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# Pick and Place Robotic Arm Vehicle

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**ABSTRACT:** In the constantly advancing field of robotics, the creation of pick-and-place robotic arm vehicles represents a significant milestone in automating tasks that require precision, efficiency, and adaptability. This project aimed to design and implement a robotic arm mounted on a mobile vehicle platform capable of autonomously identifying, picking, and placing objects in various environments. Advanced sensors, such as cameras and proximity detectors, in conjunction with sophisticated control algorithms, empower the robotic system to perform intricate tasks with remarkable accuracy.

The robotic arm vehicle is designed to operate in a wide range of applications, including industrial automation, warehouse management, healthcare, and service industries. By utilizing machine learning techniques, the system is capable of continuously refining its object recognition and manipulation capabilities. Key features include a robust mechanical design for the arm, an efficient navigation system for the vehicle, and a comprehensive software suite for task planning and execution.

The project emphasizes the potential of robotic systems to enhance productivity and safety in environments where manual handling is either impractical or hazardous. Through extensive testing and validation, the robotic arm vehicle demonstrates its ability to adapt to dynamic settings and carry out tasks with minimal human intervention. This innovation not only represents a significant advancement in robotic technology but also paves the way for future breakthroughs in autonomous systems and intelligent automation solutions.

**KEYWORDS:** Pick and place, Robotic Arm, Mobile platform Vehicle, Bluetooth Control .

## I. INTRODUCTION

The mobile platforms with robotic arms has opened up new opportunities for automation across numerous industries. This study centers on the creation of a pick-and-place robotic arm vehicle that merges the accuracy of servomotors and the flexibility of an Arduino board to achieve exceptional object manipulation and mobility. By utilizing a smartphone to control the system through Bluetooth communication, this solution showcases the potential for cost-effective and highly customizable robotic options.

The primary objective of this project is to build and deploy a robotic-arm vehicle that can autonomously navigate its surroundings, identify objects, and carry out pick-and-place tasks with great accuracy. The use of servomotors allows for precise movement control of the robotic arm, which is crucial for handling objects with precision. The mecanum wheels that enable Omni-directional movement of the vehicle. The Arduino board functions as the central management unit, directing the actions of the robotic arm and mobile platform based on the inputs received through Bluetooth from a smartphone.

## II. BLOCK DIAGRAM

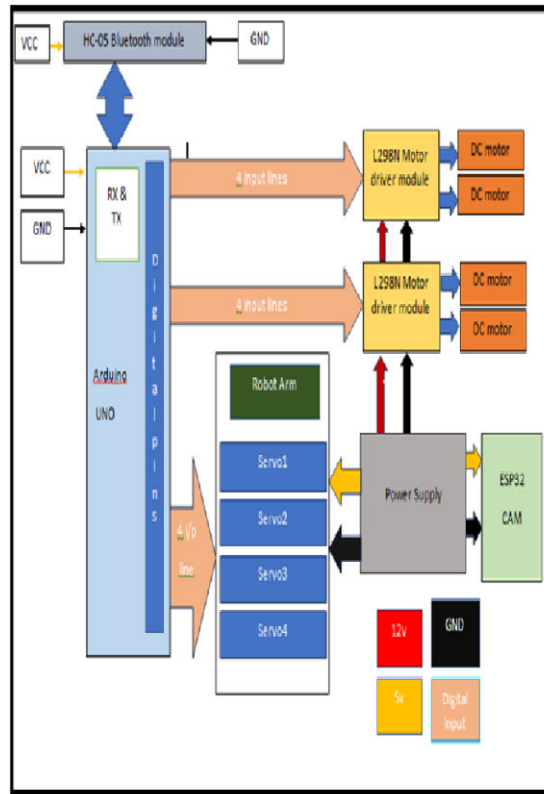


Fig. Block diagram

## III. CIRCUIT DIAGRAM

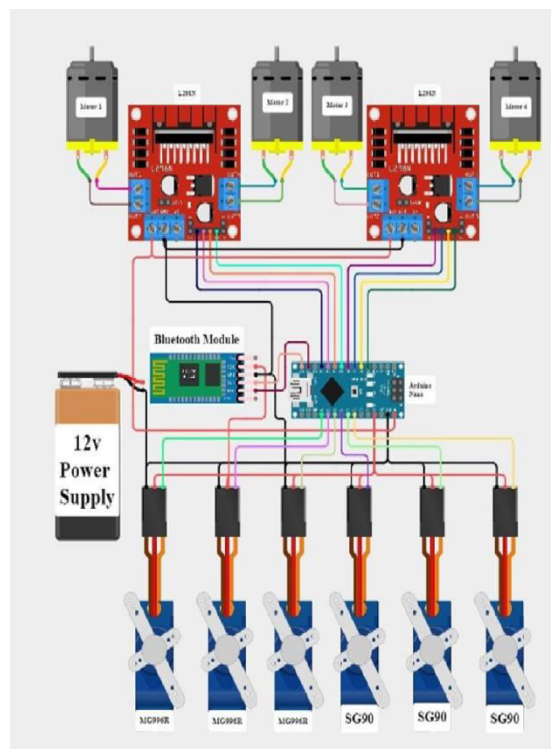


Fig. Circuit diagram



**IV. LIST OF COMPONENTS**

Sr.no	Components	Specification	Quantity
1	Arduino Nano	ATmega328p	1
2	MotorDriver	L298N	2
3	ServoMotor	SG90, MG996R	5
4	DC Motor	5V, 300rpm	4
5	BluetoothModule	HC05	1
6	Lithium-ionBattery	3.7V, 2600mAh	10
7	Switch	240V, 20A	1
8	MecanumWheel	360degreeRotation	4
9	RoboticArm	3DPrintedArm	1

**V. WORKING OF COMPONENTS**

- **Arduino Boards:** In this project arduino board serves as the core controller, managing the operations of both the robotic arm and the mobile platform. Its compact size and sufficient processing power make it an ideal choice for this project.
- **Power Supply:** 12V, 5A lithium-ion batteries are used as power supply.
- **Servo Motors:** Servo motors are essential for the precise and reliable operation of the pick-and-place robotic arm. They are used to control the arm's joints, enabling accurate movements and positioning for tasks such as picking up and placing objects. In this project we used SG90 and MG996R servo motors.
- **DC Motor:** DC motors convert direct current electrical energy into mechanical energy through the interaction of magnetic fields. Which allows mobile base to move.
- **Motor Driver:** L298N motor driver is used to control direction of rotation of DC motor. We can connect 2 DC motors at once. 2 motor drivers are used to control 4 DC motor.
- **Bluetooth Module:** HC-05 Bluetooth module that allows wireless communication between microcontrollers and other Bluetooth-enabled devices.

**VI. SOFTWARE**

The application for controlling a robotic arm and mobile platform via a Bluetooth device has been developed by the APP inventor. This application sends data to the microcontroller through a Bluetooth module.



User Interface:

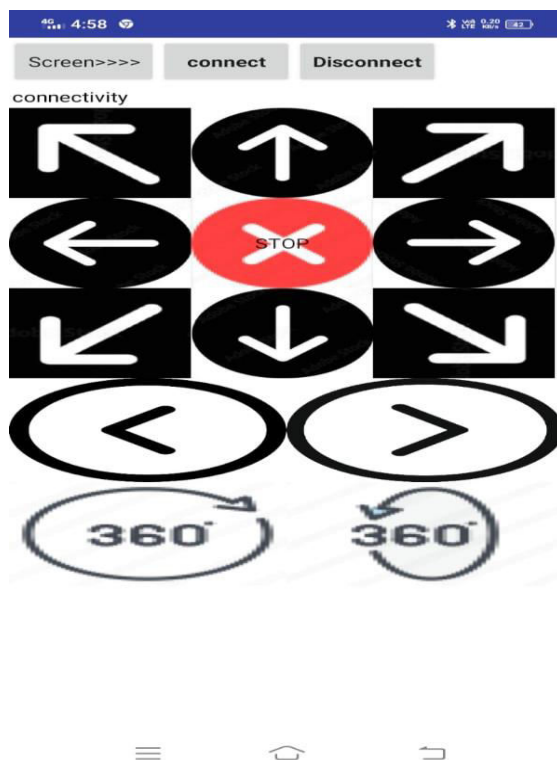


Fig. Vehicle/Mobile platform control

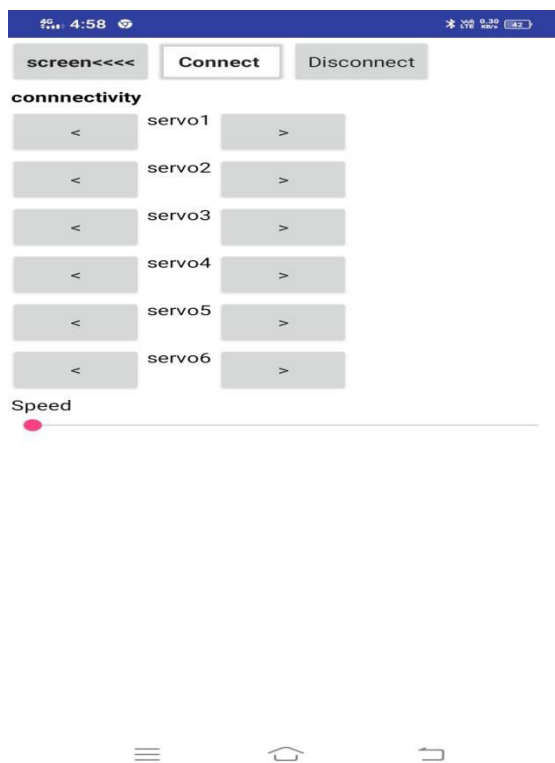


Fig. Arm control

## VII. ADVANTAGES

- It reduces human efforts.
- Robotic Arm have 6 degree of freedom for easy pick and place.
- Each component can be replaced easily.
- It can be controlled by any Android and IOS devices via Bluetooth.
- Mecanum wheels chassis for all direction movement.

## VIII. APPLICATIONS

Pick and place robotic arm vehicle are used in industries for :

- Pick and place, packing and sorting.
- Product assembly.
- Part inspection.
- Packing

## IX. FUTURE SCOPE

- We can add camera or IR camera and an IR torch for enabling night vision
- Due to Mecanumwheel's all direction movement it can be use in future automobile industries and also replace the normal tires.
- We could also add some important sensor for better usage sensors like motion, thermal, ultrasonic, etc.
- It can be used in future space missions because it can move in all direction and the robotic arm also help to pick and place the object.

## X. FINAL PROJECT

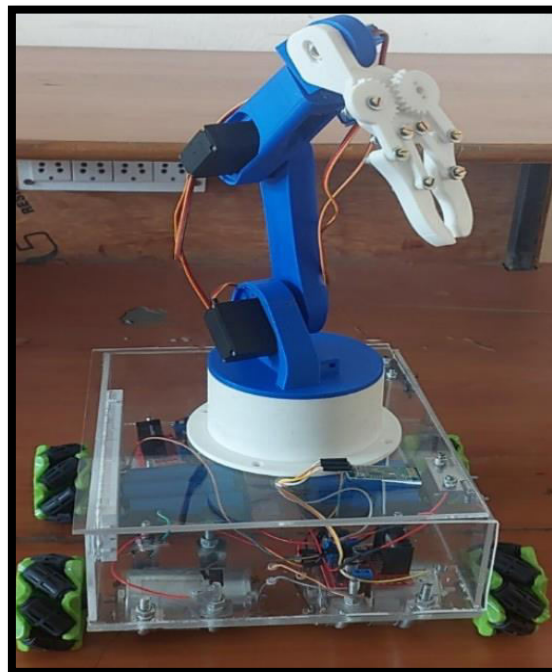


Fig. Pick and place robotic arm vehicle

## XI. RESULT

A pick and place robotic arm that is mounted on a movable vehicle is a system that allows the robotic arm to transport objects from one location to another. This robotic arm is designed to grasp and manipulate objects of varying shapes and sizes with precision. This project aimed to optimize cost parameters in comparison to the existing Robotic Arm



Vehicle. Upon successful completion, the robotic arm vehicle utilized Bluetooth technology with **6** degrees of freedom and a Bluetooth range of up to **100** meters. The robotic arm can lift weights of up to **300** grams.

## **XII. CONCLUSION**

We have successfully developed Pick And Place Robotic Arm Vehicle which is capable of Pick and place objects having weight under 300 grams, We can control this robot by using Android and IOS devices via Bluetooth.

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