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Hardware Prototype Development Of a Robotic Car To Avoid Obstacles

[1]Akanksha Dash, [1]Amrutha G., [1]Krutika S. Ganpur, [1]Sneha Chatter, [2]Dr. Pavithra G., [3]Dr. T.C.Manjunath*

[1]First Year (Second Sem) ECE Students, Dept. of Electronics & Communication Engg., Dayananda Sagar College of Engineering, Bangalore, Karnataka
[2]Associate Professor, Dept. of Electronics & Communication Engg., Dayananda Sagar College of Engineering, Bangalore, Karnataka
[3] Professor & Head, Dept. of Electronics & Communication Engg., Dayananda Sagar College of Engineering, Bangalore, Karnataka

Abstract
The project aims to construct an obstacle-avoiding robotic vehicle equipped with ultrasonic sensors for autonomous navigation. It employs an ATmega328 microcontroller for control. This intelligent robot autonomously detects obstacles in its path using ultrasonic sensors, and the microcontroller redirects its movement accordingly by controlling the motors through a motor driver. Unlike some projects that utilize IR sensors, this one opts for ultrasonic sensors due to compatibility and effectiveness. The work carried out is the second semester mini-project by the students of Electronics & Communication Engineering under the guidance of the faculties.

Introduction
Since their inception in the 1960s, modern robotics has undergone a remarkable evolution and firmly established itself as an indispensable asset in the progress of humanity. Over time, robots have assumed diverse forms, their size ranging from colossal 51-foot giants to microscopic marvels. The algorithms governing the latter, more diminutive robots are notably intricate, involving obstacle detection and precise measurements of the obstacle's dimensions. Once these parameters are ascertained, the obstacle avoidance algorithm guides the robot around hindrances, enabling it to continue its trajectory towards the initial target. Throughout the continuous technological advancements in the realm of robotics, one fundamental aspect has remained paramount to their functionality, and that is mobility.
Technology and Automation: The project embodies the essence of modern technology and automation. By utilizing ultrasonic sensors and a microcontroller, it exemplifies how machines can be endowed with intelligence to perform tasks automatically, enhancing efficiency and reducing the need for manual intervention.
Obstacle Avoidance: The primary focus of this project is obstacle avoidance, a crucial capability for autonomous robots in real-world applications. The use of ultrasonic sensors for this purpose is a well-established and effective choice, as these sensors provide accurate distance measurements.
Microcontroller: The choice of the ATmega328 microcontroller is significant. This microcontroller is a part of the popular Arduino family and is known for its versatility and ease of programming. It's a suitable choice for implementing the intelligence required for obstacle detection and avoidance.
Real-World Applications: The concept of an obstacle-avoiding robot has broad real-world applications, from autonomous vehicles and robotics in manufacturing to assistive technology for people with disabilities. It showcases how robotics can make a positive impact in various fields.
Interfacing and Control: The project underscores the importance of interfacing sensors and actuators (motors) with a microcontroller. It's a fundamental aspect of robotics and highlights the role of software and hardware integration in achieving autonomous functionality.

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Sensor Selection: The decision to use ultrasonic sensors over IR sensors is explained in the context of compatibility. This is a thoughtful choice that can have implications for the robot's reliability and effectiveness in obstacle detection, which could be elaborated upon in further detail.
Continued Advancements: Robotics is a field that is continually advancing, and projects like this one contribute to the ongoing evolution of robotic technology. It's essential to stay updated with the latest sensor technologies and control algorithms to remain at the forefront of innovation.
Overall, this project's focus on obstacle avoidance and the use of ultrasonic sensors and a microcontroller demonstrate a practical and hands-on approach to robotics, providing a valuable learning experience in the realm of autonomous systems.

Photograph of the developed obstacle avoidance robotic car

Fig. 1 : Model of the developed robotic car

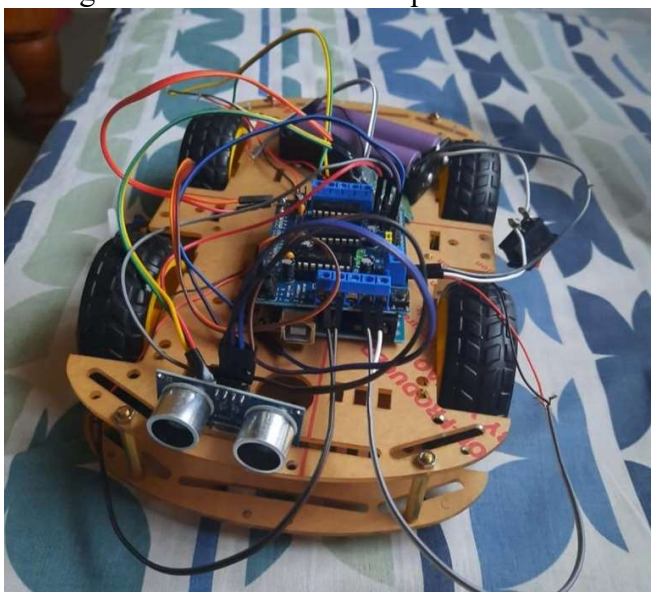

Fig. 2 : Model of the robotic vehicle developed

Conclusions

Practically every navigation robot necessitates some form of obstacle detection, making obstacle avoidance strategies paramount. Obstacle Avoidance Robots boast a wide array of applications, ranging from serving as domestic robots for household chores to various indoor tasks. Furthermore, they play a pivotal role in scientific exploration and emergency rescue scenarios, especially in environments that are perilous or inaccessible to humans. In such challenging settings, robots are tasked with gathering vital environmental information to navigate obstacles safely. The incorporation of a voice recognition system into robotic vehicles offers a remarkable opportunity

for assisting individuals with disabilities. This speech control system, while elegantly straightforward, harnesses the power of speech recognition techniques to govern robotic actions. The method ensures real-time functionality by employing an Android application to convert human voice into text, which is subsequently processed and utilized to control the robot's movements. Throughout the course of this project, comprehensive understanding of Arduino UNO and a diverse array of sensors was achieved, bolstering skills in coding and design. The project provides valuable insights into various technological advancements and tools for project enhancement. Exposure to software like Arduino IDE and Proteus has expanded knowledge across a wide spectrum. While the project demonstrates notable progress, there remains potential for improvement, particularly in terms of communication range and processing efficiency.

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