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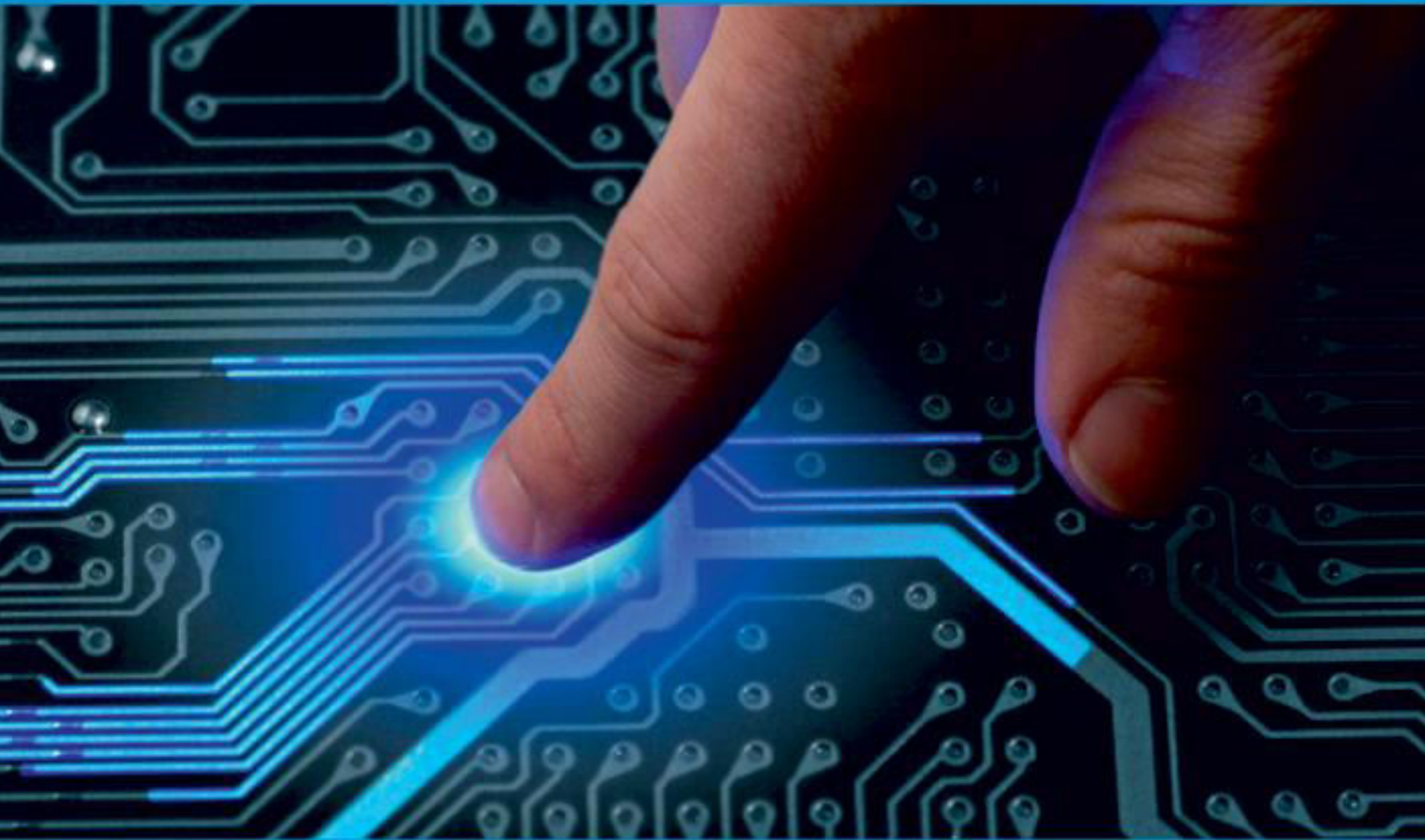

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# Wireless Electric Vehicle Charging System Using Solar energy

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**ABSTRACT:** The main issues of fuel and pollution when charging electric vehicles are discussed in this paper, along with the design of a solar- powered charging station. Electric car sales are steadily rising now that they are ubiquitous on the road. Electric vehicles not only benefit the environment but also reduce travel costs because they run on electricity rather than gasoline, which is significantly less expensive. Here, we develop an inventive and clever EV charging solution to solve the problem. Vehicles may be charged while moving thanks to an EV charging system, which runs on solar electricity and does not require an additional power source. An LCD display, solar panel, battery, transformer, regulator circuits, copper coils, AC to DC converter, and ESP 32 controller are among the parts utilized to construct the system. This method eliminates the need to stop and wait for a charge by enabling electric automobiles to be charged while driving. As a result, the system shows an integrated solar-powered wireless charging system for electric vehicles.

## I. INTRODUCTION

The development of wireless charging solutions for electric cars has accelerated noticeably over the past ten years. With the rate at which cities are becoming more urbanized globally, they wish to move away from cars that run on gasoline and diesel to become greener cities. This is partially due to EVs becoming more economical and efficient. Thanks to wireless charging devices that are intelligently integrated into cars and placed both within and outside of cities, owners should never needto plug in their vehicles. Just to review Park your vehicle normally over a coil that is buried or set on the ground using this technique.

There has been a notable surge in the advancement of wireless charging systems for electric vehicles in the past ten years. With the rate at which cities are becoming more urbanized globally, they wish to move away from cars that run on gasoline and diesel to become greener cities. This is partially due to the increasing efficiency and affordability of electric vehicles. Thanks to intelligently designed wireless charging devices that are placed both inside and outside of cities, owners should never need to plug in their cars. Just use this strategy to park your car normally over a coil that is buried or placed on the ground.

As a new era of automotive technology is ushered in, the industry is quickly moving from internal combustion engines (IC engines) to electric vehicles. The increased demand for electric vehicles is reflected in the increasing number of charging stations. This technique uses inductive coupling as a wireless charging method to power the car wirelessly. The process of transferring electrical energy from a source to a load without the need for conducting wires is known as "wireless power transmission. The architecture of the system includes a solar panel, battery, transformer, regulator circuits, copper coils, AC to DC converter, at-mega controller, and LCD. With this technique, charging electric cars while on the road is possible instead of stopping at a station. Thus, the technique makes it possible to charge an EV wirelessly using solar electric system that is embedded into roads possible.

This study examines the objectives, limitations, design considerations, and potential applications of solar electric charging systems for mobile phones in this setting. By examining current research, technological developments, and real-world uses, we seek to clarify the feasibility, challenges, and prospects of mobile solar energy collecting.

In the pursuit of a low-carbon future and innovative approaches to fulfilling the growing need for sustainable mobility, the development of solar electric charging systems for automobiles is at the forefront of this revolutionary journey. Together, the business community, academic institutions, and policy-making bodies can make the most of solar energy and power the next generation of affordable, clean, and environmentally friendly transportation options.

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## II. LITERATURE SURVEY

- A review of the literature on recent advances in solarand wireless charging stations for electric vehicles.
- Bugatha Ram Vara Prasad et al. (2021) proposed a solarpower system. A solar-powered charging station for electric vehicles array, as well as a power conditioning unit,to convert solar energy into electrical energy.
- The system includes an energy source. Managementsystem that controls the charging procedure and optimisesthe use of renewable energy sources.
- T.D. Nguyen and colleagues et al. (2020) investigated the viability of bipolar pads for chargers for wireless power. The study evaluated the performance and efficiencyof bipolar pads for wireless charging, highlighting thepotential benefits of this technology in reducing the reliance on physical connections. Bugatha Ram Vara Prasad.
- M. Singh et al. (2019) proposed a real-time coordinationsystem for electric vehicles to support the grid at thedistribution substation level. The system utilizes a communication network and intelligent algorithms to manage the charging and discharging of the vehicles, optimizing the use of renewable energy sources and reducing the reliance on the power grid.
- R. Das, K. Thirugnanam, P. Kumar, R. LavuDiya, and M. Singh examined the feasibility of using bipolar pads as wireless power chargers.
- The study evaluated the performance and efficiency of bipolar pads for wireless charging, highlighting the potential benefits of this technology

## III. METHODOLOGY AND DISCUSSION

### Methodology

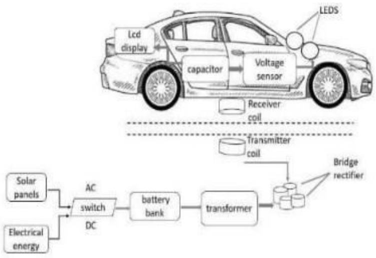


Fig No 1: Flowchart

**System Design and Optimization:** The first stage is to builda solar electric charging system that is specific to the vehicle's kind, size, and energy requirements. This includes evaluating the best solar panel placement and orientation to optimize sunshine exposure while also taking aerodynamicsand vehicle aesthetics into account.

**Solar Panel Selection**: Choosing solar panels with goodefficiency, durability, and adaptability is critical. Thin-film solar panels or lightweight, flexible alternatives may be favored for incorporation into vehicles due to their ability to conform to curved surfaces and reduce aerodynamic drag.

**Tracking Mechanism Implementation**: Include a tracking mechanism that constantly adjusts the position of solar panelsto ensure the best light exposure throughout the vehicle's route. This could include using sensors, actuators, and controlalgorithms to dynamically align the panels with the sun's location relative to the vehicle.

**Energy Conversion and Storage**: To maximize energy conversion from solar panels to the vehicle's electrical system, incorporate efficient power electronics such as maximumpower point tracking (MPPT) controllers. Include energystorage options, such as batteries or supercapacitors, to store extra solar energy for use during times of low sunshine or highenergy demand.

**Vehicle Integration and Compatibility**: Ensure that thesolar electric charging system integrates seamlessly with the vehicle's existing electrical architecture and power management system. This could include modifying or developing automobiles with dedicated interfaces, connectors, and safety measures to accommodate solar charging functionality.

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**Real-Time Monitoring and Control:** Installing a monitoring and control system will allow you to keep an eye on the generation of solar energy, battery charging, and overall system performance in real time. This maximizes dependability and energy efficiency by enabling proactive system adjustment and change.

**Testing and Validation**: Conduct extensive testing and validation of the solar electric charging system under a varietyof operational situations, including weather, topography, anddriving scenarios. Field testing, simulation studies, and performance evaluations may be used to assess the system's resilience and effectiveness.

**Cost-Benefit Analysis:** Conduct a complete cost-benefit analysis to determine the economic viability and return on investment of installing a solar electric charging system.Consider initial installation expenses, energy savings, and potential environmental advantages when determining thesystem's overall cost-effectiveness.

**Continuous Improvement and Innovation**: Create a cultureof continual improvement and innovation to propel advancesin solar charging technology for moving automobiles. Investigate novel materials, design approaches, and integration methodologies for increasing system efficiencyand dependability.

## IV. OBJECTIVES

- Maximize energy harvesting: Optimize surface area,minimize shade, and maximize solar energy capturewhile the vehicle is moving.
- Efficient energy conversion: Use high-efficiency solar panels to minimize energy loss.
- Adaptive tracking mechanism: Real-time orientation adjustment for maximum sun exposure.
- Supplement energy needs: Increase range and reduce reliance on external sources.
- Cost-effectiveness: Balance cost and performance for long-term savings.
- Environmental sustainability: Promote renewable energy usage to cut carbon emissions.
- Integration with vehicle systems: Smoothly integratesolar charging with minimal interruption.
- User experience: Enhance user input and tracking foreffective system administration.
- Regulatory compliance: Ensure legal standards for safeand authorized use.
- Durability and reliability: Design parts for long-termdependability despite operational challenges.

## II. Working/Schematic

### Solar Panels

Electrical energy is produced from solar radiation using solar panels. The photoelectric effect hypothesis, which states that when a solar panel is exposed to light, electrons are liberated, is used by them. The cells used to make solar panels are silicon. With an atomic number of 14, silicon contains two of its outermost electrons when light enters a silicon cell.

Fig No 2 : Solar Panel

The electrical current that I started is now triggered. There are two different sales forms available for silicon. The final silicon block is used to make silicon wafers, which are utilized in monocrystalline solar panels, in both single- and multi-crystalline forms. Similar to how monocrystalline silicon cells are more expensive but also more efficient than polycrystalline ones, polycrystalline silicon cells are made by melting several silicon crystals together.

### Batteries (Power Supply)

An apparatus that directly transforms chemical energy into electrical energy is a battery. It consists of two half cells joined in series to create one or more voltaic cells via the conductive electrolyte. consists of a single series voltaic cell or more. A long horizontal line for the positive terminal and a shorter horizontal line for the negative terminal are used to depict each cell. These are submerged in a liquid or solid electrolyte and do not meet one another. The half-cells are

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connected by a conductor called the electrolyte. Additionally, it has ions that can react with the electrodes' chemical composition.

Chemical reactions that transfer charge between the electrode and the electrolyte at their interface transform chemical energy into electrical energy. The term "faradaic" refers to these processes, which are what cause current to flow through a cell. At the electrode-electrolyte interfaces, regular, non-charge-transferring (non-Faradaic) processes also take place. One reason voltaic cells, especially the lead-acid cell found in most automobile batteries, "run down" while left idle is non-faradaic reactions.

**Regulator**

A circuit that produces and maintains a consistent yield voltage free of input voltage or stack circumstances is called a voltage.

The voltages from a control source are directed by voltage controllers (VRs) so that the other electrical components can endure the voltages. Although a few voltage controllers may to change over AC/AC or AC/DC, DC/DC control change is the foremost common utilization for them.

**MOSFET**

Metal oxides and semiconductors form the basis for field-effect transistors, which can provide multiple outputs and protect against overcurrent and overvoltage with the use of an AC/DC converter. High-frequency transformers are commonly utilized in machinery or other equipment that requires specific voltages or currents, and are connected to a high-frequency voltage source known as an H-bridge according to their original design. The primary coil receives the pulses and transforms them into higher voltages, which are then sent to the rectifiers. Apart from traction batteries, batteries intended for use in electric vehicles are referred to as EVBs. Business or pleasure cars can be powered by battery electric vehicles (BEVs), which are rechargeable. Traction batteries, which are used in electronically operated car batteries, are often used to fuel the electrical grid.

**Transmission Coil**

In the CAR SYSTEM, the wireless power reception coil receives power from the transmitting coil, which is powered by solar panels and the grid. The transmitting coil uses gauges 28 and 32.

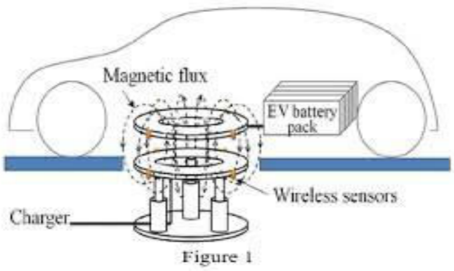


Fig No 3: Transmission And Receiver

**Receiving Coil**

The components of the receiver section, including the voltage regulator, rechargeable battery, bridge rectifier, and receiving inductor coil, are critical. The bridge rectifier is utilized to transform the AC signal that the coil receives into a DC signal. However, it is essential to convert the unregulated voltage generated by the bridge rectifier into a regulated constant voltage.

**ESP32 Microcontroller**

The ESP WROOM 32 MCU Module is an all-purpose WIFI-BT-BLE MCU module that is capable of handling a wide range of operations, including speech encoding, music streaming, MP3 decoding, and low-power sensor networks.

The ESP32S chip, which is designed to be scalable and adaptable, served as the core component of this module. It boasts two separately controllable or programmable CPU cores, and its clock frequency can be adjusted from 80 MHz to 240 MHz.

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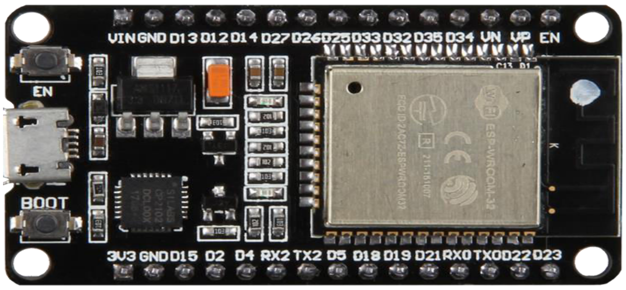


Fig No 4: Microcontroller

Instead of disabling the CPU entirely, the user can choose to utilize the low-power coprocessor to consistently monitor the peripherals for any alterations or threshold breaches. The ESP32S microcontroller boasts a wide array of peripherals, such as capacitive touch sensors, Hall sensors, low-noise sensing amplifiers, SD card interface, Ethernet, high-speed SDIO/SPI, UART, and I2C.

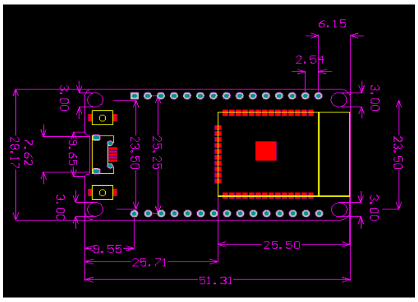


Fig No 5 : Microcontroller Schematic

This module is capable of achieving the widest possible physical range by handling data rates of up to 150 Mbps and producing an output power of 22 dBm at the PA.

**LCD Display**

A versatile electronic component is the Liquid Crystal Display (LCD) screen, particularly the 16x2 LCD display, which is commonly found in various circuits and devices. This choice is preferred over other multi-segment displays due to its affordability, ease of programming, and lack of limitations on content display.

With its two lines each displaying up to 16 characters, the 16x2 LCD display presents each character as a 5x7 pixel matrix. This display has two registers: Command and Data, which allows for efficient control and manipulation of its contents.

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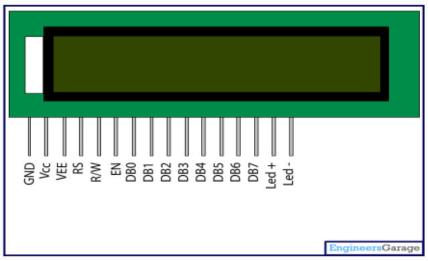


Fig No 6 : LCD Display

The commands sent to the LCD are stored in the command register, which gives instructions to perform specific tasks like initializing, cleaning the screen, adjusting the display, and so on. These commands are referred to as instructions. The data register holds the information that will be displayed on the LCD, and the ASCII value of the character to be shown on the LCD is known as the data.

**Motor**

12V DC geared motors operating at 100RPM for robotics applications. Incredibly user-friendly and offered in standard size. Internally threaded shaft for easy connection to the wheel, and nut and threads on the shaft for easy connection.

Overall, by removing the need for frequent pauses to recharge, a wireless EV charging system while driving offers a practical and effective way to increase the range of electric vehicles and encourage their widespread adoption.

**Schematic TX-SIDE**

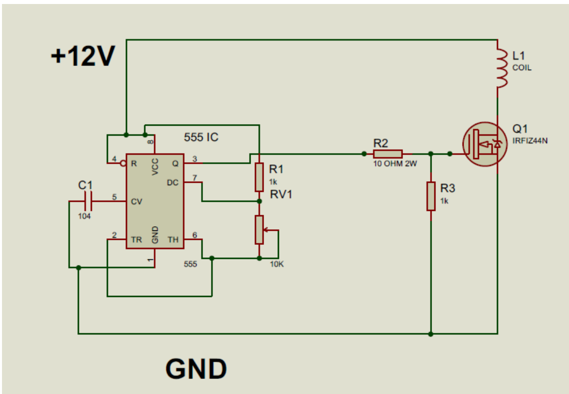


Fig No 6: Transmission side layout

**RX-SIDE**

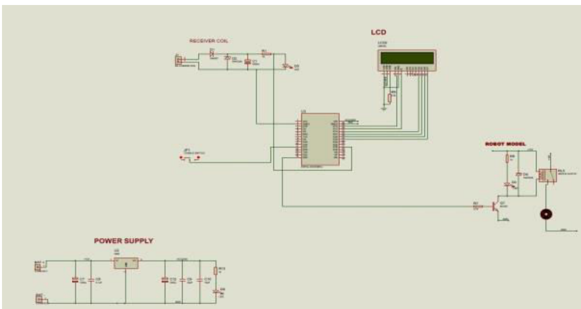


Fig No 7: Receiver side layout

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## V. WIRELESS ELECTRIC VEHICLE CHARGING SYSTEM USING SOLAR ENERGY

**Hardware & Software Tools**
The following components hardware:

- ESP232 Controller,
- Battery,
- Voltage Sensor,
- LCD Display,
- Transformer,
- Regulator Circuitry,
- Transmitter and Receiver Coils,
- Vehicle Body,
- Wheels,
- Switches,
- LEDs,
- PCB Board,
- Resistors,
- Capacitors,
- Transistors,
- Cables and Connectors,
- Toggle Switch.
- Motors

The car also features Blynk IOT technology.

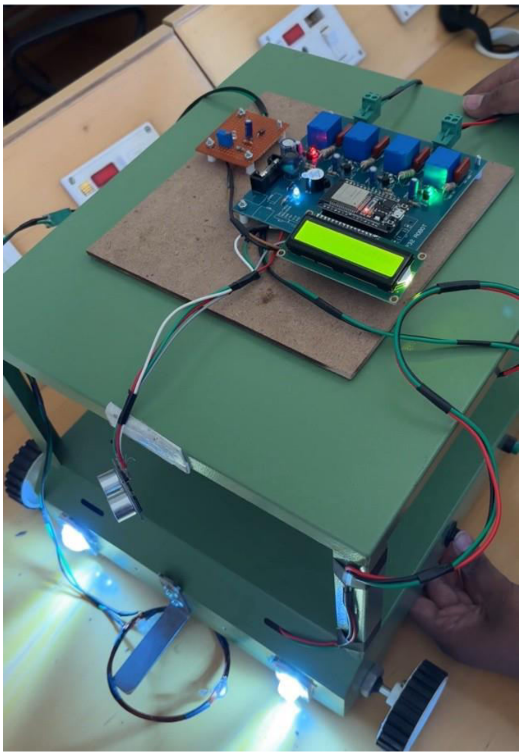

Fig No 8: Prototype

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## VII. CONCLUSION

The earlier paper did a good job of explaining how to build a wireless electric vehicle charging system that runs on solar electricity. For electric vehicles, wireless charging is a more basic and practical option because it eliminates the need for transmission lines and uses less gasoline. This procedure lessens the wear and tear on hardware components. This wireless charging system can be constructed using a dynamic electrical car charging system. In conclusion, the Solar Wireless Electric Vehicle Charging System (SWEVCS), which is built utilizing an ESP232 controller, coils, LCD display, rechargeable battery, and boost converter, offers an efficient and environmentally friendly way to charge electric cars. Utilizing wireless power transfer technology in conjunction with a solar panel, the solution allows for flexible and sustainable charging. ESP232 oversees charging. ensures both safety and excellent charging efficiency.

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