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Application Based Robotic Arm Vehicle

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ABSTRACT:

This paper explores the creation of a robotic arm vehicle that can be controlled through a mobile application. The system brings together mechanical and electronic components to ensure precise movement and functionality. At its core, it uses an Arduino Uno as the main controller, with MG995 servo motors allowing the arm to move and 12V 300 RPM DC gear motors enabling the vehicle to navigate. A Bluetooth module (HC- 05) enables wireless control via a smartphone. Additionally, the L298 motor driver and LM2596 DC-DC buck converter help manage power efficiently from a 7.4V to 12V battery.

Designed for tasks like picking and placing objects, remote operations, and industrial automation, this robotic arm vehicle offers a practical and cost-effective solution. The paper covers the system's design, how the software works, and how well it performs based on testing. Ultimately, this project aims to contribute to mobile robotics by offering a flexible and affordable solution for

various real-world applications. This paper introduces a robotic arm vehicle that can be controlled using a mobile application, making it a versatile and user-friendly system. The project combines mechanical and electronic components to create a functional and efficient design. At its core, an Arduino Uno acts as the brain of the system, controlling the movement of the robotic arm using MG995 servo motors. The vehicle itself moves using 12V 300 RPM DC gear motors, allowing it to navigate different surfaces smoothly.

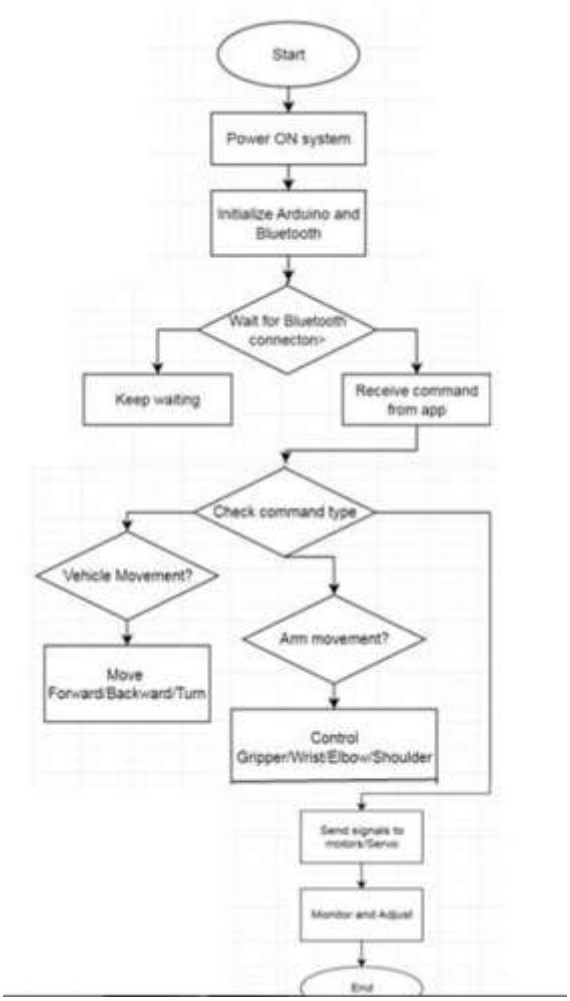
INTRODUCTION:

In recent years, robotics has advanced significantly, resulting in the development of sophisticated automated systems that enhance efficiency, precision, and safety across various sectors. One such innovation is the smartphone-controlled robotic arm vehicle, which enables users to remotely execute tasks requiring high accuracy and versatility. This project integrates multiple engineering disciplines, including embedded systems, mechanical design, and wireless communication, to create a fully operational robotic system that can be conveniently managed via a mobile app.

The robotic arm vehicle is designed using an Arduino Uno microcontroller, which acts as the system's brain, processing commands from the smartphone and controlling both the vehicle and the robotic arm. Wireless communication is enabled by the HC-05 Bluetooth module, allowing real-time control without relying on complex wired connections. The robotic arm operates with MG995 servo motors, ensuring precise and stable movement for handling objects. The vehicle moves using 12V DC gear motors (300 RPM), managed by an L298 motor driver, allowing smooth navigation across different terrains.

To ensure a steady power supply, the system features an LM2596 DC-to-DC buck converter, which regulates voltage and protects sensitive components from damage. The entire setup runs on a 7.4V to 12V battery, providing portability and continuous operation. A power switch is included for easy system control, making it more convenient for users.

ALGORITH OF ROBOT:



FEATURES:

- Application-controlled robotic arm .
- Arduino Uno-based control system .
- MG995 servo motors for arm movement .
- 12V 300 RPM DC gear motors for vehicle mobility .
- Wireless communication via HC-05 Bluetooth module .
- Mobile application interface for remote operation .
- L298 motor driver for motor control .
- LM2596 DC-DC buck converter for voltage regulation .
- Powered by a 7.4V to 12V battery .
- Capable of object handling and remote operations .
- Designed for industrial and automation applications .
- Lightweight and cost-effective design .
- Customizable and scalable system .
- Efficient power management .
- Smooth and precise motion control.

APPLICATIONS:

- Object Picking and Placing: The robotic arm is capable of accurately lifting, moving, and placing objects, making it ideal for automating handling tasks.
- Remote-Controlled Material Handling: Using Bluetooth for control, the system can transport materials in places like warehouses, factories, or construction sites, eliminating the need for manual labor.
- Industrial Automation: The system can be incorporated into assembly lines to handle repetitive tasks like sorting, packaging, or quality control, boosting efficiency and cutting down on labor costs.
- Warehouse and Inventory Management: The robotic arm vehicle helps move and organize inventory in warehouses, lowering manual effort and improving the flow of logistics.
- Agricultural Applications (e.g., Harvesting, Sorting): It can be customized for agricultural tasks such as picking fruits, sorting produce, or handling delicate crops, ultimately enhancing productivity.

CONCLUSION AND FUTURE SCOPE:

The development of an application-controlled robotic arm vehicle showcases the integration of mechanical, electronic, and software components to achieve accurate and efficient robotic manipulation. Powered by an Arduino Uno and controlled through a mobile app, the system allows smooth arm

movements with MG995 servo motors and vehicle movement with 12V 300 RPM DC gear motors. Wireless communication is enabled by the HC-05 Bluetooth module for remote control, while the L298 motor driver and LM2596

DC-DC buck converter ensure stable power distribution. Successful testing and implementation demonstrate its potential in industrial automation, material handling, hazardous environment operations, and more.

Looking ahead, there is significant potential for improvements. Future enhancements could involve integrating IoT and AI-based automation for autonomous operation, adding real-time feedback through sensors for greater precision, and upgrading the power system for longer operational times.

Expanding communication with Wi-Fi or 5G connectivity could improve control range and responsiveness. Additionally, the robotic arm's design can be optimized to handle heavier loads, increasing its versatility for industrial and commercial use. With ongoing innovation, this project can lay the groundwork for more advanced robotic systems, contributing to the growth of automation, robotics, and artificial intelligence.