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Bluetooth-Based Voice-Controlled Obstacle Avoiding Robot Car

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ABSTRACT

This paper introduces a versatile Bluetooth-based voice-controlled obstacle avoidance robotic vehicle. It is a future advancement technology, which provides real-time data for the system. This robotic vehicle senses the object by the ultrasonic sensor for obstacle avoidance and sends an acknowledgment to the Arduino module and activates the autonomous vehicle braking system. Users of this system can control by own speech and the system can task user commands significantly. Obstacle avoidance robots are being used in hazardous locations inaccessible to humans. The Author presents this system employed by Bluetooth-based automation, navigation, robotics technology, and smart environments when avoiding obstacles is necessary for the user. Bluetooth technology can create communication between robots and human control power. This project offers a practical and easy-to-use way to improve control and safety in a variety of real-world circumstances by Voice control incorporated with Bluetooth technology. In the future, this technology can be enriched by AI or IOT for global control.

Keywords: Ultrasonic Sensor, Arduino UNO, Bluetooth Technology, Navigation, Robotic Technology, AI, IoT.

I. INTRODUCTION

Vivid research is related to an instructive mode control system that combines robotics, programming and electronics components with the help of Arduino for the designing of a robot car with the virtue of obstacle avoidance. Over the past decade, technological advancements have led to the widespread integration of sensors into electronic devices, revolutionizing various aspects of our daily lives. These ingenious devices play a pivotal role by transforming different energy forms into electrical energy, contributing to enhanced convenience and efficiency across diverse applications. Through the process of assembling a robot car generally, we are incorporating sensors and linking them to an Arduino board using proper code anybody can produce a multipurpose vehicle that is capable of navigating around obstacles on its own and being controlled from a distance using voice commands and Bluetooth. With a mobile device that is connected via Bluetooth, users can travel through complex landscapes and manage the movements of the system remotely. Voice commands also improve ease and usability. This research article has many benefits, such as improving problem-solving skills, developing a grasp of robotics, and polishing programming abilities. Additionally, it offers experience in hardware assembly, wiring, and troubleshooting, promoting an understanding of electronics. Many applications are possible with an Arduino-based robot car due to its versatility. Sensors play a crucial role in establishing a

seamless connection between the environment and various electronic devices. These environments span a broad spectrum, ranging from military zones, airports, factories, hospitals, shopping malls, home automation, and surveillance. Modern technology has witnessed the proliferation of digital gadgets like smartphones, robots, tablets, and smartwatches, every with a big selection of applications spanning manipulate, protection, imaging, and presentation. The rapid evolution of the sensor era, including temperature sensors, pressure sensors, proximity sensors and human detectors, has transformed their function from mere light fixtures to important tools that significantly facilitate a regular lifestyle. These sensors allow devices to sense and respond to adjustments in their environment with clarity and precision. In the modern landscape, artificial intelligence (AI) has ushered in the development of state-of-the-art robot systems. Emotion recognition emerges as an essential detail in robotics, permitting robots to interpret and respond to human feelings efficiently. Meanwhile, electronic devices encompass a variety of technologies, including smartphones, robots, tablets, and smart clocks. In the contemporary landscape, the integration of artificial intelligence algorithms has led to the development of sophisticated robot systems. The ability of a robot to interpret its environment is paramount, especially in applications such as military operations, where identifying explosives or detecting potential threats requires precise sensor-based perception. The applications of these devices are extensive, involving control, protection, imaging, and identification within industrial processes. It gives prospective engineers real-world experience in areas like environmental monitoring, smart cities, and driverless cars.

Literature Survey

In 2004, L. Zhizeng et.al. reported a Speech recognition robot control system incorporated with a linear predicted coefficient (LPC), pattern comparison, and dynamic time warping technique. In 2017 S.S. Pujari et.al. designed a remotely controlled autonomous robot using Android, which can be controlled from any remote place. In 2021, A. Ananth et.al. developed a Bluetooth-based obstacle-avoiding Autonomous Robot. The Author tested this model from different distances. In 2016, D. Chakraborty et.al. designed an Android-based auto-obstacle detection and prevention robotic controlled car. Various sensors can control and monitor the movement of this vehicle via Bluetooth. In 2019, D. V. Sai et.al. reported an IoT-based modern technology-oriented obstacle detection car for long-range communication. It is a more accurate, efficient, cheap, fast automated transport system.

Methodology

The methodology of the Bluetooth-based voice-controlled Obstacle Avoiding Robot Car is designed by many sensors depicted in Fig. 1. The proposed system consists of a Motor Driver circuit (L293D), four BLDC motors, an Arduino UNO module, a Li-Ion Battery, a switch, Ultrasonic Sensors, servo motor, Bluetooth Module. This entire system is controlled by automatic mode. It is Bluetooth-based technology and it can communicate with an Arduino module. Arduino UNO is the main brain of this model. It is an embedded C-programming based module. From this module, every component is connected. To the best output, it will be acknowledged. Here HC-06 Bluetooth module is connected to the motor driver as well as the Arduino board. It creates communication between the device and the user interface by USART serial communication. The L293D motor driver circuit is connected to the DC motor, which converts electrical energy to mechanical energy using DC. It is used for turning the wheels which helps move the devices. Here the Author uses the ultrasonic sensor Hc-Sr04 which is connected with an Arduino module for sonar navigation and object detection. Sensors emit an

ultrasonic sound and can measure the distance from object to sensor. After determining the distance, it sends the signal to the Arduino board. Then it stops the movement of the robot or moves to the other side. Ultrasonic sensors have two transducers, one is speaker and other is microphone. The flowchart of the Bluetooth-based Voice-Controlled Obstacle Avoiding Robot car is designed in fig 3.

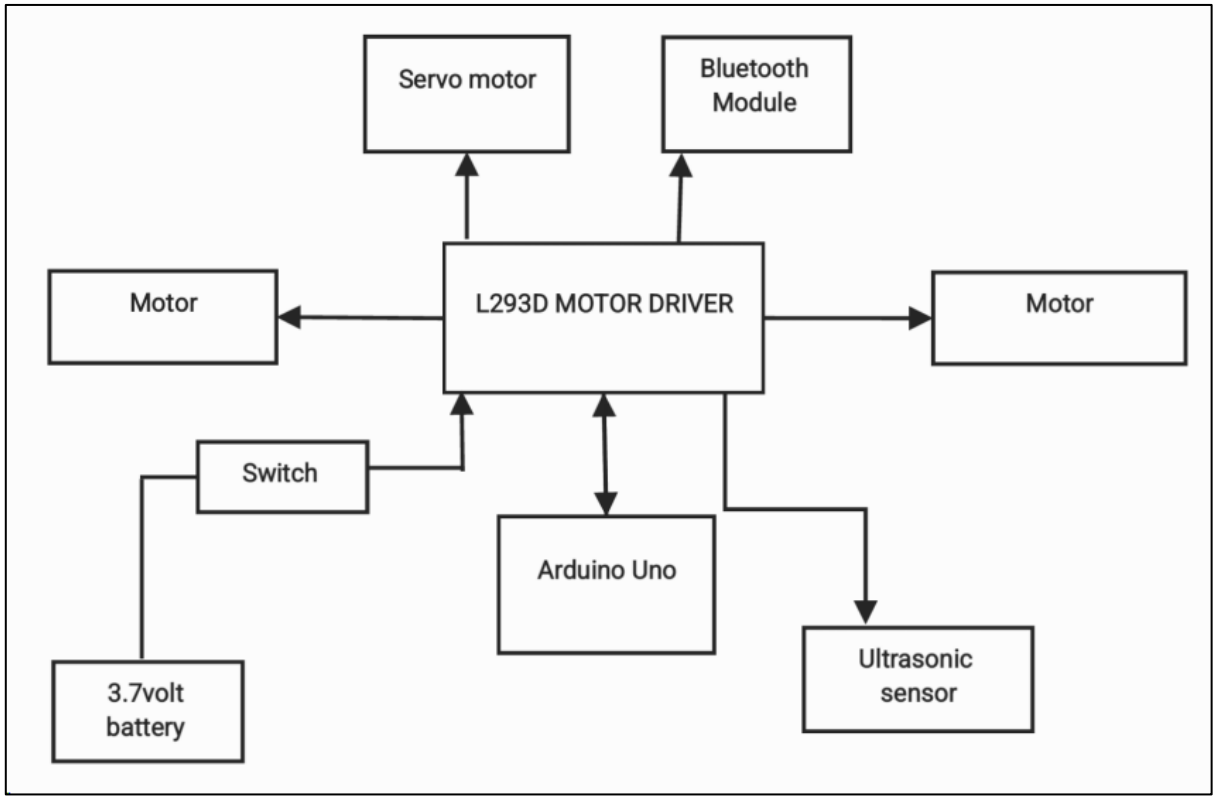


Fig.1 Block Diagram of Bluetooth-Based Voice-Controlled Obstacle Avoiding Robot Car

Software Requirement: The Author uses the Arduino IDE software platform. It is an easy-to-use environment for a microcontroller programming software platform. It is an essential tool that makes creating, developing, and uploading code to Arduino boards easier for both beginner and skilled developers. The Arduino programming language is straightforward to learn and understand, based on C and C++, and the IDE supports it. The Arduino IDE is a valuable tool due to its extensive collection of prewritten code, or "sketches." These illustrations save time and scale when coding by offering ready-to-use code snippets for a variety of hardware parts and functionalities. Moreover, the Arduino IDE features an integrated serial console that enables developers to track and troubleshoot their projects in real-time. It ensures wide platform compatibility by being interoperable with several operating systems, such as Windows, Mac OS X, and Linux. To summarize, the Arduino IDE is an intuitive interface and interoperability with a wide range of hardware elements. It gives people the freedom to express their creativity and realize their technological projects.

B. Operating Principle: In the working principle, at first, the robotic car assembles all the components, such as, an Arduino board, Motor driver circuit, BLDC motor, wheels, sensor, battery, and switch. The Circuit Diagram of the proposed model is designed in Fig 2.

After generating input from the battery, activate the Arduino board and send the all information to the peripherals.

After activating Arduino board, all peripherals which is connected must be activated.

User sends information via Bluetooth connection by mobile interface or user's voice commands; ultrasonic sensor is activated and the robotic car moves according to the user's information.

When it will be moving, first it checks its mentioned direction through the sensor and check every period for objects available in their way.

If an object is detected, it will be moved in a clockwise direction. Object checking in every direction. If objects are detected in their lines, then move in an anti-clockwise direction and then in a backward direction respectively.

If every direction is blocked. The car moving has been stopped.

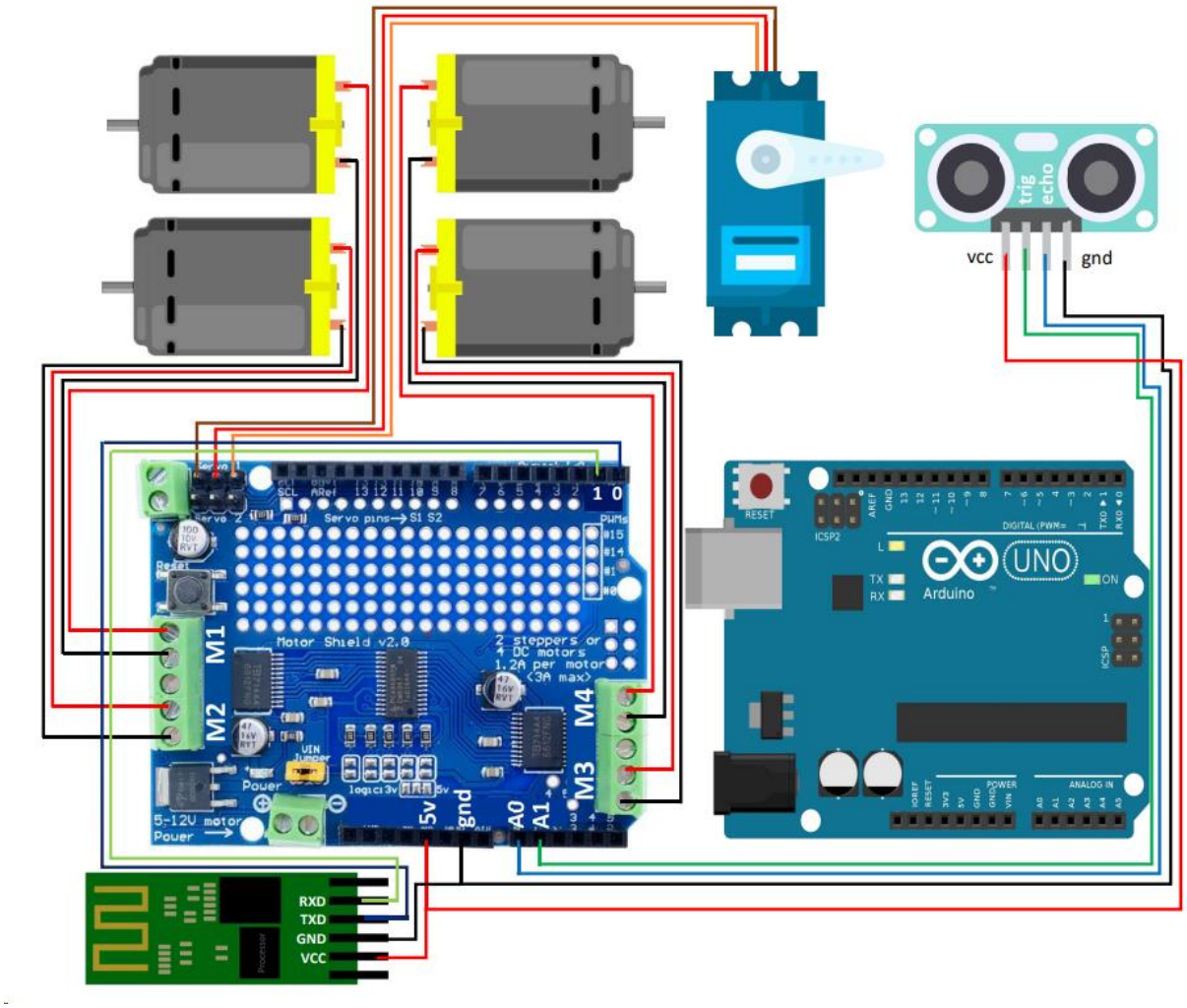
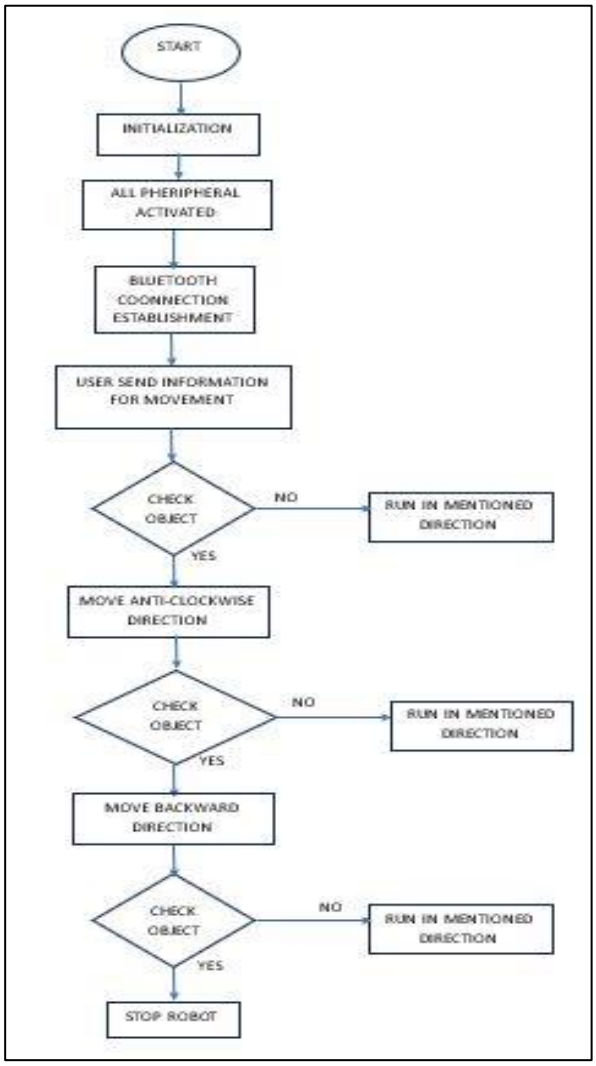


Fig 2: Circuit Diagram of Bluetooth-Based Voice-Controlled Obstacle Avoiding Robot Car



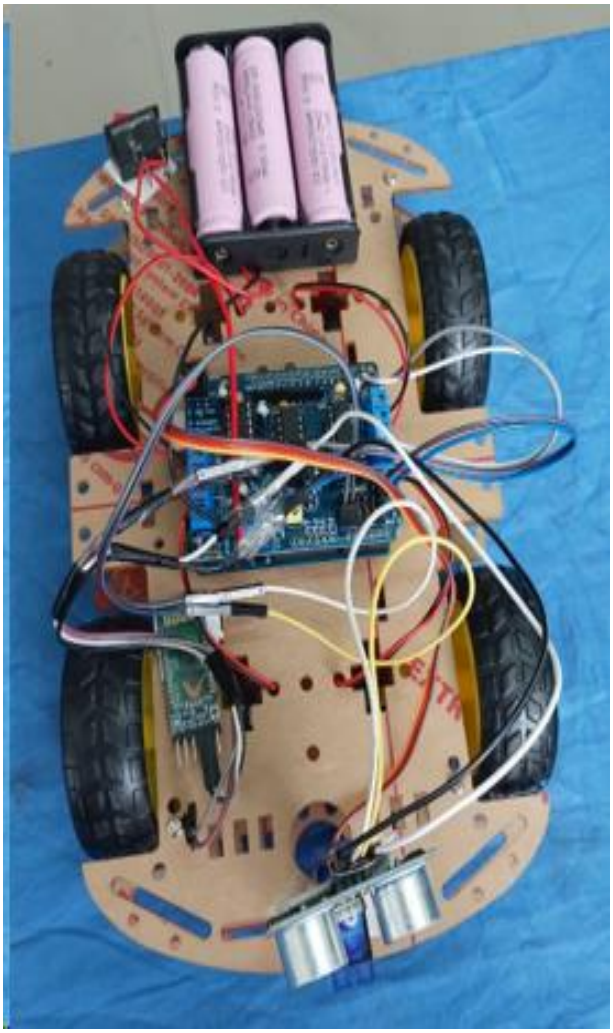


Fig 3: Flowchart of the Designed Model

Fig 4: Proposed of the Designed Model

Conclusion

Bluetooth-based voice-controlled Obstacle Avoiding Robot Car using Arduino is designed and developed for diverse applications. This model incorporates many components, operated autonomously and software-controlled. It is a fully Bluetooth-based complete obstruction removal emerging technology in remote-controlled robotic vehicles that is a remarkable blend of time and innovation. This proposal is a modern breakthrough in advanced, scalable electronics and robotic-like intelligent devices. It works Bluetooth timing enables, Wi-Fi to switch zones in robotic vehicles, greater flexibility and convenience. Through robotic vehicle development and unbiased monitoring of systems, it prevents troublesome valuable energy, decisional thinking and authority. Overall, particularly, generally obstacle-based remotely controlled robotic devices based on Bluetooth are the age's transformative ability to advance the boundaries of what can improve our lives time exemplified by the rapid and controlled advances in robotics and automation.

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