A 6x6 DIY Bluetooth Controlled Car with solar Assist

Bluetooth-controlled robot, rocker-bogie mechanism, and Arduino-based project

Ashrit Saha
Electronics and Communication
Vellore Institute of Technology
Kolkata, India
ashrit.saha@gmail.com

Pranidhan Atreya
Electronics and Communication
Vellore Institute of Technology
Guwahati, India
pranidhanatreya@gmail.com

Divyansh Kumar Jain
Electronics and Communication
Vellore Insttitue of Technology
Chennai, India
divyanshkumar.jain2021@vitsudent.ac.in

Abstract— This report details the design and development of a DIY Bluetooth-controlled car. The project combines an Arduino microcontroller, Bluetooth module, motor driver, and DC motors to create a remotely operable vehicle. Key features include wireless control via a smartphone app, solar- powered battery charging, and a rocker-bogie suspension system for traversing uneven terrain.

The working principle involves the smartphone app transmitting directional commands over Bluetooth to the HC-05 module on the car. The Arduino interprets these signals and sends appropriate instructions to the L298N motor driver, which regulates the speed and direction of the DC motors to maneuver the vehicle. A power bank provides the necessary electricity, with solar panels enabling sustainable recharging.

The report outlines the step-by-step process of assembling the car's hardware components, programming the Arduino, and integrating the Bluetooth control functionality. Practical considerations such as chassis construction, wiring, and troubleshooting are also discussed. The resulting DIY Bluetooth-controlled car demonstrates the feasibility of creating a versatile, eco-friendly, and remotely operated robotic platform using readily available components and open-source software.

Introduction

. In the rapidly evolving world of robotics and automation, the ability to control devices remotely has become increasingly important. This is particularly true in the realm of mobile robotic platforms, where wireless control can unlock new possibilities for exploration, surveillance, and even recreational applications. The DIY Bluetooth-Controlled Car project aims to explore the integration of readily available components to create a versatile, eco-friendly, and remotely operable vehicle.

At the core of this project lies the Arduino microcontroller, a popular open-source electronics platform renowned for its flexibility and ease of use. By pairing the Arduino with a Bluetooth module, a motor driver, and DC motors, we have developed a car that can be controlled wirelessly using a smartphone app. This not only adds an element of convenience but also opens up new avenues for user interaction and experimentation.

One of the key features of this DIY vehicle is its sustainable power source. Equipped with solar panels, the car's power bank can be recharged using the abundant energy of the sun, making it an environmentally friendly alternative to traditional battery-powered models. This emphasis on sustainability aligns with the growing demand for eco-conscious solutions in the robotics and automation industry.

Moreover, the car's mechanical design incorporates a rocker-bogie suspension system, which enables it to navigate uneven terrain with greater agility and stability. This feature, combined with the wireless control capabilities, expands the potential applications of the car, from recreational use to specialized tasks such as remote exploration and surveillance.

The 6x6 DIY Bluetooth Controlled Car with Solar Assist project presents a significant advancement over existing 4x4 counterparts by integrating several innovative features. Primarily, the expanded size of the vehicle enhances stability and mobility, allowing it to traverse challenging terrains with ease. The incorporation of solar panels introduces sustainability and reduces reliance on traditional power sources, extending operational duration. Furthermore, the Bluetooth control system offers improved range and responsiveness, enhancing user experience. Additionally, IoT integration enables functionalities such as environmental monitoring, GPS tracking, and data logging, contributing to the vehicle's versatility and functionality. This not only showcases practical advancements but also offers valuable research contributions in the realm of DIY Bluetooth-controlled vehicles with solar assist, including experimental findings, comparative analyses, and theoretical insights.

This report delves into the detailed process of designing, building, and programming the DIY Bluetooth-Controlled Car. It covers the working principles, hardware components, and software integration, providing a comprehensive guide for those interested in replicating or expanding upon this project. By sharing our experiences and insights, we aim to inspire and empower others to embark on their own journeys of robotic exploration and innovation.

REQUIRED COMPONENTS

A. PKE 4 in 1 Soldering Iron Tool Kit

The 4-in-1 Soldering Iron Tool Kit is a comprehensive and versatile solution for a wide range of electronic and DIY projects. This all-in-one kit integrates a soldering iron, a desoldering pump, a wire stripper, and a multifunctional tool, making it an indispensable tool for hobbyists, electronics enthusiasts, and professional technicians alike.

The soldering iron features adjustable temperature control, allowing users to precisely regulate the heat output to suit different soldering tasks and materials. The integrated desoldering pump effectively removes excess solder, simplifying the process of reworking and repairing electronic

components. The wire stripper ensures clean and precise removal of insulation from wires, while the multifunctional tool provides additional functionality, such as cutting and scraping, to cater to a diverse array of needs.

Designed with portability and convenience in mind, the 4-in-1 Soldering Iron Tool Kit is compact and easy to transport, making it an ideal companion for workshops, workbenches, or on-the-go projects. With its comprehensive set of tools, users can tackle a variety of soldering, desoldering, and wire management tasks with ease, improving the efficiency and quality of their electronic work.

B. Red BO Motor Wheels

The Red BO Motor Wheels are an essential component for IoT (Internet of Things) projects that require mobile robotic platforms. These high-performance wheels, equipped with integrated DC motors, provide the necessary locomotion for building autonomous or remote-controlled devices.

Featuring a durable and vibrant red design, the BO Motor Wheels are well-suited for a wide range of IoT applications, from educational robotics to home automation systems. The built-in motors allow for precise control of speed and direction, enabling smooth and responsive navigation. These versatile wheels can be seamlessly integrated with microcontrollers and control systems, making them a versatile choice for IoT enthusiasts and developers.

With their robust construction and reliable performance, the Red BO Motor Wheels are an excellent addition to any IoT project that requires mobile capabilities, whether it's a small-scale robot or a larger-scale autonomous system.

C. 60W Heavyduty Hot Melt Glue Gun with 10 Sticks (11 mm x 20 cm)

The 60W Heavy-Duty Hot Melt Glue Gun from Supreme-Mart is a powerful and versatile tool for a wide range of adhesive applications. With its 60-watt heating element, this glue gun delivers fast and consistent melting of the included 10 glue sticks, allowing users to efficiently bond a variety of materials such as wood, plastic, fabric, and more. Designed for heavy-duty use, this glue gun features a comfortable grip and a sturdy construction, making it a reliable choice for DIY projects, craft work, and industrial applications.

D. OLatus DC BO Motor Dual shaft Smart Car Robot Gear Motor for DIY Robotics (2 Pieces)

This dual-shaft gear motor from OLatus is a versatile component designed for DIY robotics and smart car projects. Featuring a BO (Brush Operation) motor, these high-performance motors offer reliable and efficient power for propelling mobile robotic platforms.

The dual-shaft design allows for seamless integration with various wheel and drive configurations, making it a flexible choice for a wide range of IoT and robotics applications. With the inclusion of two pieces, users have the necessary components to power a smart car or small robot, enabling them to explore and experiment with their DIY projects.

Equipped with robust construction and precise speed control, the OLatus DC BO Motor Dual Shaft Smart Car Robot Gear Motor is an essential building block for IoT enthusiasts, robotics hobbyists, and makers looking to bring their innovative ideas to life.

E. Robotbanao UNO R3 Development Board With 1 Feet USB Cable-Blue And Black-Pack Of 1

The Robotbanao UNO R3 Development Board is a versatile and user-friendly platform for a wide range of electronic and IoT projects. Based on the popular Arduino UNO architecture, this board provides a robust and well-documented ecosystem for prototyping, experimenting, and bringing ideas to life.

Featuring a sleek blue and black design, the UNO R3 Development Board comes bundled with a 1-foot USB cable, making it easy to power and program the board using a computer or other compatible devices. The board's open-source nature and extensive community support ensure that users can access a wealth of resources, libraries, and examples to kickstart their projects.

Whether you're a beginner or an experienced maker, the Robotbanao UNO R3 Development Board offers a reliable and flexible foundation for your DIY electronics, robotics, and IoT endeavors. Its compatibility with a vast array of shields and add-ons further expands the board's capabilities, allowing you to customize and enhance your projects as per your needs.

F. Kit4Curious Acrylic 6 Wheel Drive Curious Chassis for DIY Robotics (Black)

The Kit4Curious Acrylic 6 Wheel Drive Curious Chassis is a versatile platform designed for DIY robotics and IoT projects. Featuring a sleek black acrylic construction, this chassis provides a sturdy and modular foundation for building mobile robotic systems.

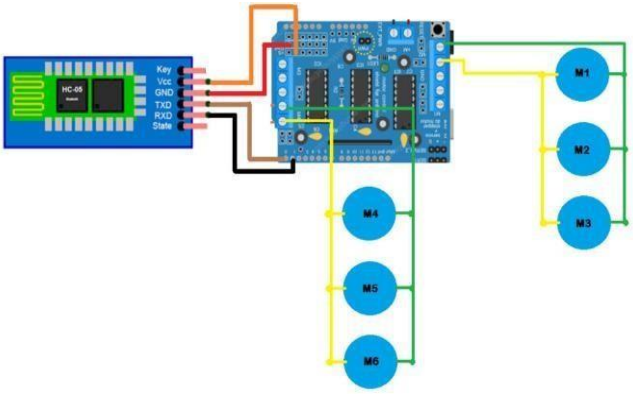
The key highlight of this chassis is its 6-wheel drive configuration, which offers enhanced stability and traction, making it ideal for navigating uneven terrain or challenging environments. The wheels are positioned in a manner that allows for smooth and precise maneuverability, giving users greater control over their robotic creations.

Compatible with a wide range of electronic components and microcontrollers, the Kit4Curious Chassis can be easily integrated with motors, sensors, and other peripherals to bring your robotic ideas to life. Its modular design allows for easy customization and modification, empowering makers and hobbyists to tailor the chassis to their specific project requirements.

G. Supreme-Mart Two Rolls Of Rosin Core Solder Wire And 50G Soldering Paste (Flux)

Supreme-Mart's Two Rolls of Rosin Core Solder Wire and 50G Soldering Paste (Flux) offer a complete soldering solution for electronics enthusiasts and professionals. The high-quality solder wire, with its rosin core, ensures a reliable and consistent flow during soldering, while the soldering paste (flux) helps to improve wetting and prevent oxidation for superior joint quality. This comprehensive set of soldering supplies from Supreme-Mart provides the essential tools needed to tackle a wide range of electronics projects with confidence and efficiency.

Circuit Diagram



WORKING PRINCIPLE

Control App: You'll need a Bluetooth control app on your smartphone. There are pre-made apps available or you can code your own.

Bluetooth Communication: The app sends control signals (forward, backward, left, right) via Bluetooth to the HC-05 module on the car.

Arduino Program: The Arduino is programmed to receive these signals and translate them into instructions for the motor driver.

Motor Driver: The L298N motor driver controls the DC motors based on the Arduino's instructions. It regulates speed and direction of the motors to maneuver the car.

Power Supply: The power bank supplies the electricity to run the Arduino, motor driver, and motors.

Solar Charging: The solar panels convert sunlight into electricity, which is used to charge the power bank, making your car eco-friendly!

Here's a more detailed explanation of each stage:

Building the Car: Construct the chassis or use an existing one.Mount the Arduino, motor driver, Bluetooth module, and DC motors securely on the chassis.Connect the motors to the motor driver following the L298N datasheet.Wire the motor driver, Bluetooth module, and Arduino together based on their pin configurations (refer to their datasheets for pin details).

Programming the Arduino: Write or find Arduino code that receives Bluetooth commands from the app and controls the motor driver accordingly.The code should interpret commands like "forward" as setting specific speeds and directions for both motors to move the car forward.

Using the Car: Charge the power bank using the solar panels or a wall outlet.Connect the power bank to the car's battery input.Open the Bluetooth control app on your smartphone and pair it with the HC-05 module on the car (refer to the module's instructions for pairing).

Now, you should be able to control the car's movement using the app's controls!

Power Source: The car would primarily operate using the power stored in the power bank.The solar panel would continuously recharge the power bank while the car is not in use or while driving in sunny conditions.

Benefits:

Renewable Energy: The solar panel provides a renewable source of energy, reducing reliance on disposable batteries and minimizing environmental impact.

Extended Playtime: The power bank acts as a buffer, extending playtime even when sunlight is limited. You can enjoy using the car for longer periods before needing to recharge the power bank through an external source (like a wall outlet).

Portability: The combination of solar panel and power bank eliminates the need for a constant external power source. You can use the car outdoors without worrying about finding an outlet to recharge.

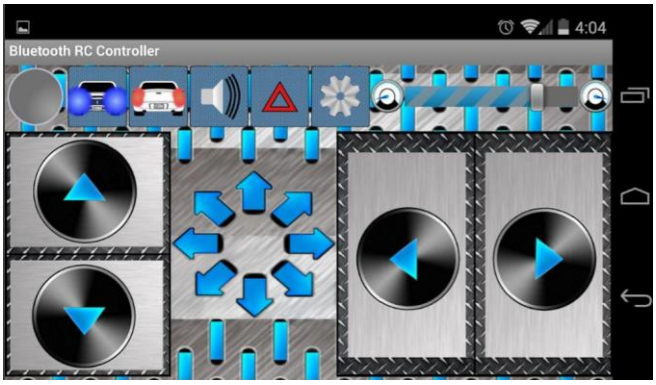
Considerations:

Solar Panel Efficiency: The amount of power generated by the solar panel will depend on its size and efficiency. A larger or more efficient panel will recharge the power bank faster and allow for longer playtime.

Power Bank Capacity: A larger capacity power bank will store more energy, providing more time for car operation before needing to recharge the power bank itself.

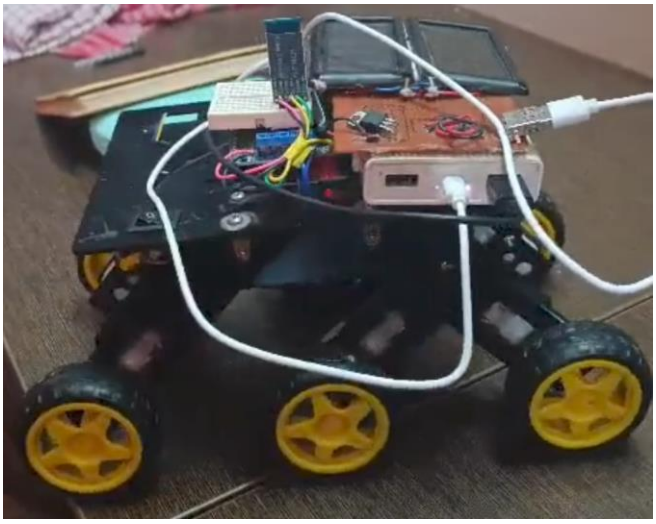
Power Consumption: The car's power consumption will determine how long the power bank can last on a single charge. More powerful motors or additional features will drain the power bank faster.

APP



The Arduino Bluetooth RC car app, is a user-friendly mobile application designed to control Arduino-based remote-controlled cars wirelessly via Bluetooth connectivity. This intuitive app offers users a seamless interface to remotely maneuver their RC cars using their Android devices. With features such as directional control (forward, backward, left, and right), speed adjustment, and possibly additional functionalities like light control or sensor feedback, the app provides an immersive and customizable RC driving experience. Whether for hobbyists, enthusiasts, or educational purposes, the Arduino Bluetooth RC car app enhances the versatility and enjoyment of Arduino-powered remote-controlled vehicles.

Implementation and Configuration



UTILITY AND USE CASES OF POWER BANK POWERED BLUETOOTH CAR WITH SOLAR PANEL SUPPORT

Educational Tool:

STEM Learning: This project is a perfect platform to teach students about robotics, electronics, Bluetooth communication, and solar power. Building and controlling the car reinforces concepts of mechanics, circuitry, and programming (if using an Arduino). Project-Based Learning: It serves as an engaging project for students to showcase their problem-solving, teamwork, and technical skills. They can experiment with different designs, control algorithms, and sensor integrations. Entertainment and Hobbyist.

Applications:

Remote-Controlled Fun: It provides a fun and affordable way to enjoy remote-controlled car racing or navigating obstacle courses indoors or outdoors. The portability due to solar charging adds to the convenience. Customization and Tinkering: The DIY aspect allows for customization and tinkering. You can modify the car's design, add features like lights or sensors, and experiment with different control methods (e.g., smartphone app, voice control).

Practical Uses:

Line Following for Simple Tasks: With a line following sensor, the car can be programmed to follow a black line on a white background, potentially useful for following a specific path for simple tasks indoors.

Environmental Considerations:

Solar Power: The use of solar panels makes the car eco-friendly, powered by a renewable energy source. This reduces reliance on batteries and minimizes environmental impact.

CONCLUSION

The 6x6 DIY Bluetooth Controlled Car with Solar Assist project represents an innovative and forward-looking approach to sustainable and remote-controlled robotics. By integrating Bluetooth control and solar assistance, the project demonstrates enhanced mobility, educational value, and a commitment to sustainability. The 6x6 design offers improved maneuverability and stability, making the vehicle suitable for various terrains and environments. The incorporation of solar assistance not only showcases a commitment to sustainable energy sources but also underscores the potential for environmentally friendly alternatives in transportation and robotics. Additionally, the Bluetooth control feature adds a layer of convenience and versatility, enabling remote operation of the vehicle. Overall, the project lays a foundation for future advancements in autonomous functionality, energy efficiency, and the integration of additional sensors. Sharing the project's details and results with the community can inspire others to explore similar projects, fostering a culture of innovation, collaboration, and sustainability in the realm of DIY robotics and electronics.

REFERENCES

[1] http://grnjou.rnal.us/index..php/AJEMA/article/view/656

[2] https://digitalscholarship.unlv.edu/ece_fa.c_articles/104/

[3] http://earsiv.cankaya.edu.tr:8080/handle/20.50.0.12416/4265