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Restoration of Energy for the Electric Vehicles

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Abstract:
The growing inclination towards electric vehicles (EVs) can be ascribed to their energy efficiency and eco-friendliness. However, limited driving range of EVs continues to be a major concern for potential buyers. This study explores various methods, including wireless charging, solar power, and regenerative braking, for EV energy replenishment. This review assesses the benefits, challenges, and effectiveness of several strategies for extending the range of electric vehicles. Providing insights on enhancing the sustainability and feasibility of electric cars is the main goal, which will help to create a transportation system that is more environmentally and energy efficient.

Keywords: Solar Panel, Arduino software, LCD display, Buzzer, Relay, Sensors.

1. INTRODUCTION

Renewable energy is becoming increasingly significant as the prices of fossil fuels continue to fluctuate. Solar energy is one of the most popular sources of renewable energy. It is a rich stream of energy, available both directly as solar isolation and indirectly as wind energy. The sun emits energy in the form of electromagnetic radiation, with a potential of 178 Billion MW, which is approximately 20,000 times the world's demand. A portion of solar energy contributes to the evaporation of water, resulting in rainfall and the formation of rivers. Additionally, some of it is utilized in photosynthesis, which is vital for the sustenance of life on Earth.

Numerous research projects have been undertaken to increase solar panel efficiency. Using a solar panel tracking system is one practical strategy. This research article focuses on a microcontroller-based sun tracking system. In order to ensure that the solar panel remains in a perpendicular alignment with the sun's beams, solar tracking is essential for boosting energy production. For many years, there has been a continuous process to create tracking systems for solar panels. Solar panels can maximize power output by positioning themselves to absorb the optimum amount of solar energy by following the sun's movement throughout the day.

At present solar electric power generation systems are having fixed solar panels whose efficiency of generation is less. The aim of the paper is to introduce the solar tracking to the existing fixed solar panels, thus we are maintaining the constant maximum power output. Thus by using this tracking system we can increase the conversion efficiency of the solar electric power generation. For this purpose, we uses PIC microcontroller for sun tracking.

2. RELATED WORKS

An electric vehicle (EV) with an extended driving range is known as a solar electric vehicle (SEV), which uses photovoltaic cells on board to charge a set of batteries. In order to improve a solar electric vehicle's energy management and ultimately extend its range, we have created a customized fuzzy logic control system in this study. Although it is theoretically possible to power a solar automobile directly with the energy produced by solar modules, using batteries as a stored energy source turns out to be a more effective and ideal option solar cell modules;

- rechargeable energy storage system with batteries;
- electric drive motor and gear box;
- control system, which includes a maximum powerpoint tracker (MPPT);
- electrical distribution system;
- wheels and tires;
- body, chassis, suspension.

Figure 1 illustrates the block diagram of a typical SEV.

Solar modules and a Li-ion battery are used as energy sources, via MPPT; the output voltage is compatible for charging the battery and for supplying the electric motor drive. Excess energy produced by solar modules is diverted to charge batteries. Batteries also stored energy supplied by the electric motor running on regenerative mode, during braking and downhill motion of the vehicle.

The control system shares electrical energy between the battery and the drive system, and commands the inverter. The speed of the traction motor is regulated by the Field Oriented Control (FOC) method.

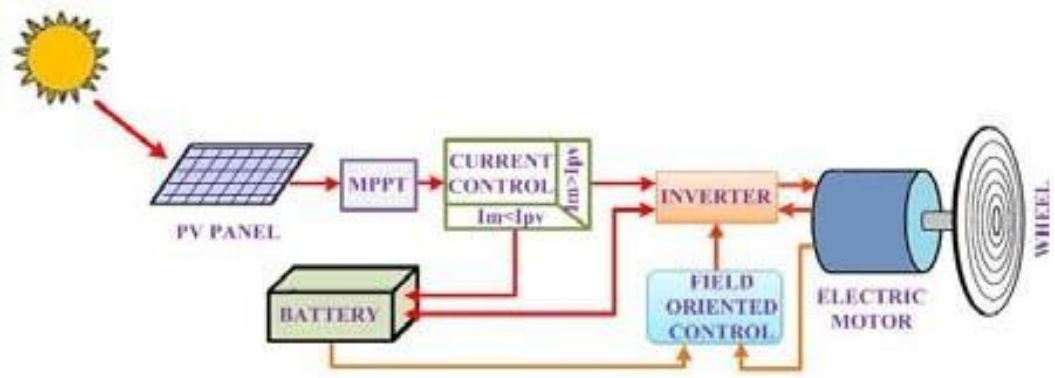

Fig. 1: Block diagram of solar electric vehicle

Solar cars can be designed for car races, considering the special driving rules of that race. The pilot, striving to reach destination as soon as possible, needs to consider the remaining energy stored in batteries, the level of solar cells charging and the remaining distance to destination. Further- more, the track conditions such as up- and down-hill, and turns that effect energy consumption rate of a SEV need consideration. For example, since the acceleration causes a higher rate of energy consumption, the pilot needs to keep speed constant as long as possible without sacrificing the spirit of the race. Solar vehicles can also be designed for transportation on short distances, as between departments of an organization or golf areas.

3. METHODS/SOFTWARE

In this project we should download arduino software in order to write a code and dump it into Arduino

UNO.

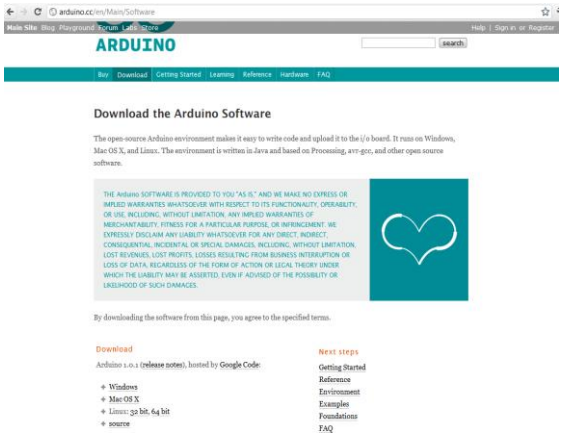

Fig 2: Downloading arduino software

In next step download library

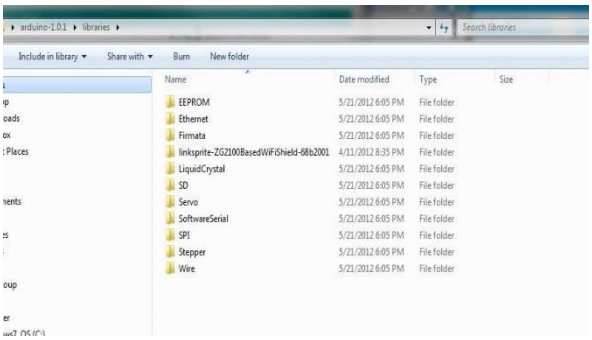

Fig 3: Pasting libraries

Paste all the arduino software libraries into the file and launch it. The arduino interface consists of file, edit, sketch, tools and help.

Select new page and write the entire code which is required in order to perform the required task by the prototype. And then compile it and verify. Convert the code into binary file and dump into the Arduino UNO board. This board performs the operation which is defined in the code.

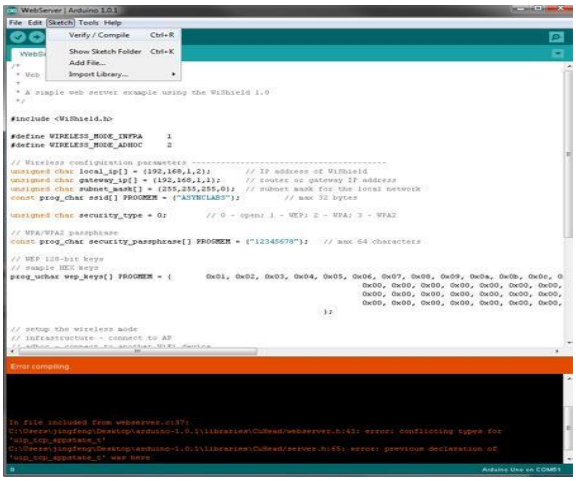

Fig 4: Compling the code

The working operation is mentioned in below figure.

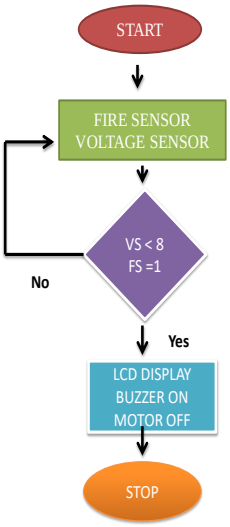

Fig 5: Flowchart for restoration of energy

This is the flowchart for a restoration of the energy for electric vehicles using Arduino, an LCD display, an voltage and fire sensor, a buzzer, and solar & wind power i.e., solar panel and dynamo.

1. Start
2. Initialize Arduino and components:
- Set up LCD display
- Set up motor
- Configure Voltage and fire sensor
- Initialize buzzer

3. Monitor sensors:
- Check for changes in voltage sensor readings
- Check for changes in fire sensor readings
- If no changes are detected, continue monitoring
- If changes are detected, go to step 4

4. Display alert on LCD:
- Show a message like “LOW VOLTAGE” on the LCD

5. Activate the buzzer:
- If fire sensor value is high
- Sound the buzzer to alert the user
- Continue sounding until user’s respond to the alert

6. Check for voltage and fire values:
- Check whether voltage value must be greater than 8volts and go to step 7
- If value is still less than 8volts, continue alerting

7. Turn off the alert:
- Stop the buzzer, if voltage sensor is greater than 8volts and fire sensor must be low

- Clear the message in LCD display

8. Resume monitoring Voltage and Fire sensor

9. End

4. RESULTS

The prototype for this project is mentioned in below figure. Basically, it consists of Arduino UNO, Voltage sensor, Fire sensor, Relay, WIFI module, Buzzer and LCD display.

Firstly we should connect WIFI module to authority user in TELNET software by using local network such as IP address i.e. 192.168.4.1

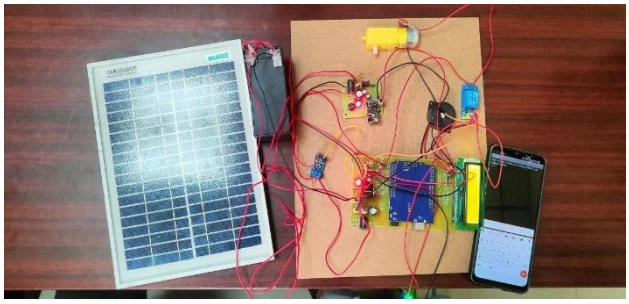

Fig 6: Prototype output measures voltage value

In above figure, there is 12v power supply through solar panel through Battery. In this case the motor is ON and LCD display will display the current voltage value and relay, buzzer is OFF. If the resulted voltage value is less than 5V then, it will display as “LOW VOLTAGE” and relay, buzzer will become ON which makes the motor in OFF condition.

In other case, the prototype will work based on fire sensor. Here it will monitor the flame and starts its functioning property.

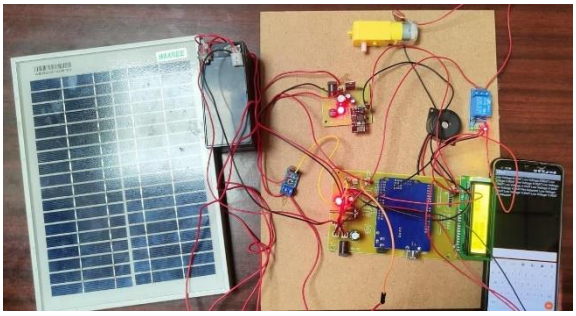

Fig 7: Prototype output measures flame condition

In above figure, there is 12v power supply through solar panel through Battery. Here it will measure the flame or fire sensor. If fire sensor is ON, the relay and buzzer will become on which makes motor OFF. It helps the user from fire accident while travelling and rescue the life.

5. CONCLUSION

The current project involved the installation of a Solar PV Wind Hybrid Energy System. By utilizing electricity generated from both wind and solar power, a portion of the energy needed for a private house, farm house, small company, educational institution, or apartment house has been provided. This

approach decreases reliance on a single energy source, thereby enhancing reliability and improving system efficiency compared to individual modes of generation.

6. FUTURE SCOPE

Our project aims to address the global issues of global warming and energy crisis by harnessing solar energy to generate electricity. Solar energy, being an infinite source of power, is key to reducing our reliance on nonrenewable energy sources. Our main goal is to promote the use of renewable energy in order to create a sustainable future. The solar inverter we have developed serves as a prototype for future projects that will incorporate advanced technologies such as micro controlled solar tracking and charge control. This demonstrates that solar inverters are not only cost-effective but also easy to install, making the transition to renewable energy sources more feasible. With further advancements in this field, solar energy will play a crucial role in revolutionizing the energy sector.

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