chance that they hit any article, at that point they reflect back reverberation sign to the sensor. The Arduino is customized utilizing NI lab view to identify these reflected signs and to ascertain the range at which this sign is reflected back, in view of this count the arduino alters the course of vehicle to a way where there is less impediments, The ultrasonic sensor empowers the robot to for all intents and purposes observe and perceive object, stay away from snags, measure separation. The working scope of ultrasonic sensor is 10 cm to 30 cm.

In this venture the yield from the ultrasonic sensor is given to the Arduino uno controller as a contribution to process them as per codes which are really installed into the controller The sonar framework is utilized in HC-SR04 ultrasonic sensor to decide separation to an article like bats do. It offers brilliant non-contact go location from around 2 cm to 400 cm or 1feet to 13 feet. Its activity isn't influenced by daylight or dark material. The ultrasonic sensor emanates the short and high recurrence signal. On the off chance that they distinguish any article, at that point they reflect back reverberation signal which is taken as contribution to the sensor through Echo pin.

Firstly user initialize Trigger and Echo pin as low and push the robot in forward direction. When obstacle is detected Echo pin will give input as high to microcontroller. Pulse In function is used for calculating the time of distance from the obstacle. Every time the function waits for pin to go high and starts timing, then timing will be stopped when pin go to low. It returns the pulse length in microseconds or when complete pulse was not received within the timeout it returns.

The timing has been determined means it gives length of the pulse and will show errors in shorter pulses. Pulses from 10microseconds to 3 minutes in length are taken into consideration. After determining the time, it converts into a distance. If the distance of object is moderate then speed of robot get reduced and will take left turn, If obstacle is present in left side

then it will take right turn. If the distance of object is short then speed of robot get reduced and will turn in backward direction and then can go in left or right direction.

This robot was built with an Arduino development board on which microcontroller is placed. If the sensors detect more obstacles together then the speed of the DC motor is reduced and the vehicle completely stops. Arduino board is connected with DC Motor through Motor driver board (pin10, pin11, pin12, pin13) which provides power to the actuators. Actuators are used to move robot in Forward, Backward, Left and Right directions. The brief description of inputs pins for movement of robot is given in below.

4. RESULT

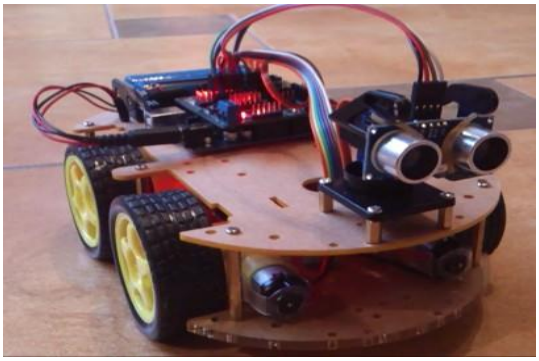

FIG 3. THE COMPLETE BUILD OF THE VEHICLE

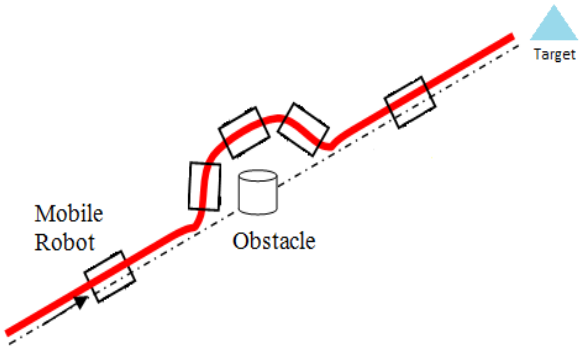

FIG 2. THE PATH OF THE VECHICLE

The designed vehicle has to be switched on and then the vehicle moves, as soon as the vehicle encounters any obstacle in front of it the vehicle will deviate its path from the obstacle and chose another path where obstacle doesn't exist or the path were there is fewer obstacles.

5. CONCLUSION AND FUTURE ENCHANCEMENTS

The objective of this task is to make an independent robot that wisely distinguishes the obstacle in its way and explores as indicated by the activities that we set for it. So what this framework gives is an option in contrast to the current framework by supplanting gifted work with automated apparatus, which thusly can deal with more patients in less time with better exactness and a lower for each capita cost.

Further improvement can be achieved by adding sensors on the left and right side of the robot. Besides that, computer vision with camera features can be implemented for monitoring applications. For further improvement, to implement an obstacle avoidance in aerospace, well-suited sensors should be used to gather the accurate information about the environment and obstacles. The laser based (LIDAR) sensor system is robust especially in off-road outdoor environments.LIDAR sensor is considered as an effective solution to the problem of obstacle detection and recognition. However, the obstacle avoidance poses challenges to the image processing using LIDAR sensor

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