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Automatic Obstacle Detecting Robot

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Abstract: Obstacle avoidance is one of the most important aspects of mobile robotics. Without it, robot movement would be very restrictive and fragile. This project proposes 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. In rapidly growing world robotics is used in every division, whether it is in household, industry, transport and many other sectors. In this study, the design and execution of an automated vehicle consider both its hardware and software aspects. We elect this as our project as robotic has become a vital role of our day-to-day life and has a specific application in the engineering sector. It plays an important role in the new technological environment.

Keywords: Ultrasonic Senor, Arduino Uno, Motor Driver Shield, and Servo Motor.

I. INTRODUCTION

Robotics is a part of today's communication & communication is a part of advancement in technology. In this paper, we aim to provide a comprehensive analysis and comparison of these sensor-based approaches for obstacle detection. This project consists of wheeled autonomous robot. Obstacle avoidance is the primary requirement of any autonomous robot. Enabling an autonomous robot to be able to navigate from one place to another without human intervention. The analysis will consider factors such as obstacle detection range, accuracy, response time, robustness to lighting conditions, and ability to detect different types of obstacles.

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 two D.C motors to give motion to the ROBOT. The construction of the ROBOT circuit is easy and small. The electronics parts used in the ROBOT circuits are easily available and cheap too.

II. LITERATURE SURVEY

"Obstacle avoiding robot-A promising one" has been developed by Md. Saddam Khan, Rakesh Chandra Kumar, Dinesh Kumar, Sarmistha Mondal, Rajesh Birua and Manas Kumar Parai. They proposed a robot that is able to do the basic walking movements using two gear motors. It is easily capable to sense the obstacle and by processing the signal it perfectly avoids the obstacle coming in between the path [1].

"Obstacle avoidance robot using Arduino" has been developed by Pavithra A C, Subramanya Goutham V. They developed a robot that detects and then avoids obstacles in its path which runs on Arduino platform for data processing. For obstacle detection, three ultrasonic sensors were used that provide wider field of detection. The robot is fully autonomous [9].

"Moving obstacle avoidance of a mobile robot using a single camera" has been designed and developed by Jeongdae Kim and Yongtae Do. They developed a moving obstacle detection method which is based on vision for the safe navigation of a mobile robot. The method can quickly detect movable obstacles like walking humans in an indoor space using a single camera. The camera is mounted on the robot for vision [4].

"Line follower and obstacle avoider robot" has been designed and developed by Darshan S, Chinnapu Charan Teja Reddy. They proposed to design a line follower and obstacle avoiding robot for autonomous navigation along a black line using the concept of IR sensors and Ultrasonic sensors. In case crossover comes, the robot will be able to choose the free path. To control the line follower robot, the only way is to change the path. The proposed can be controlled using WIFI module, but the power will be more consumed. So, there will be chances quick drainage of battery. It can be used for very long-distance applications with a predefined path. [5].

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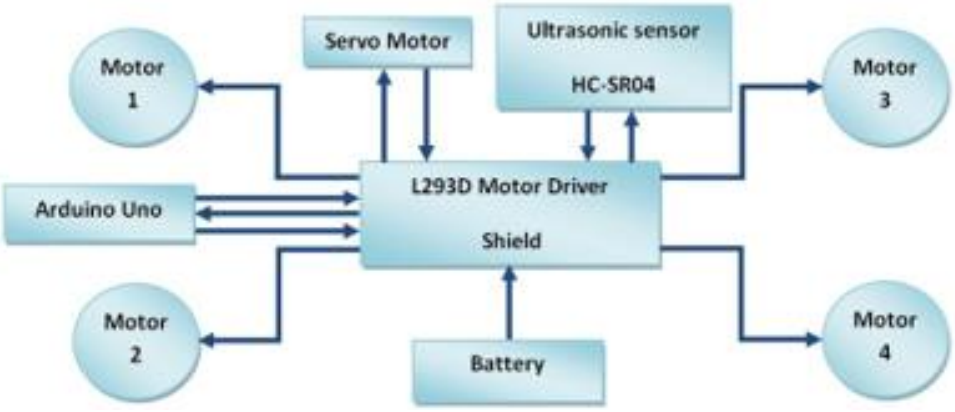

Fig 1 . System block diagram

"An Ultrasonic line follower robot to detect obstacles and edges for industrial rescue operations" has been designed and developed by Vicky Barua, Md. Arif Isteik Neloy, Shahid Uddin Rahat, Mithun Das, Md. Shafiul Islam Joy, Abhijit Pathak and Nazmun Nahar. They developed a prototype of robot for industrial use. Their robot is smart and intelligent and has more benefits as it does not consume much power. Their robot follows the pre-defined path(line), intelligently senses the obstacles and edge in its path. Then, it avoids the obstacle and navigates according to the behaviour that have been set for it [6].

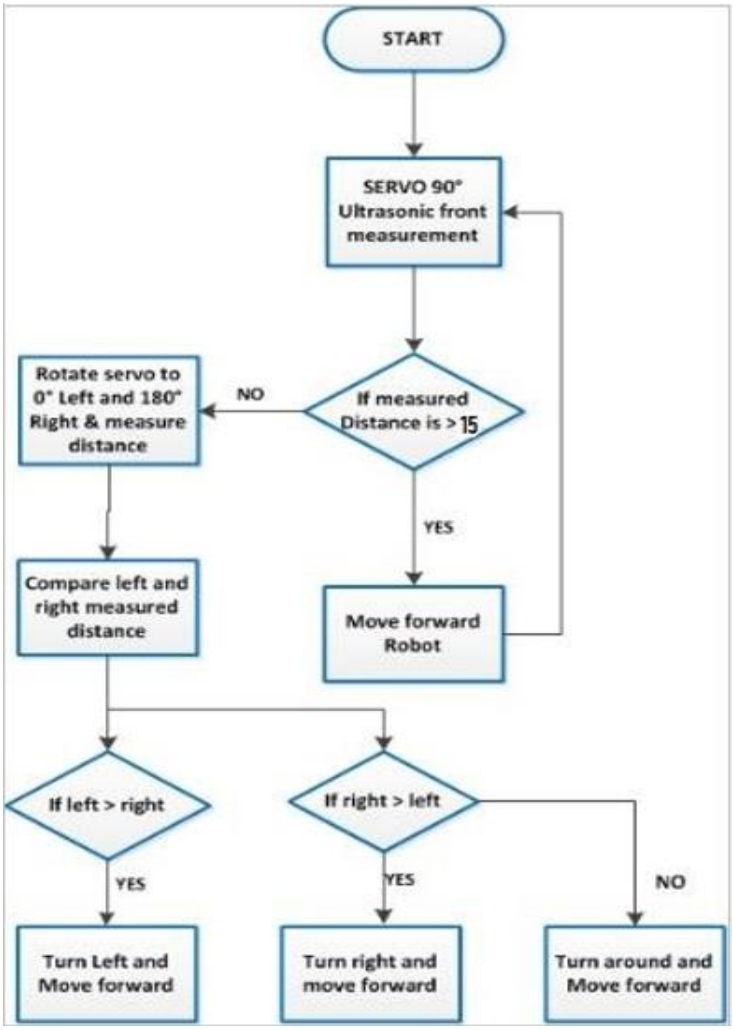

Fig 2. Flow chart

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"Path following, Obstacle detection and obstacle avoidance for thrusted Underwater snake robots" has been designed and developed by Eleni Kelasidi, Signe Moe, Kristin Y. Pettersen, Anna M. Kohl, Pal Liljeback and Jan Tommy Gravdahl. They designed and developed underwater snake robots (USRs) that can work underwater as the name implies. These robots are more maneurable and have better access capabilities due to their flexible and slender body. USRs are capable of energy transit over long distances, capable of performing light intervention tasks. They also propel themselves using energy efficient motion patterns. They were inspired from their biological counterparts. Thrusters were attached at tail module of the USRs. They have many essential qualities for autonomous underwater operations which includes efficient locomotion, flexible bodies and to perform intervention tasks. Computer vision algorithm is given to USRs to detect and to calculate position of potential obstacles [7].

Obstacle Detection for Unmanned Ground Vehicles: A Survey" by J. Wang, Z. Xiong, and D. Hu. The paper titled "Obstacle Detection for Unmanned Ground Vehicles: A Survey" provides a comprehensive survey of obstacle detection techniques specifically tailored for unmanned ground vehicles (UGVs). The authors, J. Wang, Z. Xiong, and D. Hu, explore various methods and approaches used in the field of obstacle detection, aiming to assist UGVs in navigating and avoiding obstacles autonomously[8].

Pavithra A C, Subramanya Goutham V, (2018), Obstacle Avoiding Robot Using Arduino, International Journal of Engineering Research & Technology, vol 6, issue 13.The authors discuss in depth the working principles, advantages, and limitations of each technique, providing valuable insights into their effectiveness in obstacle detection. They also compare and contrast the performance of different methods, considering factors like accuracy, robustness, computational complexity, and real-time capabilities[9].

Eleni Kelasidi, Signe Moe, Kristin Y. Pettersen, Anna M. Kohl, Pal Liljeback, Jan Tommy Gravdahl, (2019), Path Following, Obstacle Detection and Obstacle Avoidance for Thrusted Underwater Snake Robots, Journal of Frontiers in Robotics and AI, vol 6.Furthermore, the paper addresses the challenges and open research areas in obstacle detection for UGVs. These challenges encompass issues like handling occlusions, dealing with varying environmental conditions, and achieving real-time obstacle detection. The authors suggest potential directions for future research, including the integration of multiple sensor modalities, the utilization of advanced machine learning algorithms, and the development of hybrid approaches combining sensor-based and vision-based techniques[10].

N. Senthil Kumar, M. Saravanan, S. Jeebananthan, (2012), Microprocessors & Microcontrollers, Oxford University Press, 4th Edition.The paper begins by emphasizing the importance of obstacle detection for UGVs, highlighting the challenges posed by complex and dynamic environments. It presents an overview of the different types of obstacles that UGVs may encounter, including static obstacles like walls and trees, as well as dynamic obstacles such as pedestrians and vehicles. The authors also discuss the significance of accurate obstacle detection in ensuring the safety and efficiency of UGVs[11].

III. METHODOLOGY

The obstacle avoidance robotic vehicle uses ultrasonic sensors for its movements. Arduino is used to achieve the desired operation. The motors are connected through motor driver IC to Arduino. The ultrasonic sensor is attached in front of the robot. Whenever the robot is going on the desired path the ultrasonic sensor transmits the ultrasonic waves continuously from its sensor head. Whenever an obstacle comes ahead of it the ultrasonic waves are reflected back from an object and that information is passed to the Arduino.

The Arduino controls the motors left, right, back, front, based on ultrasonic signals. In order to control the speed of each motor pulse width modulation is used (PWM). When ultrasonic sensor detects the object which is kept inside the path it will send the signal toward the Arduino uno and according to that it will it will rotate the motor M3 & M4 in forward direction and rotate the motor M1 & M2 in reverse direction such way that the car get moving in left direction. Similarly in every time whenever an obstacle in found to be in path of car it will detect it and rotate the car in left direction to avoid the obstacle.

IV. CONCLUSION

Creating an obstacle detection bot using an Arduino Uno involves integrating sensors such as ultrasonic or infrared distance sensors with the Arduino board. The bot detects obstacles in its surroundings, responds by avoiding them, and is controlled through programmed instructions. By following the steps of gathering components, connecting sensors, programming the Arduino, testing and debugging, assembling physical components, and fine-tuning the bot, you can successfully create an obstacle detection bot using an Arduino Uno.

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V. FUTURE SCOPE

The future scope for an obstacle detection robot using Arduino Uno is promising. Advancements in algorithms, navigation, multi-sensor integration, wireless communication, human-robot interaction, IoT integration, miniaturization, and power efficiency are expected. Industrial applications like warehouse automation, agriculture, surveillance, and search and rescue can benefit from these developments. The actual scope depends on technological progress, research, and market demand.

REFERENCES

[1] Md. Saddam Khan, Rakesh Chandra Kumar, Dinesh Kumar, Sarmistha Mondal, Rajesh Birua, Manas Kr. Parai, (2013), Obstacle Avoiding Robot – A Promising One, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, vol 2, issue 4.

[2] Ekta, Kr. Manu, Yash Dhawan, Raj Kr. Saini, (2021), Obstacle Avoiding Robot, International Journal of Engineering Sciences & Emerging Technologies, vol 10, issue 6, pp 137-139.

[3] Vicky Barua, Mithun Das, Shahid Uddin Rahat, Md. Arif Istiek Neloy, Md. Shaiful Islam Joy, Nazmun Nahar, Abhjit Pathak, (2020), An Ultrasonic Line Follower Robot to Detect Obstacles and Edges for Industrial and Rescue Operations, International Journal of Computer Applications, vol 176.

[4] Jeongdae Kim, Yongtae Do, (2012), Moving Obstacle Avoidance of a Mobile Robot using a Single Camera, International Symposium on Robotics and Intelligent Sensors.

[5] T. Aravinthan, G. V. Barani Krishnan, (2018), An Obstacle Avoiding Robot, International Journal of Engineering Research & Technology, vol 6, issue 14

[6] . Ch. Vinay Kumar, B. Rakesh, S. Shyam, Manjula, (2021), Obstacle Avoiding Robot Using Arduino, Journal of Emerging Technologies and Innovative Research, vol 8, issue 6.

[7] Darshan S., Chinnapu Charan Teja Reddy, (2021), Line Follower and Obstacle Avoider Robot, International Advanced Research Journal in Science, Engineering and Technology, vol 8, issue 7.

[8] Faiza Tabassum, Dr. Bilkis Jamal Ferdosi, Muhammad Masud Tarek, Susmita Lopa, (2017), Obstacle Avoiding Robot, Global Journal of Researches in Engineering: H Robotics & Nano-Tech, vol 17, issue 1.

[9] Pavithra A C, Subramanya Goutham V, (2018), Obstacle Avoiding Robot Using Arduino, International Journal of Engineering Research & Technology, vol 6, issue 13.

[10] Eleni Kelasidi, Signe Moe, Kristin Y. Pettersen, Anna M. Kohl, Pal Liljeback, Jan Tommy Gravdahl, (2019), Path Following, Obstacle Detection and Obstacle Avoidance for Thrusted Underwater Snake Robots, Journal of Frontiers in Robotics and AI, vol 6.

[11] N. Senthil Kumar, M. Saravanan, S. Jeebananthan, (2012), Microprocessors & Microcontrollers, Oxford University Press, 4th Edition.

