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Charging Station for E-Vehicles using Solar with IoT

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Abstract: ***This paper is about E-vehicle module getting charged using a Solar panel, the maximum power of getting charged is viewed by an IOT device and the solar generates a maximum power, which can be tracked using MPPT controller. The entire system is connected to Arduino UNO, the rechargeable battery, which generates and distributes an amount of charge, which can be viewed on an LCD. This system helps one to charge many vehicles using solar energy with the help of solar panel. An alert message of any reduction in the power of the system will be tracked using GSM modem. To check the status of the battery getting charged a web page is used, which also shows the amount of charge transferred to the charge module and also the nearly available charging station location will be displayed. The main thought of this paper is to decrease the amount of greenhouse gas emission and fossil fuel.***

Keywords: MTTP Controller, GSM Modem, ESP8266.

I. INTRODUCTION

The interest for conventional energy like coal, gaseous petrol, and oil is increased, with the goal that the scientists constrained towards the advancement of non-conventional energy resources or renewable resources. Over the most recent few years, there has been a great deal of conversation around the costs of fuel separated from the deregulation of petroleum and non-renewable energy source costs. Also, these dangers of depletion of the resources have made a way to alternate technologies. In 1800s electric vehicle had come to this world.

The proceeding years will have great supply of these solar electric vehicles due to the following reasons: (1) Reduce in the discharge of fossil fuels for energy from renewable resources (2) Smart consistence to electronic necessities that encourage the checking of the accessibility of utilized force using IOT, and (3) Viewing of sun's radiation all through a period. Electric vehicle draws attention of a passenger by easily getting charged using a rechargeable battery. There are three kinds of electric vehicles: plug-in hybrid (PHEV), hybrid electric vehicle (HEV), battery electric vehicle (BEV) and extended range electric vehicle (EREV). The fundamental goal of the paper is to provide power from solar photovoltaic cell to the charging station where the vehicle can be charged with the help of the rechargeable battery and also with the assistance of IOT and also the status of the amount of power in the vehicle can be monitored at any place and time. Many countries are moving on to the greenhouse gas emission free environment; electric vehicles are chosen among the world. When there is increase in the number of electric vehicles then there will be more in need of the charging stations.

A system having IOT will help to increase the performance of charging the electric vehicles. Ideal booking of electric vehicle charging is a need to counter the expanding trouble on network. If it is not done in future, then there would be a problem in both voltage and frequency maintenance, which may lead to the failure of the network.

A common place interest profile for one day regarding 15min offering time squares, acquired from Indian Power Exchange (IEX), which is an imitation of the energy request in Indian situation, where the base burden is seen during the night hours and furthermore during the mid of the day. As the solar cell plays an essential task, the system with LDR sensor helps to find the location for generating the power from the source flow of the energy.

And this charge from the LDR sensor helps out in the charging of a solar cell and this charge will be saved in the rechargeable battery which can be used for charging the cars. The output from the cell should unbiased or else it would create a loss. At first, DC-DC converter will accept the DC input voltage and will also provide the same DC voltage as output in the upcoming level whether higher or lower relies upon the prerequisite with the end goal that converter yield voltage coordinates the force gracefully required to the module. Voltages are checked by a voltage sensor which comes from the rechargeable battery. If there is a high unit of voltage released then a message will be sent to the phone using GSM module. And it will also be printed on the LCD display and also will upload the data to the cloud.

II. RELATED WORK

The paper proposed is a completely new thing of use for the existing installed PV solar panels at the required locations, which will reduce the uses of present installed systems. As of now the current system will only provide the energy in a network, we have performed a study which has proved that the effectiveness of the generated energy can be increased by bringing an electric vehicle charging station into existence. Our analysis has showed that the on the whole cost of the energy will be reduced as this type of system is already built in the campus of the university that therefore, requires zero cost for installation and run of the system. The energy which is produced at the Institute of Energy of Dhaka University by the solar PV system is up to 13,792kWh/year, which helps in the utilization of these energy in the charging station (2861kWh/year) for the two electrical buses which can be constructed or imported from the market. Just about 21% of the total production can be used for charging of the electrical vehicles in the charging station and remaining energy helps in the contribution of the national network(about 9837kWh/year). The increase of the energy flow from the solar PV cell to the electric vehicle involves in the long and very low power charges that will help in allowing exploiting the time while the manufacture of the photovoltaic will be high. However, a better idea is that we can use an energy storage system to store the energy. Additionally, using this concept of green transportation will reduce the amount of greenhouse gas emissions by 52,944 kg/year. Consequently, the pollution will be reduced in the environment. On the whole, this green transportation will be a great beneficial for a country as it reduces the total load pressure on the electricity grid network and for the environment also as it will reduce the CO2 emissions.

Since mid 2010, in the transport sector the petrol consumption has been increased at a larger rate as compared to the other sectors. The Total CO2 emissions by the transport sector are generated by 35%. In this circumstance, strategies have been used to use a clean energy; the main directive being used is electro mobility. This paper helps in the charging of the rechargeable batteries in the electric vehicle with the clean energy using solar renewable resources. A setup was created, dimensioned and replicated in the process for charging station for electric vehicles with solar panel which consists of photovoltaic cells and batteries as their important components. The best design of the photovoltaic system was produced with a Hybrid Optimization by Genetic Algorithms (iHOGA) software version 2.4 and its operation was simulated. The solar energy system should be designed, so that the charging station will provide enough electricity, which should be provided to the electric vehicles throughout all the 24 hours of the day. The major outcome was connected to the environment, energy and economic performance provided by the system during a year of process.

Internet of Things (IoT) based battery checks the status of the rechargeable battery as the energy storage system. The IoT used here uses a cloud platform for the managing purpose. The user can easily check the location of the nearby charging stations present and can also view the battery voltage being passed from the system. The Arduino consists of stored data which can withstand till the battery stopped to charge. It has additional quality for the multiple users for the vehicle who uses the station will be stored and updated in the cloud so that supply for the different user can be viewed. Both the solar and electric vehicle industry has been growing in the recent past which has been witnessed by the Global trends. For example, the United States has approximately 500,000 solar rooftops and about 250,000 electric vehicles, and these both are growing rapidly. While still there is a problem of making solar based electric vehicle charging system as a conventional option, auto-manufacturers and government policymakers are exploiting the advantages to speak on it. Therefore, these both EVs and solar energy are very needed to make one to grow in a new avenue for the other, and also reducing the pollution levels by being eco friendly. In addition, the EV-PV synergy is predicted to come on which may provide new business opportunities in the future with the help of the clean energy.

III. PROPOSED SYSTEM

In the understanding of the present work, the real and related studies have been recognized about the optimization, the design, the simulation for solar charging systems for electric vehicles, many different methods have been analyzed, and also the present situation of the world wide execution of these energy generating systems, which is based on the green solar charging station idea for the electric vehicles. Ideal booking of electric vehicles charging is the only required thing to oppose the increasing load on the network. If not done progress of time, it will prompt to disproportion of frequency and voltage, which at last may prompt network failure. A characteristic demand outline for one day in condition of 15min request time blocks, obtained from the Indian Power Exchange (IEX), which is a copy of the energy request in Indian circumstances, where the smallest amount of load is seen during the mid of the day and on night hours. These non-renewable petroleum products have a drawback of releasing large amount of harmful and dangerous sculpture dioxide, nitrogen oxides and carbon dioxide during burning into the environment. Each of these harmful components directly or indirectly led to global warming. These greenhouse gas emission is the main incentive for the rising attention to the electrification of mobility.

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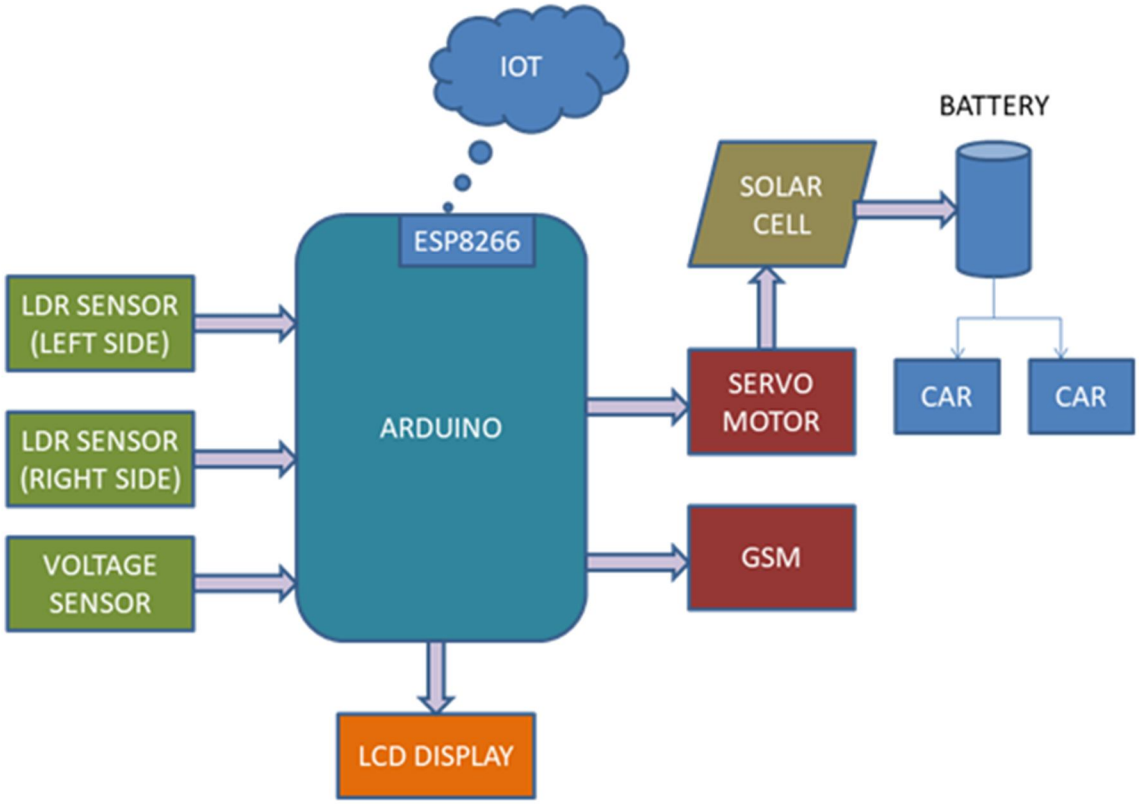

Figure 1: Architecture of the Proposed System.

IV. IMPLEMENTATION

As a solar PV cell assumes a necessary job in an exceedingly task, the model with LDR sensor to follow the case for creating power from the source which helps the persistent progression of energy. Also will charge the electrical cell and using that charge the battery stores that charge which charge from the battery is utilized to charge the cars. the complete output from the cell and it must be a balanced output or if it exceeds the predictable result then there would be a loss occurring. At first, the DC input voltage is accepted by the DC-DC converter and provides the output also as DC voltage within the following level within which the upper or lower mainly depends when the voltage converter matches the ability given to the component. From the battery voltages are generated which could be checked by the voltage sensor. The messages are sent to the phone using GSM module if there's more of voltage. These messages are displayed on the LCD and using thing speak the messages are uploaded to the cloud. A synchronized constant voltage is shipped to an analog input of the device Arduino to chop back or avoid the difficulty of the tactic. a seamless voltage should be monitored by the meter. Arduino UNO R3 is also a microcontroller board with 20 digital inputs and during this six inputs are often used as an analog input. In Arduino, program for delivering, tracking and displaying the ability are often given easily using Arduino worm.

In IoT ,the voltage data is uploaded on thingspeak and messages are sent through GSM module to mobile and voltage sensor senses hoe much voltage is entering through the ability supply. If it's more or less it sends a message to the mobile.

A. ThingSpeak

ThingSpeak is an open source Internet of Things (IoT) application and API to store and recover information from things utilizing the HTTP and MQTT convention over the net or by means of a locality Area Network.In 2010, ioBridge launched ThingSpeak as a service provider for the IoT applications. ThingSpeak has incorporated help from numerical figuring programming MATLAB from MathWorks, permitting the ThingSpeak users to test and analyze about the uploaded data which uses Matlab without the requirement for purchasing the Matlab license from the Mathwork. Mathwork incorporates a detailed relationship with ThingSpeak.

B. ESP8285

Initially, this chip made an attention to the Western creators in August 2014 which had ESP-01 module in it, which was made by a third-party producer Ai-Thinker. This ESP-01 module makes microcontrollers to connect on to a Wi-Fi network and also makes simple TCP/IP connections using the Hayes-style commands. At the first, there was no English-language documentation on the chip and so the commands which were accepted. because the value was very low and also there are only only some components on this module, this made the module inexpensive in volume, also attracted many users and also hackers to explore about the module, and its chip and also the software utilized in it, and also the interpretation of Chinese documentation. The ESP8285 is an ESP8266 and also with 1 MiB of a built-in flash, which allows to make single-chip devices which could attach with the Wi-Fi.

V. RESULT AND FUTURE ENHANCEMENT

A. Result

Internet of Things (IoT) helps to check the status of the battery and makes it as a energy storage system. The IoT used here uses the cloud platform for the managing purpose. Using this IoT, the user can check the destination of all the charging station which are present nearby and also can see the increase and decrease of the voltage from the supply. The data which is present in the Arduino can withstand until the battery neglects to charge. For the further use, numerous client for the e-vehicle who settles the station are put away and have updated the database with the goal that the appropriation to the different users will also will be checked. To have a eco-friendly and greener environment it relies on our activities that we put on, which is based on the car usage that maximizes the pollution level. Proficient harnessing of the solar energy will be involved by choosing productive components that will produce require amount of energy to charge the electric vehicles. We can produce energy of at least 136kwh approximately in the winter with a surface area of 2900m^2, 840 ISTH-350-WH PV modules at 71 degrees inclination and an average of 823.2kwh daily energy as output throughout year is produced. As the solar energy gets generated and charging happens during the day, usage of photovoltaic to charge the electric cars means all the electric cars charging takes place during the working hours, which can reduce the emission of the carbon products. This piece of information can be a starting point for many other researchers to work on it.

B. Future Enhancement

One of the Dutch company has already set a vehicle to test. This vehicle averaged an speed of 69 kilometers per hour and travelled across Australia from Darwin to Adelaide. When going on a test, this vehicle had been able to resupply the rid and power up some few areas that it was passed through. Based on this information, we can say that future solar car not only supply power for itself for short trips to and from work or even long trips across the country, but also plays an important role in contributing for the world power supply. This would be a great solution for the growing power supply in the world. Many new and modern technologies are coming on long way. There are many different health related and environmental related problems with the current situation of the transportation. During the early stages of this solar electric cars development offers a real promise and also decreasing the related issues present. These models are really promising, and the solar cars will easily be on the roads at the regular sight in the future.

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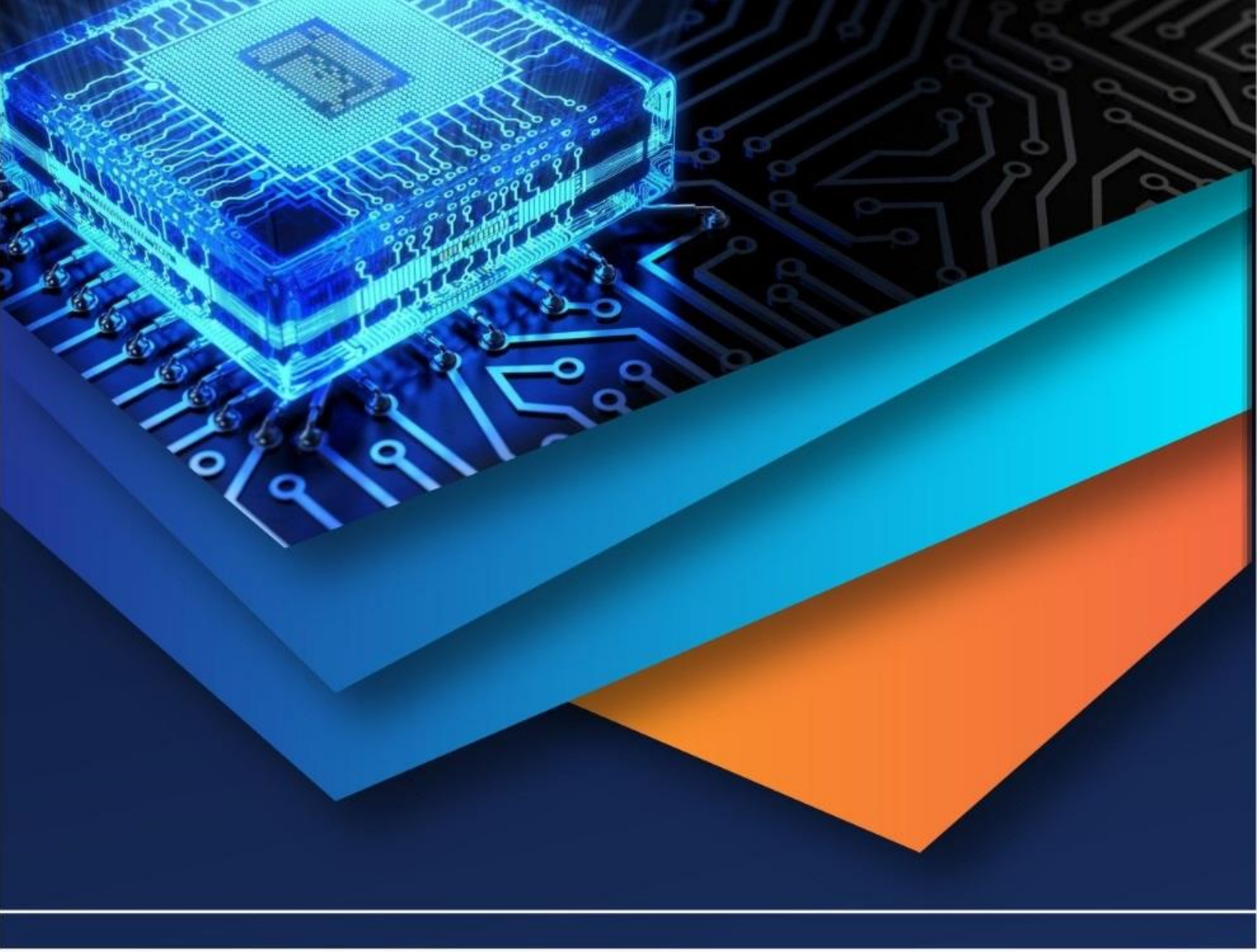

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