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Automatic Smart Robot Vehicle

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ABSTRACT: The Smart Robot Vehicle is electromechanical device is directed with the help of IOT. Robotics is the upcoming field, which will be of great use to society in the coming years. The demand of robot is increasing day by day. The classical way of controlling robots is outdated. For the bulky nature and the long wires to control a robot has made it less efficient. That is why the movement of the smart phone is applied in the form of gesture, voice assistant, manual mode to control a robotic vehicle. So, the robotic vehicle can move with the help of above given features. So, a person can control the movement of this robotic vehicle in forward, backward, left, and right directions as well as 360^0 only with the use of smart phone. Nowadays there are many accidents occurring due to less concentration during driving. By the obstacle avoidance feature the vehicle detects the obstacle and stops there and chooses a safe direction and move forward. Hence the main focusing feature of our project is Obstacle Avoidance which will make our project up to mark. As we know that in some areas there is network issue so to avoid this problem, we have used Bluetooth module for the connectivity.

I. INTRODUCTION

In today's world, the integration of robotics and artificial intelligence has opened a world of possibilities for innovative projects. One such project is the development of a smart robot vehicle that can be controlled through various methods, providing both convenience and functionality. This project aims to create a versatile and interactive robot vehicle capable of responding to voice commands through Google Assistant, recognizing hand gestures for control, allowing manual control via a mobile application, and autonomously avoiding obstacles. Creating a smart robot vehicle that can be controlled via Google Assistant, gesture control, manual control, and equipped with obstacle avoidance capabilities is an exciting and versatile project. This project combines advanced technologies and requires a multifaceted approach to achieve its objectives. Gesture recognition has always been a technique to decrease the distance between the physical and the digital world. In this work, we introduce an Arduino based vehicle system. The proposed work is achieved by utilizing the Arduino microcontroller, motor driver, gear motor, wheels, vehicle chase, battery (Li-ion 3.7v battery), battery holder, Bluetooth and for their main connection the jumper wires. Two main contributions are presented in this work. Firstly, we show that the vehicle can be controlled with gestures according to the movement and position of the smart phone. Secondly, the proposed vehicle system is further extended to be controlled by an android based mobile application having different modes (e.g., touch buttons mode, voice recognition mode). In addition, an automatic obstacle detection system is introduced to improve the safety measurements to avoid any hazards. We remark that the proposed systems can be implemented under real conditions at large-scale in the future that will be useful in automobiles and robotics applications.

II. PROBLEM STATEMENT

In today's world, rich people often prefer having a personal driver for their travels. If they choose to use our system, it could help them save money on transportation. The advantage of a robot-controlled vehicle is that it reduces the need for manual work. Our system integrates a control unit with a Bluetooth device, allowing users to give voice commands for easy control. Speech recognition is a technology that understands spoken words, even though it may not grasp their meanings. This makes it a perfect method for controlling robots and communicating. Our project can also be easily adjusted to include an ultrasonic sensor, helping the vehicle detect obstacles and navigate around them. Gesture recognition and voice control are additional features that not only make the system user-friendly but also improve driver safety and the overall travel experience. In simple terms, our project aims to make travel more convenient and safer for wealthy individuals by automating certain aspects of their journeys.

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III. OBJECTIVES OF THE PROJECT

Module 1:

Obstacle avoidance feature an obstacle avoiding robot vehicle is a fully autonomous robot which can be able to avoid any obstacle which it faces when it moves. Simply, when it met an obstacle while it moves forward, automatically stop moving forward. Then it looks it is two sides left & right and starts to move the best possible way, which means either in left direction if there is another obstacle in right or in right direction if there is another obstacle in left side.

Module 2:

Voice assistant the voice controlled robotic system is very beneficial in areas where there is high risk for humans to enter. Voice controlled robotic system is controlled through voice commands via android device.

Module 3:

Gesture controlling Gesture Controlled robot vehicle is a kind of robot which can be controlled by your hand gestures using smartphone. This will transmit an appropriate command to the robot so that it can move in whatever direction we want.

Module 4:

Manual controlling A Manual Controlled robot vehicle is a kind of robot which can be controlled by using buttons on android application in the form of traditional way. This will operate an appropriate command to the robot so that it can move in forward, backward, left, right directions as well as 360^0 direction and stop.

IV. SCOPE OF PROJECT

The scope of a Connected Automated Vehicle (CAV) and Robotics Car project involves a comprehensive set of aspects, ranging from hardware and software development to system integration and testing.

Hardware Development: Integration of advanced sensors (LiDAR, radar, cameras) for perception. Implementation of actuators for steering, acceleration, and braking. Design and assembly of the vehicle's physical structure to accommodate robotic.

Key components:

- **Sensor Fusion and Perception:** Integration of sensor data to create a holistic perception of the vehicle's surroundings. Development of computer vision algorithms for object detection and classification.
- **Control Systems:** Implementation of control algorithms for autonomous navigation and vehicle dynamics. Integration of machine learning models for adaptive and intelligent decision-making.
- **Communication Systems:** Design and implementation of communication protocols for vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication. Integration with cellular networks for data exchange and remote monitoring.
- **Navigation and Path Planning:** Development of advanced path planning algorithms considering real-time traffic conditions and dynamic obstacles. Implementation of localization systems for accurate positioning.
- **Human-Machine Interface (HMI)**: Design of user interfaces for manual control, monitoring, and system configuration. Implementation of voice or gesture-based control interfaces.
- **Cyber security:** Integration of security measures to protect the vehicle from cyber threats. Implementation of secure communication channels and data encryption.
- **Data Management and Analytics:** Implementation of systems for collecting, storing, and analysing large volumes of data generated by the vehicle. Utilization of data analytics for improving performance and efficiency.
- **Edge Computing and Onboard Processing:** Utilization of onboard computing resources for real-time data processing. Integration with edge computing technologies for enhanced decision-making.

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- **Energy Efficiency and Sustainability:** Integration of energy-efficient systems and components. Consideration of sustainability aspects in the design and operation of the vehicle.
- **Testing and Validation:** Development of comprehensive testing scenarios for various operational conditions. Validation of the vehicle's performance in simulated and real-world environments.
- **Maintenance and Upgrades:** Implementation of remote diagnostic systems for predictive maintenance. Planning for software and hardware upgrades to incorporate advancements.
- **Public Acceptance and Education:** Designing strategies to educate the public about CAV technology and build trust. Consideration of ethical and social implications.
- **Project Management:** Detailed project planning, scheduling, and resource management. Continuous monitoring and adaptation to changing requirements.

V. EXISTING SYSTEM

JIMU ROBOT BUILDER BOTS KIT:

It is an educational robot kit users can build and program robots with gesture and smartphone app control features are.

- Obstacle avoidance

sensors, such as infrared or ultrasonic sensors, can detect obstacles in the robot's path. When an obstacle is detected, the robot can be programmed to take specific actions, such as changing its direction to avoid the obstacle.

- manual control

JIMU Robot Builder Bot Kits often support manual control through interfaces or apps. Users can typically use a dedicated app to manually control the robot's movements, direction, and other actions. This manual control is useful for evaluating the robot, exploring its capabilities, or simply having fun with direct interaction.

ANKI VECTOR ROBOT

- Voice commands

Anki Vector supported voice commands. Users could interact with the robot by issuing voice prompts and Vector would respond accordingly.

- manual control

Anki Vector supported manual control using a mobile app. Users could use the app to drive Vector manually, controlling its movements and direction.

- Obstacle avoidance

Anki Vector was equipped with obstacle avoidance capabilities. The robot used sensors to detect obstacles in its path and autonomously navigated around them to avoid collisions. This feature allowed Vector to move around its environment more effectively and avoid potential obstacles in its way.

ROS Based research robot.

- voice commands.

ROS Based research robot supported voice commands. Users could interact with the robot by issuing voice prompts and Vector would respond accordingly.

- Gesture control.

Gesture control refers to the ability of a robot or device to interpret and respond to physical gestures made by a user. This feature allows users to interact with the robot without the need for direct physical contact or traditional input devices.

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LIMITATIONS OF EXISTING SYSTEM

Limited Complexity: While educational, the JIMU Robot Builder Bots Kit may have limitations in terms of the complexity of actions and tasks it can perform. It may not be suitable for advanced robotics projects or applications.

App Dependency: Manual control through smartphone apps may introduce a dependency on the availability and compatibility of the app, which could be a limitation if the app is not well-maintained or supported over time.

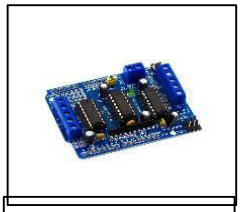
Limited Customization: While Vector is a charming and interactive robot, it may have limitations in terms of customization and programming compared to more open-ended robotics platforms.

Complexity for Beginners: ROS (Robot Operating System) is powerful but can be complex, making it less suitable for beginners or those without a strong background in robotics. Setting up and configuring a ROS-based robot can be challenging.

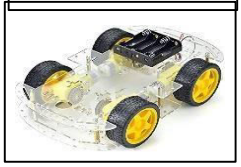
Hardware Compatibility: ROS-based robots often require specific hardware components, and not all sensors or actuators may be compatible. This can limit the range of components that users can integrate into their robots.

VI. PROPOSED SYSTEM

i. **Arduino UNO R3:** The Arduino Uno R3 is based on the ATmega328P microcontroller, which has fourteen digital input/output pins, 6 Analog inputs, a 16 MHz quartz crystal oscillator, and a USB connection for programming and power. Arduino Uno R3 is an open-source platform, which means its design and software are freely available for modification and distribution.

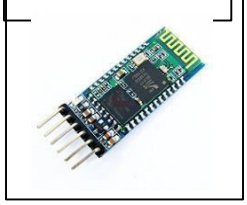


ii. **Motor Driver**: When selecting a motor driver for your Arduino project, be sure to consider the type of motor you are using, the voltage and current requirements, and the control features you need. Properly interfacing and controlling motors with a motor driver is essential to prevent damage to your motors and ensure reliable motor performance in your projects.



iii. **Cheses:** Creating an Arduino car chess-playing robot is a challenging and rewarding project that combines robotics, AI, and chess strategy. It is a great opportunity to learn and experiment with various technologies and programming concepts.

iv. **Ultra-Sonic Sensor:** An ultrasonic sensor is a device that uses ultrasound (high-frequency sound waves) to measure distances or detect the presence of objects. These sensors are commonly used in a wide range of applications, from robotics to automation and distance measurement. Here is some key information about ultrasonic sensors.



v. **Bluetooth module:** A Bluetooth module for Arduino allows your Arduino board to communicate wirelessly with other Bluetooth- enabled devices, such as smartphones, tablets, or other Arduino boards. These modules provide a convenient way to add wireless communication capabilities to your Arduino projects.

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vi. **Jumper Wires:** Jumper wires are essential electronic components used in prototyping, breadboarding, and connecting various electronic components and devices. They are flexible wires with connectors or pins at each end, making it easy to establish connections between components on a breadboard or between different parts of a circuit.

vii. **Servo Motor:** A servo motor is a type of rotary actuator that is commonly used in electronics and robotics to control the position or movement of mechanical components. Servo motors are known for their precision and ability to provide precise angular control, making them suitable for a wide range of applications.

viii. **Battery:** A lithium battery is a type of rechargeable battery that uses lithium as a key component in its electrochemical.

VII. CONCLUSION

In conclusion, the Automatic Smart Robot Vehicle is not merely a vehicle; it represents a profound paradigm shift in the transportation landscape. With its innovative fusion of artificial intelligence and advanced functionalities, it transcends traditional notions of travel. Beyond streamlining journeys, it establishes a new benchmark for safety and efficiency in transportation. By seamlessly integrating autonomous technologies, the vehicle minimizes human intervention, fundamentally altering the dynamics of urban mobility. This shift holds the promise of reducing congestion and mitigating environmental impact, creating a more sustainable and resilient transportation ecosystem.

As we wholeheartedly embrace this intelligent future, the Automatic Smart Robot Vehicle emerges as a symbol of technology's transformative potential. It signifies an era where smart, automated solutions redefine how we experience and interact with transportation. This innovation not only delivers convenience to users but also addresses pressing challenges faced by modern cities. The Automatic Smart Robot Vehicle thus serves as a beacon, guiding us into a future where technology reshapes and enhances our daily experiences in unprecedented ways.

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