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AUTOMATED SOLAR PANEL CLEANING SYSTEM

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Abstract:

The project titled "Solar-Powered Wireless Charging System for Electric Vehicles" showcases a pioneering solution in the realm of sustainable transportation. In this innovative endeavor, a solar car has been meticulously designed, leveraging the abundant energy of the sun for both propulsion and extending support to other electric vehicles. The solar car is equipped with a 6V solar panel, charging a 4.5V battery, and driven by four 4V motors, controlled seamlessly by a standard RC transmitter and receiver.

A key highlight of this project is the incorporation of a wireless charging system at the car's rear, capable of wirelessly transferring power to other electric vehicles in need. This functionality is particularly useful when encountering stranded or discharged electric cars on the road. In such situations, the solar car automatically identifies the needy vehicle, navigates to its location, and initiates wireless charging, effectively reviving the stranded vehicle and enabling it to resume its journey.

This project not only represents a significant advancement in green technology but also addresses a critical challenge in the adoption of electric vehicles—range anxiety. By providing on-the-go wireless charging support, the solar car mitigates concerns about running out of power, thereby bolstering confidence in the viability of electric vehicles for everyday use.

The research and development behind this project encompassed solar energy harnessing, efficient battery management, precise motor control through remote technology, and the implementation of cutting-edge wireless charging principles. Furthermore, the system's autonomous response to identifying and assisting other electric vehicles demonstrates the project's practical applicability and real-world impact.

Introduction:

In a world ever more conscious of environmental sustainability and energy-efficient transportation, the Solar-Powered Wireless Charging System for Electric Vehicles emerges as a pioneering project. This innovation combines cutting-edge technology, harnessing 6V solar power, to charge a 4.5V battery in a specially designed solar car. Equipped with four 4V motors for forward and reverse movement, this vehicle is controlled by a standard RC transmitter and receiver. A standout feature is the integration of a wireless

charging system at the rear, enabling this solar car to provide wirelessly charged energy to other electric vehicles in need, revolutionizing how we envision eco-friendly transportation.

In this project report, we delve into the intricacies of our Solar-Powered Wireless Charging System, exploring each component's functionality and synergy. We will discuss solar power generation, battery management, electric propulsion, remote control technology, wireless charging principles, system integration, testing, and real-world applications. The project's ultimate goals are not only showcase a sustainable mode of transportation but to pave the way for a future where electric vehicles can support each other in times of need.

OBJECTIVE:

The objective of a Solar Wireless Electric Vehicle (EV) Charging system is to provide a sustainable and efficient method for charging electric vehicles using solar energy without the need for physical connections or wires. Here are some key objectives of such a system:

Clean and Renewable Energy: Utilize solar power, a clean and renewable energy source, to generate electricity for charging electric vehicles. This helps reduce dependence on non-renewable energy sources and lowers the overall carbon footprint of the transportation sector.

Energy Independence: Promote energy independence by utilizing local solar resources, reducing reliance on external energy sources. This can enhance the resilience of the transportation infrastructure and reduce vulnerability to fluctuations in traditional energy markets.

Wireless Charging Convenience: Eliminate the need for physical cables and plugs by employing wireless charging technology. This enhances the convenience of EV charging, making it easier for users to charge their vehicles without the hassle of handling charging cables.

Cost Savings: Over the long term, solar energy can offer cost savings compared to traditional grid electricity. While the initial setup costs may be higher, the ongoing operational costs can be lower, especially as the price of solar technology continues to decrease.

Promotion of Electric Vehicles: By providing a convenient and environmentally friendly charging solution, the system can contribute to the increased adoption of electric vehicles, supporting the transition to a more sustainable and low-emission transportation sector.

PROBLEM STATEMENT:

Electric vehicles have now hit the road worldwide and are slowly growing in Numbers. Apart from environmental benefits, electric vehicles have also proven helpful in reducing the cost of Travel by replacing fuel with electricity which is way cheaper.

• However electric vehicles have 2 major disadvantages:

✓ Long charging time – 1-3 hours required for charging

✓ Not availability of power for charging stations in off-city and remote areas.

• The power is converted to AC using a transformer and regulated using regulator circuitry. This power is Now used to power the copper coils that are used for wireless energy transmission.

• A copper coil is also mounted underneath the electric vehicle. When the vehicle is driven over the coils Energy is transmitted from the transmitter coil to the EV coil.

• Please note the energy is still DC current that is induced into this coil. Now we convert this to DC again so That it can be used t charge the EV battery.

• We use AC to DC conversion circuitry to convert it back to DC current. Now we also measure the input Voltage using an Atmega microcontroller and display this on an LCD display.

• Thus the system demonstrates a solar-powered wireless charging system for an electric vehicle that can be Integrated into the ro

SCOPE:

Future Scope of Solar-Powered Wireless Charging System for Electric Vehicles:

The Solar-Powered Wireless Charging System for Electric Vehicles you have developed presents an innovative solution that aligns with the growing need for sustainable transportation. As the world increasingly shifts towards renewable energy and eco-friendly practices, your project holds significant potential for future applications and advancements. Here are some key future scopes for your project:

1. Advancements in Solar Technology:

As solar technology continues to advance, the efficiency and output of solar panels are likely to improve. Integration of high-efficiency solar cells and energy storage systems could enhance the charging capacity of solar-powered vehicles, extending their range and reducing dependency on grid electricity.

2. Smart Grid Integration:

Introducing smart grid technologies that enable bidirectional energy flow between the vehicle and the grid can be explored. This bidirectional flow allows electric vehicles to not only charge from the grid but also discharge excess energy back to the grid when required, contributing to grid stability and energy management.

3. Integration with IoT and Al:

Incorporating Internet of Things (IoT) devices and Artificial Intelligence (AI) algorithms can enhance the Intelligence of your solar car. IoT sensors can provide real-time data on sunlight intensity, battery status, and vehicle performance. Al algorithms can optimize charging patterns based on historical data and weather forecasts, ensuring efficient use of solar energy.

4. Vehicle-to-Grid (V2G) Technology:

Exploring Vehicle-to-Grid (V2G) technology allows electric vehicles, including solar cars, to interact with the grid. During peak energy demand periods, these vehicles can supply stored energy back to the grid, helping balance the load. Implementing V2G capabilities could make your solar car a valuable asset in the context of grid management.

METHODOLOGY:

No methodology is available for material and method selection except decision making in multi attribute environment. Material selection is vital and crucial activity in any industry nowadays. This substantially reduces the risk of wrong material or method selection.

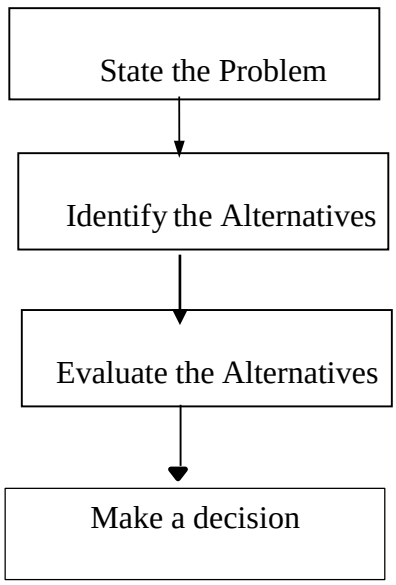

Figure 3.1 - Decision Making Processes

Working:

1. Wireless Power Transmission:

Nowadays electricity is considered as one of the basic needs of human beings. The conventional power transmission system uses transmission lines to carry the power from one place to another, but it is costlier in terms of cable costs and also there exists a certain transmission loss

2. Capacitor

The capacitor is a component which has the ability or "capacity" to store energy in the form of an electrical charge producing a potential difference (*Static Voltage*) across its plates, much like a small rechargeable battery.There are different kinds of capacitors available from very small capacitor beads used in resonance circuits to large power factor correction capacitors, but they all do the same thing, they store charge

3. Diodes

The most common function of a diode is to allow an electric current to pass in one direction (Called the diode's forward direction), while blocking current in the opposite direction (the Reverse direction). Thus, the diode can be viewed as an electronic version of a check valve.

4.PCB B0ARD

A printed circuit board (PCB) mechanically supports and electrically connects electronic components using conductive tracks, pads and other features etched from copper sheets laminated onto a non-conductive substrate. Components (e.g. capacitors, resistors or active devices) are generally soldered on the PCB. Advanced PCBs may contain components embedded in the substrate.

5. Solar Panel

Solar panels are devices that allow for the input of sunlight, and convert this sunlight into electricity. The shape of solar panels can vary in different rectangular shape and a combination of these rectangular shaped panels are installed and used to produce the electricity. The solar panel consists of solar cells which are semiconductor devices that change the sunlight into electricity or direct current.

6. Resister

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses. High-power resistors that can dissipate many watts of electrical power as heat may be used as part of motor controls, in power distribution systems, or as test loads for generators, fixed resistors have resistors have resistances that only change slightly with temperature, time or operating voltage.

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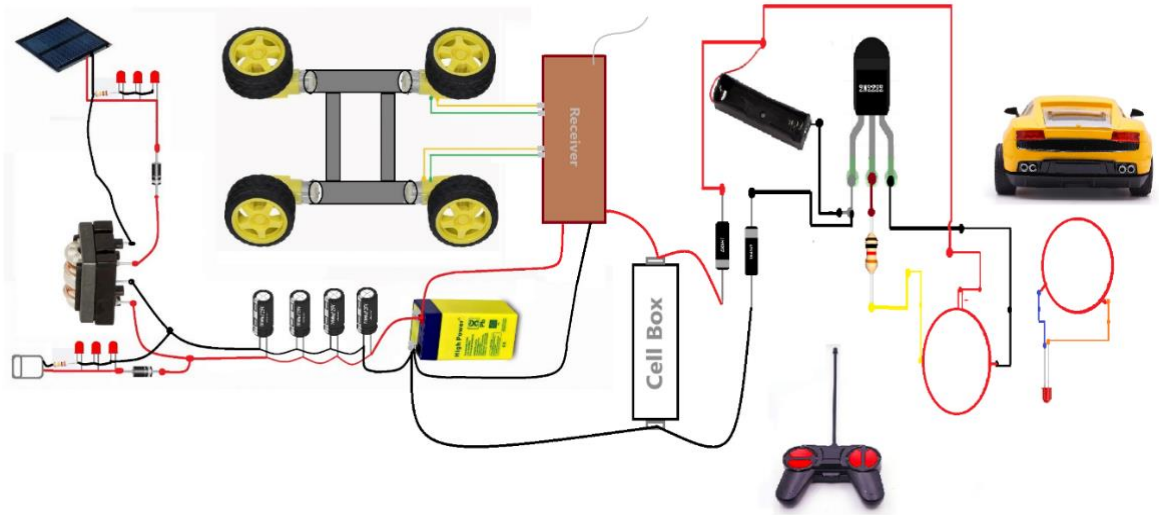
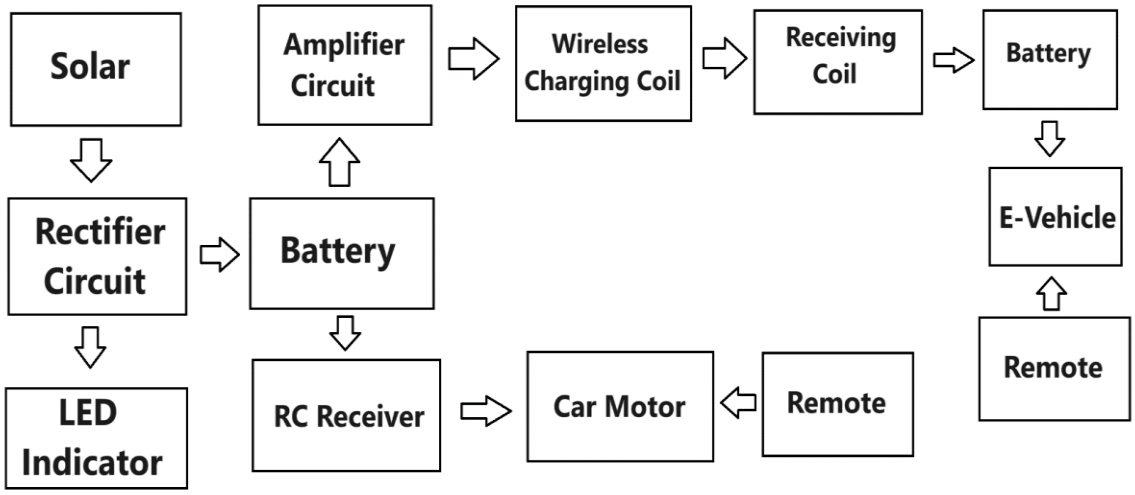
7.BATTERY

An electric battery is a device consisting of one or more electrochemical cells with external connections provided to power electrical devices. Such as flashlights, smartphones, and electric cars. When a battery is supplying electric power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that when connected to an external circuit will flow and deliver energy to an external device

Model & Design





Conclusion:

Automated cleaners mainly focus on large arrays and in general are not suitable for installing on smaller arrays namely residential solar plants. Our system requires less space than a commercial array also it is Easy to install, Therefore out idea serve as a huge advantages for those smaller sites. As we know prevention is better than curing thus the cleaning action prevents the primary accumulating surface dust on the solar panel before it becomes too sticky to remove. As a result, we can increase the efficiency of solar panel by keeping thr surface of panel clean and dust free using same renewable source of solar energy

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