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ADVANCED ELECTRA DRIVE

[1]Sourabh V. Patil, [2]Parth R. Soundattikar, [3]Sujay R. Kamble, [4]Sanika P. Jamdade, [5]Divya K. Kadam, [6]Prof . Manoj J. Deshmukh

[1,2,3]Students,[4]Assist. Professor.
[1,2,3,4]Department of Electrical Engineering
[1,2,3,4]Jaywant College Of Engineering & Polytechnic, K. M. Gad, Sangli, India.

Abstract : ***The Electra Drive is a smart electric car that is powered using renewable energy sources and is equipped with intelligent control systems. The Electra Drive makes use of the solar panel to produce real-time electricity using sunlight and the produced electricity is controlled using the solar charge controller and used to power the car. Any additional electricity is charged in the Li-ion/LiPo rechargeable battery. If there is no sunshine, the device automatically shifts to battery power.***
In addition, the car can be wirelessly controlled using the ESP32 microcontroller which uses Wi-Fi technology and a smartphone application. On the other hand, the L298N motor driver regulates the functioning of the DC motors and the obstacle detection sensor halts the movement of the car whenever there is any obstacle. From the design of the model, it can be seen that it works effectively in terms of energy utilization and wireless control.

Index Terms **- Solar Assisted Vehicle, Smart Electric Vehicle, ESP32, Wi-fi Control, Obstacle Detection, Renewable Energy.**

INTRODUCTION

The need for green transport is rising due to environmental pollution and scarcity of fuel. Electric cars decrease the emission levels; however, they totally rely on the grid supply for charging their batteries. Some issues arise, such as long charging periods, restricted driving range, and dependence on charging stations. In contrast, solar power is abundant during the daytime but is not utilized extensively in small-sized electric cars. Electra Drive is designed to harness solar power effectively and operate on the real-time energy provided by the sun whenever sunlight is available. The car runs on a rechargeable battery when sunlight is unavailable. Such a combination increases energy efficiency and minimizes charging reliance. Smart wireless control through ESP32 and mobile applications are included in the system. The speed of the wheels is regulated by the motor driver, while the obstacle avoidance sensor enhances safety.

II. LITERATUREREVIEW

Studies conducted on solar cars have indicated that the installation of solar cells can help conserve batteries and increase operational hours. Studies focus on the significance of the charging controller in controlling solar energy and protecting the batteries. Most robotically automated vehicles incorporate DC motors as well as motor drivers such as L298N. ESP32 is one of the most popular wireless communication methods in IoT applications because of its in-built Wi-Fi function. The use of ultrasonic sensors to detect obstacles is another popular method in robotics. With the use of all these technologies, Electra Drive creates a hybrid smart vehicle.

III. RESEARCHMETHODOLOGY

The project was designed systematically in phases. Initially, the chassis of the robot was constructed, and the DC motors were fixed on the chassis with wheels attached to the motors to give it the physical structure of the robot car. After that, the solar panel was interfaced with the solar charge controller and rechargeable batteries to develop its power supply system.
Then the ESP32 microcontroller and L298N motor driver were interfaced to drive the movement of the motors. The obstacle detection sensor was interfaced with the ESP32 to ensure safety from any obstacles in front of the robot car. The ESP32 microcontroller was programmed using the Arduino IDE to create the Wi-Fi hotspot and perform control operations. Commands for the robot's movements were sent using an android application via Wi-Fi.

System Design:
Combining the solar panel, battery, controller, and drive system in one unit.
Two power sources for the solar and battery modes.

Hardware Setup:
Putting together the chassis, DC motors, and wheels.
Mounting the solar panel and power switch onto the vehicle.

Software Development:
Coding ESP32 with the help of Arduino IDE.
Developing a Wi-Fi hotspot for remote control through the smartphone.
Development of motor and obstacle avoidance functions.

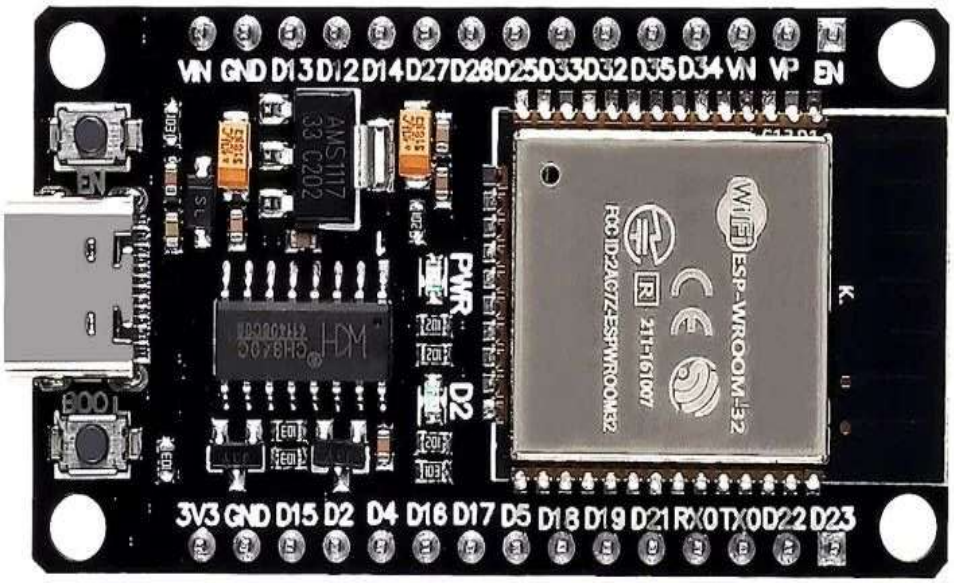
IoT Integration:
Create dashboard on IoT platform.
Add controls (slider for speed, ON/OFF button).
Connect ESP8266 to cloud server.

Data Communication:
IoT connection capability by means of ESP32 for wireless communication.
Information about vehicle battery levels and condition is available via a smartphone.
Future scope to integrate with cloud-based systems for intelligent monitoring.

Motor Control:
Controlling the speed and direction of DC motors by L298N motor driver.
Independent control of two motors for turns.

3.1 Main Components of these system:

3.1.1 M Microcontroller: ESP 32 development board.

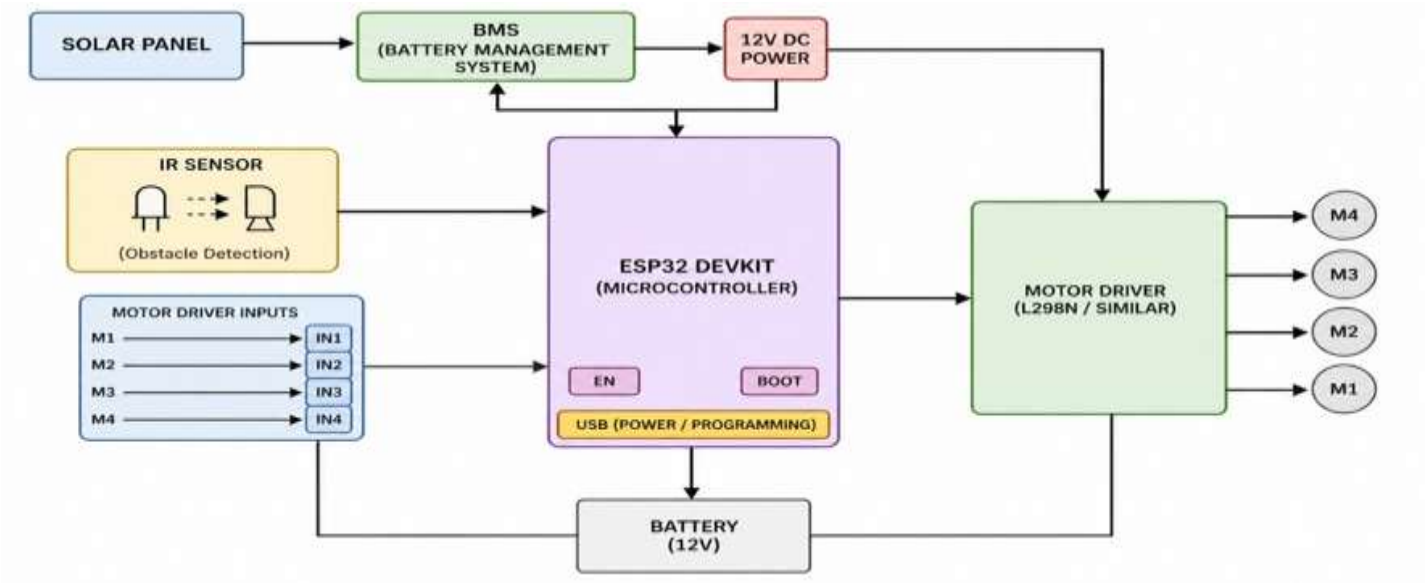


3.1.2 Motor Driver: L298N driver to control voltage and current parameters.

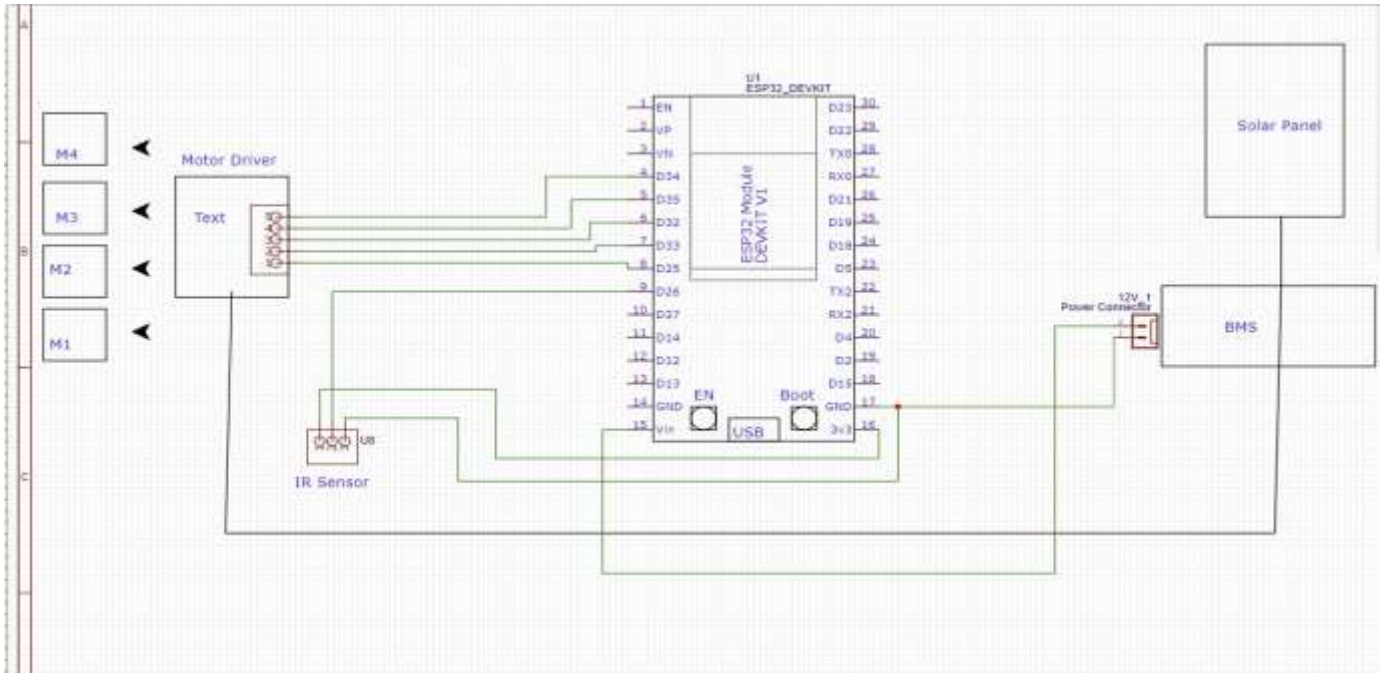
3.1.3 DC Geared motor :

3.1.2 Solar Panel :

3.2 BlockDiagram:



3.3 Circuit Diagram:



3.4 Working Model

IV. APPLICATIONS

[1] College campuses
[2] Park & tourist areas
[3] Industries
[4] Smart city control
[5] Short-distance delivery

V. CONCLUSION AND FUTURE SCOPE

5.1 Future Scope

We implemented our projected for increasing the efficiency, intelligence, and usability of the car.
[1] Larger Solar panel for more power.
[2] Higher capacity battery.
[3] GPS & regenerative braking.
[4] IOT monitoring of battery & solar data.

5.2 Conclusion

Electra is an example of how solar power, battery storage, and control systems can be combined to produce a green vehicle, minimizing reliance on traditional charging methods and encouraging the utilization of renewable resources in automotive applications.

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