



## **IOT BASED SOLAR CHARGING STATION FOR E-VEHICLE**

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### **Abstract:**

In recent years, the increase in the number of electric vehicles (EVs) has led to the need for more e-vehicle charging stations. In this project, we propose the design and implementation of an e-vehicle charging station with the integration of an Arduino Uno controller, a solar panel, a grid connection, and an Internet of Things (IoT) system for monitoring. The controller manages the charging process by detecting the available power source (solar or grid) and triggering the relay driver to flow the power through the battery storage unit to the EV battery charger. The battery storage unit is also connected to the controller via a separate SCU unit. The LCD display shows all the relevant data such as the charging status, battery level, and power source information. The IoT system allows us to monitor the entire system remotely and take necessary actions when required. Overall, this charging station offers an efficient and sustainable solution for EV charging and can be a valuable addition to any EV-friendly infrastructure.

**Key Words:** Solar Panel, Arduino UNO, GSM Modem, Servomotor, Rechargeable Battery, LDR, Rain Sensor, LCD.

### **1. Introduction:**

Pretty much every establishment accompanies a sun-oriented force observing gadget, since stay educated about the thing the framework is delivering and how well it's performing. The request for traditional energy like hydrocarbon, methane gas, and crude oil is raised, so that the investigation pressured towards the growth of sustainable sources or eccentric energy funds. In the last couple of times, there has been a lot of dialogue around the fees of gas odd from the isolation of petrol and gasoline fumes prices. Moreover, these threats of disturbance of resources have brought the concentration on to different power tech technologies. In 1800s automobile handled on the road. The approaching year will come more and extra photovoltaic electric car due to these motives: Decline of discharge of fossil fuel for elicit energy from renewable resources. Cleves compliance to digital requirements that facilitate the watching the accessible of used strength the usage of IoT. Tracking of sun's radiation in the course of a time.

### **2. Literature Survey:**

A. Survey Paper 1: Utilize of solar viva city system for the electric-vehicle in 2021. It's have been proposed a whole new use for the current hooked up solar PV panels at the selected location, which will optimize the uses of the hooked-up machine.

B. Survey Paper 2: Sketch and modeling of Romanian Solar Energy Charging Station for Electric Vehicles in 2020. It is examined the opportunity of the use of solar energy assets to grant electricity bear for an EV charging station, as a beginning tip to show the practicality of the science in attendance in versatile purposes.

### **3. Proposed Methodology:**

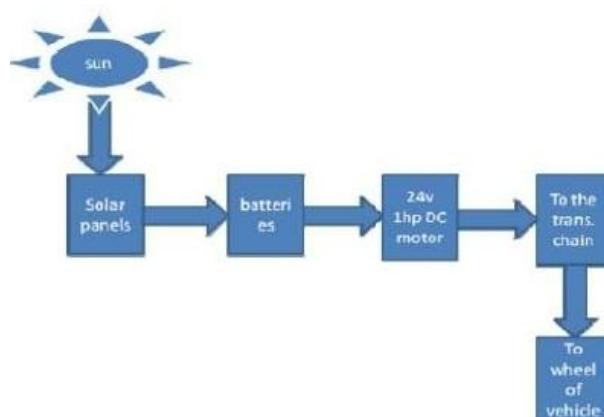


Figure 1: Methodology

Figure 1 shows a general diagram of e-vehicle having solar charging option. Current vehicles for the most part is subordinate on fossil fill such petrol, diesel, LPG etc. Fossil fills are nonrenewable asset which is one time utilize. For a sample case stud, hazards gases. This increases the environmental pollution in the world. In recent years to reduce the pollution researchers have given the solution of EV's or hybrid vehicles and many countries adopted this as one of the best solution to reduce pollution. Exhibit the idea the usage of a nimble based on electric powered motors along convinced which the use of the vehicles in this method do balance the improved buy fees of electric vehicles. A extra edge supplied via cell electric vehicles is the moving of outpouring away the element of action, supplying increased air condition in crowded cities. In spite of the income pull off, EV growth own so a ways in fuel quick based on prospect. The fundamental causes is associated to penetration of terrible effecting and vary along side with value

#### 4. System Architecture:

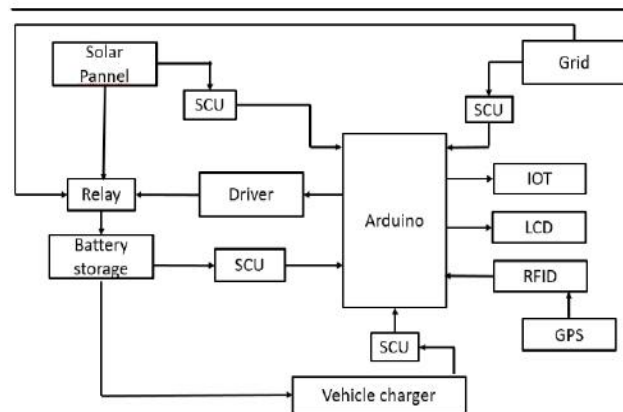


Figure 2: System Architecture of Charging Station E-Vehicle

As a solar PV array performs a critical function in a project, the mannequin actually uses torches with LDR sensor to music the position for producing power from the source which helps the continuous drift of energy. Since the tilting perspective ofthesunvariesfrom0to180o, two sensors should be constructed for either course i.e., one in the left and other in the right. At that point, the collected electric supply from the PV phone is exchanged to the converter alongside the buck controller which stabilizes the control. The regulated steady voltage is delivered to an analog enter of Arduino uno to avoid the complexity of the operation. The meter helps to screen the regular voltage. The features in corporate keep the condition of the setup good as the availability of solar in solution matters the most as per the geographical position of the vehicle.

#### 5. Requirements:

##### A. Software Requirements:

- IoT
- Arduino IDE / Embedded C

##### B. Hardware Requirements:

- Arduino Uno
- LDR Sensor
- Rain Sensor
- Servo Motor
- LCD Display
- GSM
- Solar Cell
- 12v Battery
- Voltage Sensor

#### 6. Composition for Impose Version:

##### A. Working of Module:

The complete line switching regulators converter format keeps the safety of yield from the cell phone and it need to impartial output when it outdoes the accomplish result in order to keep away from a time dependent loss. The meter ass is to display the steady Emf. Arduino UNO R3 is an embedded controller board with 20computerized enters and six can be used as a co-generator input. Initiative for tracking, pursue in and exhibiting the required electricity output grant can be stuffed on it as follows from the easy-to-use Arduino pc software.

##### B. Carving of Arduino UNOR3:

The Arduino UnoR3 is an embedded controller board principally primarily based on is movable, dual-in line-bundle (Plunge) ATmega328 AVR microcontroller. It has 20 computerized input/output activity can be stacked on to it from the easy-to-use Arduino PC program. Arduino Uno is an embedded controller board based

totally on the ATmega328PC.

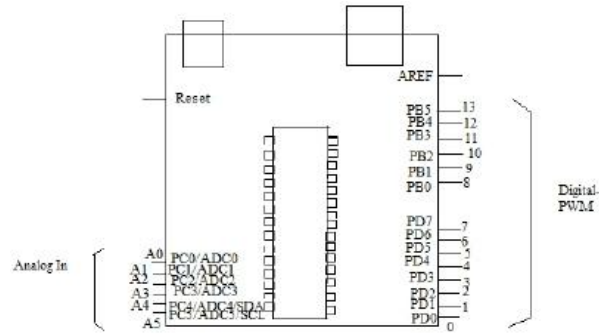


Figure 3: Pin Configuration of Arduino UnoR3

### C. Carving of Motor Drives:

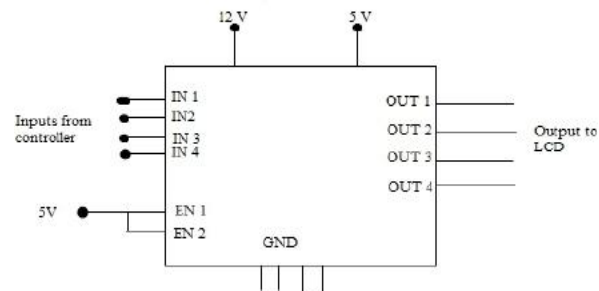


Figure 4: Carving of Piston Drive

A piston power is a megaphone which guides the feature of the motor in either direction. The motor drives operation depends upon the tracking function of the photovoltaic panel in either left or proper direction.

### D. Battery Voltage Sensor:

The cell Voltage Sensor gives customers with extra precise battery charging giving you tranquility. Envisage the value knob is running as productivity as it should. On definite appeal with long. rehearse, there can be a difference between the voltage. The voltage discern can be alter able with the fluctuating resistor linked to the motor which can regularly make bigger or minimize the output voltage inside the potential of the battery. The sensors are easily responding to the electrical or visual signals.

$$\begin{aligned}\text{Bulk Value} &= (\text{Accuracy}) \\ \text{Current} &= 1\text{mA} \sim 1500\text{A} (+\text{or}- 1\%) \\ \text{Voltage} &= 6\text{V} \sim 18\text{V} (+\text{or}- 0.2\%) \\ \text{Reversal} &= -400\text{C} \sim 1050\text{C}\end{aligned}$$

Thus, in the LCD, the Sensed sign and the battery voltage is put on view.

### E. Modeling of LCD:

LCD stands for Liquid crystal Display, works on the concepts of blockading mild as an alternative than emitting. It is collected of multiple layers which involve two poles apart panel filters and electrodes and light is transmitted from a lens on a layer of liquid crystal The LCD works on the concepts of obstruct light. While building the LCDs, a reflected mirror is organized at the back. An electrode aircraft is made of indium-tin-oxide which is kept on upper layer and a pole a part glass with a polarizing film is also brought on the clast of the device. Thus, in the Liquid crystal screen, the Sensed signal and the battery voltage is shown.

### Channels API:

To learn and write to a Thing Speak Channel, your appeal must make solicit to the Thing Speak API the use of HTTP requests. Each Thing Speak Channel permits for eight fields off acts (both numeric and alpha numeric forms), place knowledge, and repute modernize. Each entry is saved with a date and time stamp and is allocate a special Entry ID (entry id). After the information is collected, you can take back the records by using time decision or by using Entry ID. In expansion to collecting and recoup numeric and alphanumeric information, the Thing Speak API permits for numeric records clarification such as times calling, averaging, median, summing, and rounding. The channel feeds help JSON, XML, and CSV forms for integration into applications.

### Charts API:

Use the Charts application program interface to existing digital facts keeping Thing Speak Channels on grid. Hold up grid sorts are line, bar, column, and step. Courses consist of proportion, color, and dockets.

### Open - Source API:

The Thing Speak API is reachable on Git Hub and consists of the alter Thing Speak API for processing HTTP petition, to numeric and numeracy data, numeric information handling, region pursuing, and popularity

updates. The open-source model follows the same documentation as the Thing Speak lay on service

#### Apps:

Thing Speak Apps are apps that make it easier for devices to get right to fentry to sources on the web such as social networks, net services, and APIs.

#### Thing HTTP:

Thing HTTP is for connecting matters to net services with the aid of HTTP requests. Thing HTTP helps GET, POST, PUT, and DELETE methods, HTTP/1.0, HTTP/1.1, SSL, customized HTTP headers, and Basic Authentication.

#### Thing Speak:

- Obtain Started
- Join Up for New User Account–<https://www.thingspeak.com/account/new>
- Fabricate an medium with the aid of deciding on Channels and then Create New Channel
- Go after a seminar for frequent units and appeal.

#### Medium:

Medium is the place your utility shops and recover any kind of data. Each channel has an individual View and a general View. The Private View is only handy via signing into yourThingSpeak.com person narrative. The Public View is what different audience will see when they go to your Thing Speak Channel.

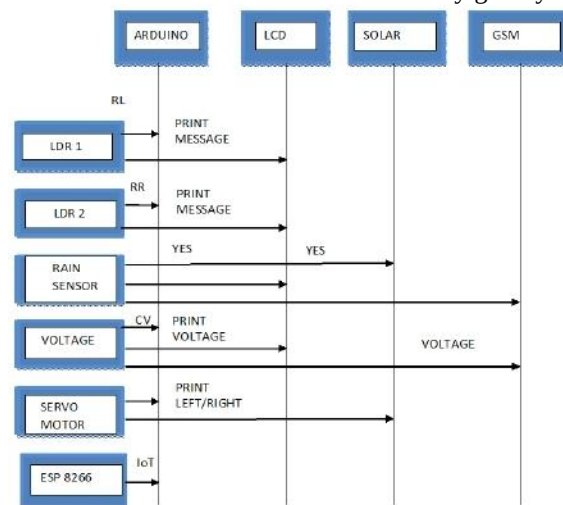


Figure 5: Sequence Diagram of the Model

## 7. Result and Discussion:

The dangerous have an effect on of EV charging station masses on the electrical energy distribution community cannot be neglected. The excessive charging hundreds of the speedy charging stations outcomes in extended load demand, reduced reserve margins.

Solar cells: 18V, Battery: 12V 10Ah, Power plant: 220V, 50 Hz AC.

Note: The solar cost controller steps down the voltage from 18V to 12V.  $P = \text{Power}$   $P = V \cdot I$   $P = 12 \cdot 10$   $P = \text{a hundred and twenty Watts}$  Therefore, the time required to cost from zero to 80% is 1 hour. (When 10A is stored)

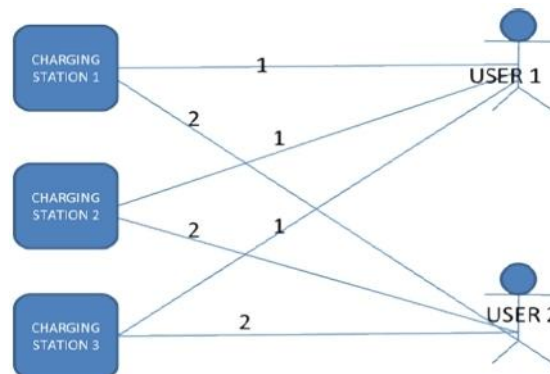


Figure 6: Charging Process Diagram

Note: Input = 220 VAC, the cost adapters have a simple output of 12 V and 5A.  $P = V \cdot I$   $P = 12 \cdot 5$   $P = 60 \text{ Watts}$  Therefore, the time need to cost from 0 to 80% in instant of time (5A is supplied). The whole hypothetical time planned to cost from 0 to a hundred percent is about 1 hour and 15 mins for photovoltaic

charging and 2 hours 30 mins for trendy charging .As a photovoltaic PV array plays a critical function in a activity, the proto type truly makes use of light with LDR sensor to music the function for creating strength from the supply which as is the non-stop float of power. Since the slope position of the solar differ from 0° to180°, two detect or sought to be assemble for both directions.

In IoT we will add the voltage information on thing speaks. And sending message using GSM module to mobile. Voltage sensor will check the how many voltages are coming. If it is more or much less it will send message to mobile. The IoT developed here uses a cloud pulp it for administration objective. The automobiles person can easily check to the goal to attain the charging station and can view the removal of battery voltage from the mode. The data stored in the Arduino can hold up to till battery stops to charge. For the future utilize, a couple of consumers for the e-vehicle who settles the station are collected and enhances in the database so that the divide to the specific person can be observed.

#### **8. Conclusion:**

In this paper, we have proposed an IoT-based solar charging power station for electric vehicles. We believe that the proposed system has the potential to revolutionize the way we power our electric vehicles by utilizing renewable energy sources and reducing our dependence on fossil fuels. The system has several advantages, including reducing greenhouse gas emissions, providing an alternative energy source, and reducing overall costs. We hope that this paper inspires further research in this area to create a more sustainable future. The IoT-based solar-based charging station is a promising technology that aligns with the global drive towards renewable energy. This technology allows for the efficient and cost-effective provision of clean energy to power devices in different locations. Further research and development can help enhance this technology's performance and applications to accelerate the transition towards green energy.

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