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DEVELOPMENT OF REGENERATING POWER SYSTEM IN ELECTRIC VEHICLE THROUGH SOLAR SYSTEM

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Abstract : In this project, we suggest a current-controlled hill-climbing strategy that is used in Maximum power point tracking of the solar photovoltaic array to charge lithium-ion batteries for off-board electric vehicles within the safety limits and supported rating of batteries, thereby preventing damage to the battery and extending the battery's life span. This strategy is used to charge lithium-ion batteries for off-board electric vehicles. This current sensor and potential difference sensor-based off-board battery charging technique for electric vehicles is being tested with the help of a simulation. In the presence of varying levels of solar irradiation, the acceptable steady-state battery is maintaining a charge that is within the limit of its rated charging capacity. The automobile industry has experienced significant growth over the past 10 years thanks in large part to the advent of electric cars (EV). The process by which batteries are charged is an essential element in the development of electric vehicles. When an electric vehicle battery is charged from the grid, the required amount of load on the battery rises. Because of this, it seems reasonable to propose installing an off-board photovoltaic (PV) array as an electric vehicle battery charging solution in this investigation. In addition to the photovoltaic array, the electric vehicle's battery must be constantly charged, regardless of the amount of solar radiation available; this can be accomplished by employing a backup battery bank.

I. INTRODUCTION

1.1 Introduction:

The automobile industry has experienced significant growth over the past 10 years thanks in large part to the advent of electric cars (EV). The process by which batteries are charged is an essential element in the development of electric vehicles. When an electric vehicle battery is charged from the grid, the required amount of load on the battery rises. Because of this, it seems reasonable to propose installing an off-board photovoltaic (PV) array as an electric vehicle battery charging solution in this investigation. In addition to the photovoltaic array, the electric vehicle's battery must be constantly charged, regardless of the amount of solar radiation available; this can be accomplished by employing a backup battery bank.

1.2 Need of project:

- The transportation sector has seen a major shift towards electric vehicles as it not only stops our dependence on fossil fuels and stop pollution from these vehicles that vehicles release.
- Hence, we are moving towards cleaner sources of energy. Also, photovoltaic resources are increasing in demand as they are the source of clean energy and don't emit carbon dioxide Two types of charging method are there ON Board charging and OFF Board charging.
- ON Board charging is when Battery is kept in the Electric vehicle and charging circuit is not on the vehicle itself but near the charging station. And the battery is charged directly through the DC supply.
- OFF Board charging is when the charging circuit is kept in the vehicle itself, and it can be charged using AC supply as there is rectifier circuit kept on the vehicle which converts the AC into DC which then charges the battery.

1.3 Motivation of the project:

- Environmental Impact: Start by discussing the global and local environmental challenges, such as climate change and air pollution, that are driving the need for cleaner and more sustainable transportation solutions. Emphasize how the widespread adoption of electric vehicles (EVs) can help reduce carbon emissions.
- Role of Renewable Energy: Explain the growing importance of renewable energy sources, particularly solar power, in reducing greenhouse gas emissions. Highlight the fact that solar energy is a clean and abundant source of power.
- Challenges in EV Charging: Discuss the challenges and limitations of EV charging infrastructure, such as the reliance on grid electricity and the need for more accessible charging options.
- Efficiency and Sustainability: Emphasize the need for more efficient and sustainable methods of charging EVs. Explain how solar power can be harnessed for this purpose, reducing the strain on the grid and promoting sustainability.
- Energy Independence: Mention the concept of energy independence, where EV owners can generate their own electricity from solar panels, reducing their dependence on fossil fuels and centralized power sources.
- IoT and Monitoring: Discuss the role of IoT technology in enabling real-time monitoring and control of solar power systems. Highlight the benefits of data collection and analysis for optimizing energy use and ensuring the system's reliability.

1.4 Objectives:

1. To overcome this disadvantage and to charge the EV battery without any interruption, the proposed charger is developed using PV array integrated with sepic converter, bidirectional dc/dc converter.
2. To design a useful system. To improve pilot project efficiency, the solar-charged vehicle system will be analysed. Reduce carbon footprint.
3. To attain energy sustainability. This solar charging system will be used to power all campus battery-operated vehicles, and more charging stations will be added.
4. This effort will promote campus energy sustainability and encourage students, teachers, and staff to use public transportation and solar-powered electric automobiles.

II. LITERATURE SURVEY

"Review of Electric Vehicle Charging Technologies, Configurations, and Architectures" Sithara S. G. Acharige, B Md Enamul Haque, Mohammad Taufiqul Arif, Nasser Hosseinzadeh, Senior Member, IEEE, 2022
Rapid EV growth may alter global transportation energy. EVs enable sustainable mobility. EV integration is complicated by load demand, power quality, and power losses. Faster charging boosts grid efficiency and electric mobility. EV adoption and services evaluated new EV charging techniques.

"Solar PV based EV charging in India: The growing start-up eco system Analysis, Challenges and solutions" Dr. Kashyap L Mokariya, Advances in Dynamical Systems and Applications. 2022
Money, consolidation, technology, and a growing local market have supported the Indian start up ecosystem. In five years, nearly 55,000 enterprises have raised $63 billion. Startups rapidly create self-employed jobs. The Indian start-up movement is driven by educated millennial with technology backgrounds, IT infrastructure, and growing Internet and smartphone penetration. Infrastructure, government rules, and funding might challenge startups.

"Simulation studies on developed Solar PV Array based Multipurpose EV Charger by using SMC Control and ANFIS", P Shameem L Suresh, International Research Journal of Engineering and Technology, 2022
This study suggests a solar PV array-powered grid-connected domestic EV charger for EV, household, and grid demands. Solar panels power homes individually. PV array failure triggers grid-connected mode. Synchronization and seamless mode switching control quickly connect/disconnect from the grid without disrupting EV charging or residential supplies.

"Solar & Wind Panel Based EV Charging" Akshay D. Satao, Nitesh G. Rathod, Samrudhi A. Sonone, Chetna R. Barapatre, Supriya V. Bhaladhare, Dr. P. S.
Gotekar, International Research Journal of Modernization in Engineering Technology and Science, 2022
This project presents a solar wind charging system (SWCM) to charge electric vehicle battery packs (EVs). The green charging station uses wind and solar PV modules. This project describes designing an electric car charging station with a solar PV-wind system.

III. METHODOLOGY

3.1 Hardware Description:

3.1.1 Battery:

- Energy storage systems, usually batteries, are essential for all-electric vehicles, plug-in hybrid electric vehicles (PHEVs), and hybrid electric vehicles (HEVs).
- Smelting recovers basic salts. Large-scale operations accept lithium-ion and nickel-metal hydride batteries. Smelting burns electrolyte and carbon anodes as fuel or reluctant. Recovering and refining valuable metals makes the product usable. Concrete slag contains lithium and other metals.

Fig. Lithium Ion Battary

3.1.2 Solar:

Around 80% of EV owners have a charging station in their own home. There are three main benefits to pairing that EV charger with solar panels:

- Lower charging costs
- Zero carbon emissions
- Convenience of charging at home

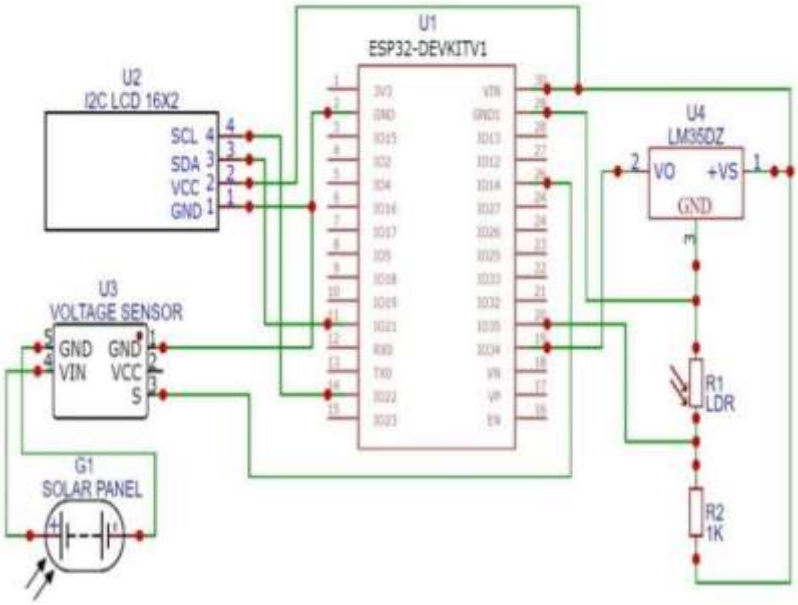
Fig.Solar Panel

3.1.3 DC Motor:

Fig. DC Motor:

The DC motor is the motor which converts the direct current into the mechanical work. It works on the principle of Lorentz Law, which states that "the current carrying conductor placed in a magnetic and electric field experience a force"

3.1.4 ESP 32 CONTROLLER

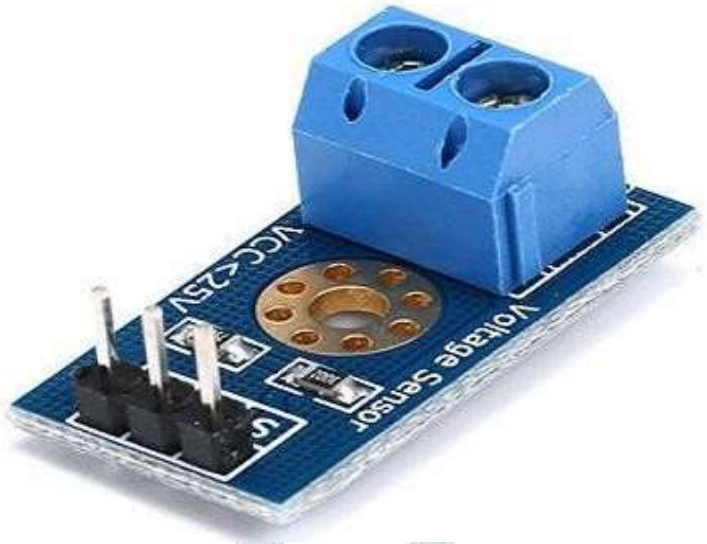


The ESP32 is the main controller for the entire project. There are 3 sensors that directly connect to the GPIO pin of ESP32. The 3 sensors are Voltage Sensor (0-25V), LM35 Temperature Sensor & LDR Sensor. Connect the input of Voltage Sensor to GPIO14 of ESP32 Board. On the other side of the Voltage, the Sensor connects the Solar Panel with a voltage range between 3V-25V as the voltage sensor's maximum sensing capacity is 25V only. Similarly, connect the input of the LM35 temperature sensor to the GPIO34 of ESP32. The LDR requires a resistor of 2.2K in series to measure the analog voltage fed to the ESP32 Analog pin. The LDR input pins connect to the GPIO35 of ESP32.

3.1.5 LCD Display

LCD brightness, or more technically "Luminance", is measured in millicandles of luminance per square meter, also known as "NITs". Serious specifies a "minimum typical" brightness for each display, meaning that the described LCD has a typical luminance specification at least that amount. Resolution: 800x480
Interface: RS232
Voltage: 11V~26V
Temperature: -20℃ ~ 70℃
Outline: 200mm x 125mm x 30mm
Size: 7"
Protocol: Topway
Active Area: 154mm x 85.9mm
Touch Screen: RTP
Casing: PC/ABS

3.1.6 Current Voltage Sensor



This type uses an electromagnetic field to detect changes in voltage. The sensor's exposure to an electric current generates a magnetic field. It induces currents in nearby conductors, such as wires or circuit boards, sensitive enough to detect these changes.

IV. CONCLUSION

The project to design and develop a Solar Power Monitoring System using IoT for onboard charging systems of Electric Vehicle (EV) batteries using a Solar PV Array addresses several crucial needs and objectives. It contributes to sustainability by reducing carbon emissions and reliance on fossil fuels, while also increasing energy efficiency and lowering energy costs. By promoting energy independence and providing real-time monitoring, the project empowers EV owners and encourages the use of renewable energy sources. Additionally, the project is scalable, promotes innovation, and aligns with government incentives for clean energy initiatives. It also raises awareness about the potential of renewable energy and IoT technology in daily life. Overall, this project serves as a forward-thinking and practical solution to the challenges associated with the growing demand for EVs and the need for cleaner, more sustainable energy sources.

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