Implementation of Charging Station for E-Vehicle using Solar Panel with IOT

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Abstract: Public charging networks for Electrical Vehicles (EV) is on the rise, with more than 1.3 million EVs deployed worldwide . Whether for economic benefits (higher price per KWh for a faster charging) or for the sole purpose of priority, it has become a point of interest to set a strategy on how to prioritize EVs charging from a single network, especially if the power source is limited as in the case of renewable energy. Our dependence on fossil fuels is drastically reduced by the combined use of solar energy and Electric Vehicle (EV) charging. In this system, a solar charger for electric vehicle is designed and developed. A dc-dc boost converter is employed to boost the solar panel voltage to station battery voltage and Maximum Power Point Tracking (MPPT) is done to optimize the output from solar panel. Provide power from solar panel to the charging station in which the vehicle can be charged through the rechargeable battery and also with the help of IOT , Charging status of the charging station can be monitor at any moment.

Keywords : Iot, Internet Of Things, Solar Panel, Mppt Charger, Renewable Energy, Arduino, E-Vehicle.

I. INTRODUCTION

According to the International Energy Agency (IEA), Renewable will be the fastest-growing source of electricity, in which wind and solar PV are technologically mature and economically affordable. But still there is increase in world's demand for energy. Adopting Renewable Energy technologies is one advance way of reducing the environmental impact. Solar energy is widely available throughout the world and can contribute to minimize the dependence on energy imports.

The Internet of Things (IoT) is a system of related computing devices, mechanical and digital machines, objects, people or animals that are provided with unique identifiers and also the potential to transfer data over a network without requiring human -to-human or human-to-computer interaction. Smart devices, Smart phones, Smart cars, Smart homes, Smart cities. A smart world. "Smart" objects play a key role in the IoT vision, since embedded communication and information technology would have the potential to revolutionize. With the growing presence of WiFi and 4G-LTE wireless Internet access, the evolution toward omnipresent information and communication networks is already evident.

As more countries are moving towards pollution free traffic, E-vehicles are gaining more popularity across the globe. As the number of E-Vehicles increases,E-Vehicle charging infrastructure will be also a basic need. A system with IoT will definitely streamline the performance of E-Vehicle charging and looks the impacts. This method is helpful for transportation systems. This proposed system will improve the city planning and makes the city life easy.

The working costs linked by means of these diesel generators might be incorrectly high due to economical fossil energy costs jointly by means of complexities in petroleum deliverance plus safeguarding of generators. Numerous hybrid systems have been installed across the world, and the expanding renewable energy industry has now developed reliable and cost competitive systems using a variety of technologies.

Using the Internet Of Things Technology for controlling solar photovoltaic energy production can considerably improve the performance, monitoring, and preservation of the plant. With the development of technologies, the price of renewable energy apparatus is going down worldwide attractive huge amount solar photovoltaic fitting. The analysis in this report is foundation on the implementation of a new cost-effective tactic based on iot to distantly observe a solar photovoltaic plant for presentation costing. This will assist in protective preservation, error finding, chronological examination of the plant in calculation to real-time monitoring. With the improvement of wired and wireless network technologies, internet-connected mobile devices such as smartphones and tablets are now in general use.

Thus ensuing in a new theory, the Internet of Things (IoT) was introduced and has received knowledge more than the precedent a small number of years. In common, iot is an data distribution surrounding wherever objects in daily living are related to wired and wireless networks. Recently, it is utilized not just for the field of customer electronics and applications nevertheless moreover in additional different fields such as a smart city, healthcare, smart home, smart car, power system, and industrial safety.

II. METHODOLOGY

In this figure, there are various units are used. This are Arduino UNO R3, power suppy, solar panel , WIFI module, current sensor, voltage sensor, two batteries, relay drivers, LCD display, MPPT charger, Android application.

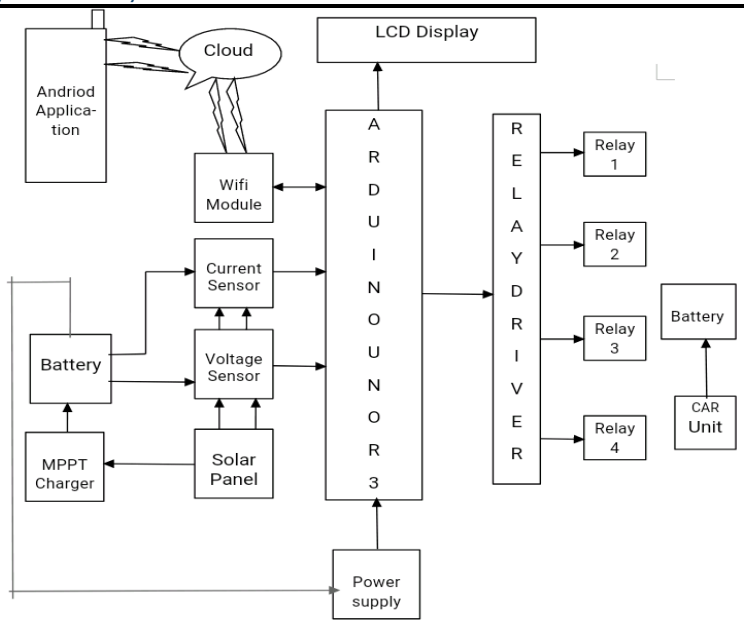

Fig.1.Block Diagram of the Proposed System

A. Description:

1. Charging E-vehicle module using the Solar panel, the maximum power generated by the solar is being tracked using the MPPT controller.
2. The whole setup is connected to the Arduino UNO R3, the battery level, generated and distributes an amount of the battery is viewed using an LCD.
3. A web page is used to check the status of charge of main station battery and the vehicle battery, the amount of power transferred to the main battery by the solar panel and the vehicle battery is charged through the main battery. The charging status of main battery and vehicle battery display on the LCD display. charging module and the available location for the charging station can be displayed.
4. Charging station status is stored in the thingspeak and access by android application. The main idea of this system is to reduce greenhouse gas emission and fossil fuel.

B. Components of Proposed Work :

Arduino :

Knowing the economic constraints and the simplicity of the system, Arduino Uno has been utilized which abates the programming difficulty. Arduino senses the current and voltage value through Analog pins. With the help of these standards, arduino programming calculates power and energy.

The Atmel AVR® core combines a rich instruction set with 32 general purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU). The ATmega328/P provides the following features: 32Kbytes of In-System Programmable Flash with Read-While-Write capabilities, 1Kbytes EEPROM, 2Kbytes SRAM, 23 general purpose I/O lines, 32 general purpose working registers, Real Time Counter (RTC), three flexible Timer/Counters with compare modes and PWM, 1 serial programmable USARTs , 1 byte-oriented 2-wire Serial Interface (I2C), a 6- channel 10-bit ADC (8 channels in TQFP and QFN/MLF packages) , a programmable Watchdog Timer with internal Oscillator, an SPI serial port, and six software selectable power saving modes.

Solar panel :

Solar energy is, simply, the energy given by the sun. This power is in the type of solar emission, that enables the generation of solar electricity likely. Electricity can be generated straight from “light” and “electric.” The solar panel is lone of the main significant parts of solar road lighting, as a solar board will transfer solar power into electricity. Solar modules utilize light power (photons) as of the sun to produce electricity through the PV effect. Solar power uses different reflectors to save additional sun’s thermal energy. A solar panel converts sunlight into an electric current or heat used to provide electricity for home or building. Solar panels are constructed as a collection of lots of small solar cells that are spread over a large area to provide enough power.

MPPT Charger :

MPPT Solar Charge Controller: An MPPT Controller, or Maximum Power Point Tracker is an electronic DC to DC converter that optimizes the match between the solar array (PV panels) and the battery bank. They convert a higher voltage DC output from solar panels down to the lower voltage needed to charge batteries and convert extra voltage of panel into current which increases the output from solar system.

Wifi-module(ESP8266EX) :

ESP8266EX has been designed for mobile, wearable electronics and Internet of Things applications with the aim of achieving the lowest power consumption with a combination of several propriety techniques.
The power saving architecture operates mainly in 3 modes: active mode, sleep mode and deep sleep mode. By using advance power management techniques and logic to power-down functions not required and to control switching between sleep and active modes

Relay:

A relay is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. Relays can work either as switches (turning things ON and OFF) or as amplifiers (converting small currents into larger ones). In our project relay is used to switch power supply in case of fault take place in solar power supply.

Voltage Divider :

A voltage divider (also known as a potential divider) is a passive linear circuit that produces an output voltage (V_{out}) that is a fraction of its input voltage (V_{in}). Voltage division is the result of distributing the input voltage among the components of the divider.

Current Sensor :

A current sensor is a device that detects electric current in a wire, and generates a signal proportional to that current. The generated signal could be analog voltage or current or even a digital output. The generated signal can be then used to display the measured current in an ammeter, or can be stored for further analysis in a data acquisition system, or can be used for the purpose of control.

LCD Display :

A liquid-crystal display is a flat panel display, electronic visual display, or video display that uses the light modulating properties of liquid crystals.
20x4 means that 20 characters can be displayed in each of the 4 rows of the 20x4 LCD, thus a total of 80 characters can be displayed at any instance of time.

III. FLOW CHART

Work Flow

Figure represents the process of proposed system. The work flow of the charging station system is presented in the form of step below:

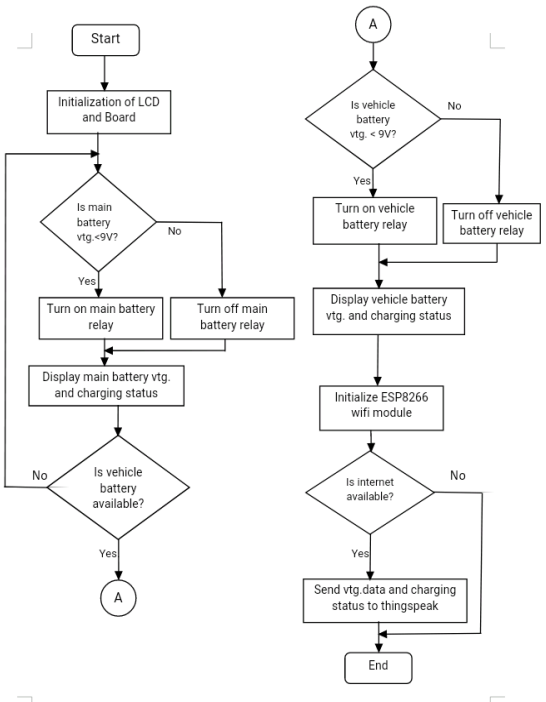

Fig.2.Flow Chart of the Proposed System

Work flow of the system

Step 1: Initialize the lcd and arduino board.
Step 2: Check the main battery charge.
Step 3: If charge <9v then turn on main battery relay.
and start to charge the main battery by the solar panel.
Step 4: Get the data and display on lcd display.
Step 5: Check the vehicle battery charge.
Step 6: If charge <9v then turn on vehicle battery
relay. and start to charge the vehicle battery by the main battery.
Step 7: Get the data and display on lcd display.
Step 8: Initialize the WIFI module
Step 9: Check internet connection. Is it available ?
Step 10: Upload the data on Thingspeak.
Step11: Get the data and display on mobile app.

IV. RESULT

Fig 3. System Hardware Setup

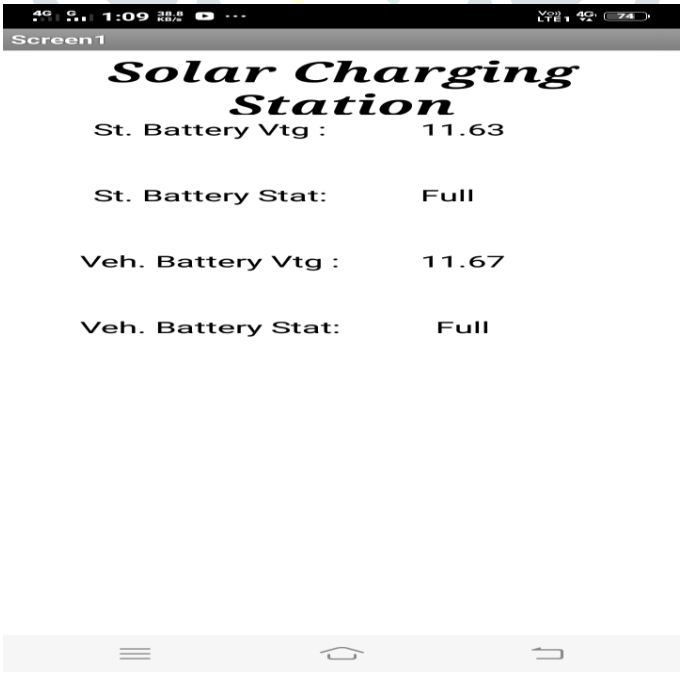

Fig 3. Hardware values on application

V. CONCLUSION

Internet of Things (IoT) based battery sensor monitors the status of the battery as an energy storage management system. The IoT developed here uses a cloud platform for management purpose. The vehicle user can easily check to the destination to reach the charging station and can view the withdrawal of battery voltage from the system. The data stored in the Arduino can withstand until battery fails to charge. For the future use, multiple user for the e-vehicle who settles the station are stored and upgraded in the database so that the distribution to the different user can be monitored. The upcoming year will come more and more solar electric vehicle due to these reasons :

Reduction of emission of fossil fuel for extracting power from renewable resources. Intelligent compliance to electronic requirements that facilitate the monitoring the availability of used power using IOT. Tracking of sun's radiation throughout a time. Electric vehicle confines the outlook of passenger a vehicle that draws current from the rechargeable battery.

VI. ACKNOWLEDGMENTS

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