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SOLAR BASED ELECTRIC VEHICLE SMART CHARGING STATION

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ABSTRACT

Electric vehicles (EV) are growing in popularity as a credible alternative to gas-powered vehicles. These vehicles require their batteries to be "fuelled up" for operation. While EV charging has traditionally been grid-based, use of solar powered chargers has emerged as an interesting opportunity. These chargers provide clean electricity to electric-powered cars that are themselves pollution free resulting in positive environmental effects. In this paper, we design a solar-powered EV charging station in a parking lot of a car-share service. In such a car-share service rental pick up and drop off times are known. We formulate a Linear Programming approach to charge EVs that maximize the utilization of solar energy while maintaining similar battery levels for all cars. We evaluate the performance of our algorithm on a real-world and synthetically derived datasets to show that it fairly distributes the available electric charge among candidate EVs across seasons with variable demand profiles. Further, we reduce the disparity in the battery charge levels by 60% compared to best effort charging policy. Moreover, we show that 80th percentile of EVs have at least 75% battery level at the end of their charging session. Finally, we demonstrate the feasibility of our charging station and show that a solar installation proportional to the size of a parking lot adequately apportions available solar energy generated to the EVs serviced

INTRODUCTION

Over the past few years, electric vehicles (EV) have gained significant traction because of their appeal as a credible alternative to gas-powered vehicles. Since 2008, more than 4,10, 000 EVs have been sold in the US alone by December2015, representing 33% of the global sales [9]. With EVs expected to be a major source of transportation in the future, there has been meaningful discussion around their adoption including those for policymakers. However, EVs requires charging station that enables them to "fuel up" its batteries similar to gasoline powered cars. While EVs are inherently pollution free, the electricity used to charge their batteries may be drawn from traditional fossil-fuelled power plants, diminishing their appeal as an environment-friendly mode of transport. Recently, there is a move towards designing solarpowered EV charging stations that provide clean electricity. With the reduction in solar costs and improvement in solar efficiency, building solar-powered EV charging station

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presents an excel-lent opportunity to greenify our transportation needs, making EVs end-to-end environmentally positive. While PV systems may be installed on rooftops to build such charging stations, solar canopies installed on parking lots make an excellent choice for solar powered EV charging stations as it not only generate clean electricity but also provide shade to the vehicle In this project a RFID tag is used to identify individual user and start the charging. The microcontroller continuously monitors the voltage levels of the battery that is charges and once it is fully charged it cut-off the supply and beeps a buzzer to indicate battery full status.

Objectives

The main aim of the project is to build a Solar based vehicle charging station using Arduino Uno. The important objectives that are associated in installing the solar based vehicle charging stations are: Reducing the usage of Fossil fuels. Improved quality and efficiency of renewable energy usage. Maximizing the utilization of solar power.

Existing System

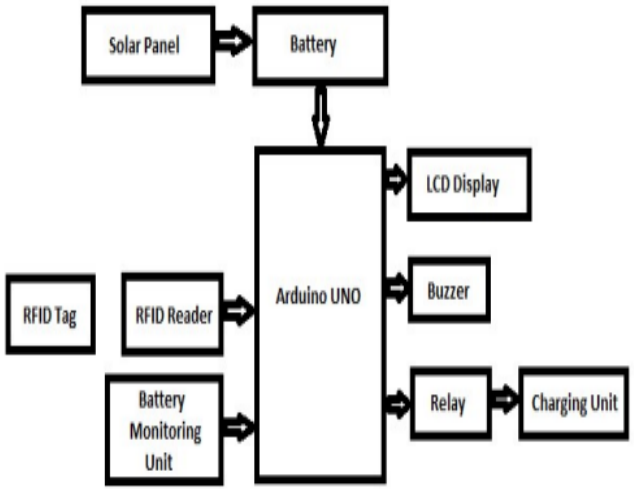
Present day advancement in technology has given rise to various new designs and methods for the smart usage of energy and most efficient solar panels.

These solar panels should be installed in the open space so that it can take maximum radiation of the sun and store its energy.

Proposed System

The battery is charged using solar panel and these operation is monitored by Arduino Uno. This charging station can be installed easily in less span of time with minimum capital. This system can be made more useful by introducing Arduino Uno to it. By integrating with Arduino Uno we can make it work even more efficiently and effectively. The modules include: Voltage Sensor, RFID reader, LCD display.

Block Diagram



Introduction to Arduino Board

The Arduino is a family of microcontroller boards to simplify electronic design, prototyping and experimenting for artists, hackers, hobbyists, but also many professionals. People use it as brains for their robots, to build new digital music instruments, or to build a system that lets your house plants tweet you when they're dry. Arduinos (we use the standard Arduino Uno) are built around an ATmega microcontroller — essentially a complete

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computer with CPU, RAM, Flash memory, and input/output pins, all on a single chip. Unlike, say, a Raspberry Pi, it's designed to attach all kinds of sensors, LEDs, small motors and speakers, servos, etc. directly to these pins, which can read in or output digital or analog voltages between 0 and 5 volts. The Arduino connects to your computer via USB, where you program it in a simple language (C/C++, similar to Java) from inside the free Arduino IDE by uploading your compiled code to the board. Once programmed, the Arduino can run with the USB link back to your computer, or stand-alone without it — no keyboard or screen needed, just power.

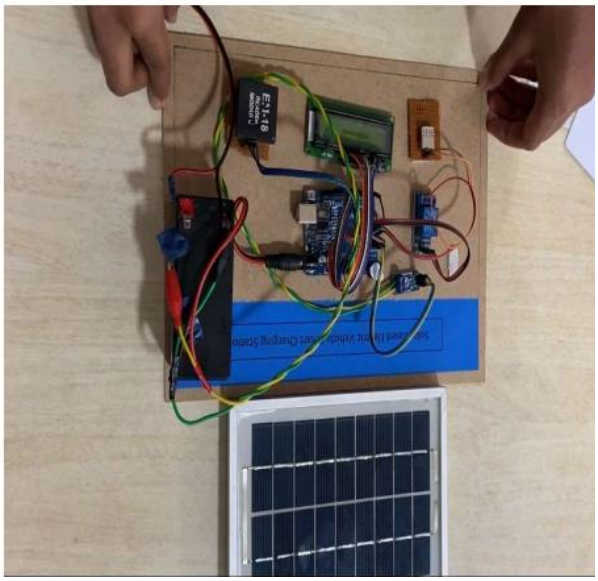
SOFTWARE

ARDUINO IDE

Install the Arduino Software that is appropriate for your specific desktop operating system (Windows, Mac, and Linux):

https://www.arduino.cc/en/Main/Software

RESULT



ADVANTAGES AND DISADVANTAGES

Advantages:

1. The main advantage of solar power is it is a renewable and powerful energy resource

2. It reduces the monthly electricity bills as you are using solar driven electricity and it also generates low maintenance costs.

3. Solar energy can be used for diverse applications and purposes. One can produce electricity in areas without access to the energy grid, to distil water in regions with limited clean water supplies and to power satellites in space

4. Technology in the solar power industry is constantly advancing and improvements will intensify in the future.

Disadvantages:

1. The main disadvantage is that the installation cost is much higher.
2. It also weather dependent, thus cannot be efficient and reliable in various weather conditions.
3. It uses a lot of space as we use more solar panels for generating more electricity

CONCLUSION

• Eliminating dependence on fossil fuels and limited resources while designing an environmentally friendly, self-sustainable, outdoor energy source is the goal for the solar powered charging station. • As well, rapidly advancing solar innovations and

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designs could lend themselves to creating a more efficient charging station • We show that our system is more reliable both in the aspects of environment safety and efficient use of energy through renewable energy resources.

FUTURE ADVANCEMENTS

For the first time ever, researchers connected nine biological-solar (bio-solar) cells into a bio-solar panel and continuously produced electricity from the panel and generated the most wattage of any existing small-scale bio-solar cells. Researchers from The Hebrew University of Jerusalem in Israel, and the University of Bochum in Germany, reported a new paradigm for the development of photo-bioelectro chemical cells in Nature Energy this January, providing a means for the conversion of solar energy into electricity. Reshaping solar spectrum to turn light into electricity. Land and labour costs account for the bulk of the expense when installing solar panels since solar cells—made often of silicon or cadmium telluride—rarely account for more than 20% of the total cost. Hence, solar energy could be made cheaper if less land had to be purchased to accommodate the panels. This is best achieved if each solar cell generates more power, but it is not easy. Transmitting solar power wirelessly from space, The Japanese Space Agency (JAXA)'s Space Solar Power Systems (SSPS) aims at transmitting energy from orbiting solar panels by 2030. On 12 March, Mitsubishi Heavy Industries Ltd (MHI) successfully conducted a ground demonstration test of "wireless power transmission", a technology that will serve as the basis for the SSPS. In the test, 10kW of electricity was successfully transmitted via a microwave unit. Power reception was confirmed at a receiver located 500 metres away. LED lights on the receiver confirmed the transmission. This marks a new milestone in transmission distance and power load (enough to power a set of conventional kitchen appliances).

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