IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 9, May 2023

IoT-Enabled EV Charging Station with Solar Power

Mr. V. D. Nalawade[1], Mr. A. G. Shivsharan[2],Mr. A. D. Jadhav[3], Ms. A. M. Pawalkar[4], Mr. S. T. Waghmode[5], Mr. O. A. R. Shaikh[6]

Lecturer, CM, Adarsh Institute of Technology & Research Centre, Vita, Maharashtra, India[1]
Students, CM, Adarsh Institute of Technology & Research Centre, Vita, Maharashtra, India[2,3,4,5,6]

Abstract: *In this project, a solar-powered electric car charging station that keeps track of the module's maximum power output via the internet of things is being developed. Along with population development, the usage of vehicles is increasing. Most modern vehicles use fossil fuels like petrol, diesel, LPG, etc. to power them. A nonrenewable resource, fossil fuels can only be utilised once. In an effort to build a sustainable, easily available alternative energy source, a variety of vehicle engines have been created; one such energy source is electrical energy.Due to its many advantages, electric-powered automobiles are now becoming the standard worldwide after years of successful development. Therefore, electric vehicle charging stations are necessary. To make access easier, we built a solar-powered charging station. Solar energy is a renewable energy source that is easily acquired from the sun. Energy from the sun is measured using solar cells, stored in batteries, and then delivered to the cloud for storage using LDR sensors and an Arduino controller*

Keywords: Servo motor, MPPT controller, rechargeable battery, LDR, LCD, solar panel, DC-DC converter, modem, Arduino .

I. INTRODUCTION

To know how well and what the structure is doing, almost every building includes a gadget that measures the direct force of the sun. Because of the growing need for traditional energy sources like hydrocarbon, methane gas, and crude oil, researchers are under pressure to concentrate on the creation of unconventional energy sources. The prices of petrol alone, as opposed to the expenses of petrol + petrol fumes, have recently received a lot of attention. Additionally, different power teaching gadgets have come under scrutiny due to concerns around resource disruption. In the 1800s, the car had revolutionised transport.The use of fossil fuels will decline in favour of acquiring energy from renewable sources, which will lead to an increase in the popularity of photovoltaic electric cars. Cleves complies with digital standards that facilitate the use of IoT for accessibility and strength monitoring. tracking the evolution of solar radiation. Researchers must concentrate on creating renewable or non-traditional energy sources because of the rising need for conventional energy sources like coal, natural gas, and oil. There has been a great deal of debate in recent years over the price of fuel, in addition to the deregulation of the price of gasoline and fossil fuels. Additionally, the concern about supply interruption has stimulated interest in alternate motor train technologies. In the 1800s, electric cars revolutionised transportation. Due to these factors, solar electric vehicles will become more prevalent in the future year:

(1) Less fossil fuel emissions are produced when power is produced from renewable sources.
(2) Intelligent adherence to technological requirements that allow for the long-term detection of solar radiation.
(3) Monitoring the availability of electricity utilised via IOT.

Electric automobiles limit the outlook of passenger vehicles that produce current using rechargeable batteries. The four distinct types of electric vehicles are hybrid electric vehicles (HEV), plug-in hybrid vehicles (PHEV), battery electric vehicles (BEV), and extended range electric vehicles.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 9, May 2023

1.1 Objectives

The major goal of the article is to power a charging station where a car may be charged using a rechargeable battery utilising electricity generated by solar PV cells. Additionally, the availability status of the charging station may be continually monitored at any time thanks to IOT.

II. SIMULATION MODEL

A. Modelling for Position Tracking

A semiconductor device called a PV cell collects energy when solar light hits it. Depending on the climate, the sun's angular position changes during the day and night. Solar cells utilisemonocrystalline silicon. The tiny and fragile solar cells are exceedingly thin. An aluminium frame surrounds the module, supporting the structure and making installing it straightforward. A solar array, sometimes called a PV array, is made up of several solar cells joined together. A PV module is made up of several solar cells connected in series, such as the 36 cells that make up a PV module. A PV array is made up of several solar panels that have been electrically connected to form a substantial PV installation.One effect of a PV array is losses due to the connecting of solar cells that aren't compatible. Temperature of the module; causes of PV module failure. Using an LDR (Light Dependent Resistor) to detect light, a servo motor spins the solar panel automatically in the direction of the sun's beams. The LDR sensor is positioned to capture the majority of sun energy. An LDR is also known as a photoresistor or light-sensitive device. LDR sensors are located on the left and right sides of the solar panel. The solar panel is rotated by the servomotor. The servomotor tilts the solar panel significantly with the help of the LDR sensor.

B. Modelling of DC-DC Converters:

A circuit or electromechanical device that adjusts the voltage level of a DC source is known as a direct current (DC) converter. It is a specific type of power converter for electricity. Extremely low to extremely high power levels are represented by small batteries to high voltage power transmission. A closed feedback loop maintains the output voltage constant even when the input voltage and output current vary. The four topologies listed below are widely employed: SEPIC Converter, Boost Converter, and Buck-Boost Converter are listed in that order.

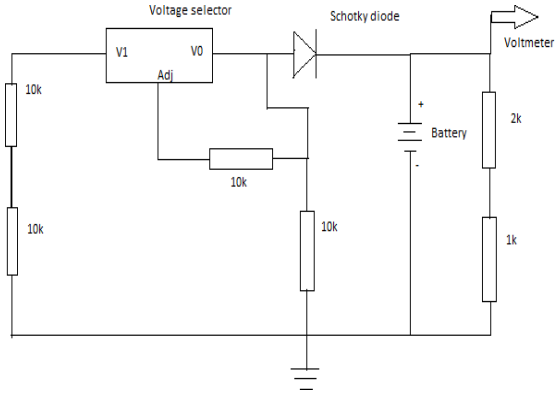


Fig.1.DC-DC Converter

C. Modelling of a Motor Drive

A motor drive is an amplifier that propels the motion of the motor in either direction. How the motor drives work depends on whether the solar panel is tracking to the left or the right. The largest amount of energy absorbed by the solar panel or the angular position of the sun's rays are taken into account while changing the circuit's (the solar panel's) low current signal into a high current signal. The motor drive begins to rotate at a certain speed. A potentiometer can be used in addition to the functions to change the total output voltage from maximum to minimum or vice versa to achieve the required charging capabilities.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 9, May 2023

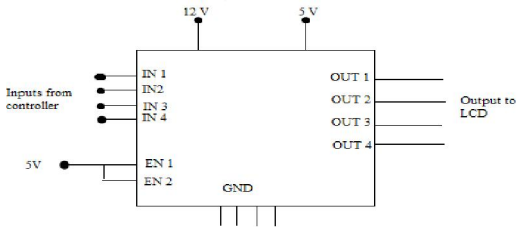


Fig. 2. Carving of piston drive

D. Modelling an Arduino UNO R3

The ATmega328 serves as the foundation for the Arduino UNO R3 microcontroller board (datasheet). It has a 16 MHZ crystal oscillator and 14 pins for digital input and output. It features a power jack, an ICSP header, and a reset button. The UNO is referred to as uno in Italian. The UNO and version 1.0 of Arduino will be the standard going forward. Uno is the name of the most current Arduino USB board. Although 7 to 12 volts is the recommended input voltage, 5 volts is the actual operating voltage. If it supplies less than 7 volts, the Arduino board may become unstable, and if it supplies more than 12 volts, the voltage regulator may overheat and damage the board. The current Arduino processor is the ATmega328.

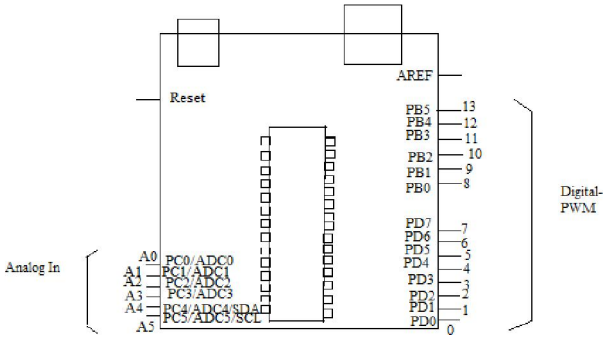


Fig. 3. Pin configuration of Arduino Uno R3

E. Battery Voltage Sensor

A voltage sensor works in tandem with battery charging and is generally used to determine the actual voltage required from the charging station. Here, one may detect both the DC and AC voltage levels. The voltage recorded may be altered thanks to the motor's variable resistor, which often raises or lowers the output voltage within the battery's capacity. The sensors only react to the electrical or optical signals. In addition to providing outputs that include amplitude modulation, pulse width modulation, or frequency modulation, certain voltage sensors may also produce sign or pulse trains.

- Measurement Value = (Accuracy)
- Current = 1 mA 1500 A (+/- 1%)
- Voltage = 6V 18V (plus or minus 0.2%)
- Temperature = -400C ~ 1050C

F. Modelling an LCD

The principle behind liquid crystal displays, or LCDs, is that light should be blocked rather than emitted. It has the specific advantage of consuming less power than LEDs. Two polarised panel filters, electrodes, and a layer of liquid crystal on which a lens projects light are just a few of the layers that make up this device. Combining coloured light with its equivalent in grayscale results in the crystal's colourful image. The picture displayed on the screen and LCD must be controlled by the applied current. Polarising the light is necessary. The polarisation of the light may be altered, and liquid crystals can regulate both transmission and reception. As a result, the battery voltage and detected signal are shown on the liquid crystal.

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 9, May 2023

G. Description of a Regulator

The MCP1612 is a fully integrated, synchronous buck regulator with current mode control that runs at 1A and 1.4MHZ. The MCP1612 is packaged using the 8-pin MSOP and the compact 3X3 DFN. The DFN package also provides a low thermal resistance package alternative for uses demanding high power and high ambient temperatures. The output voltage of the MCP1612 may be easily changed to range between 0.8v and 5.0v by using an external resistive divider. They can be used with ceramic, tantalum, or aluminium electrolytic output capacitors. Ceramic capacitors with values as low as 4.7uF can be used to reduce the output ripple voltage. For applications that require greater load step performance, the output capacitor's value can be increased to 47uF.

H. Modelling of IoT Devices:

Through the connection of electrical and digital devices, IOT has helped every sector. It is possible to communicate or transmit data over a network without requiring any interfaces. Today, IOT is employed as a tool to enhance wireless connection in daily life. By providing the user with a real-time experience and the best possible result, it promotes time-space interaction. IoT provides a useful user-interface programming to avoid mistakes and blind spots that might lower system accuracy. The newest technology improves product functionality, sharpens and improves customer interactions, and promotes the rapid development of automation technology. It provides reliable information with demanding functionality that enables several users to use it at once. The current data analytics provide an outside perspective, but IoT offers the accurate data that produces the ideal.

III. PROPOSED METHODOLOGY

The potential use of solar energy resources to generate power for an EV charging station is investigated as a starting point to show the practical relevance of the research.

Fig. 1 depicts a general concept of an electric automobile with a solar charging option. The majority of contemporary cars rely on fossil fuels like petrol, diesel, LPG, etc. A nonrenewable resource, fossil fuels can only be utilised once. A good case study example is hazardous gases. Global environmental pollution increases as a result. In recent years, researchers have proposed the use of electric or hybrid vehicles as a means of lowering pollution, and many countries have recognised this proposal as one of the most effective methods to do so.Showcase the idea of flexible electric-driven motors while expressing your belief that using the automobiles in this way would help to overcome their higher initial cost. The elimination of the element of activity, which boosts air conditioning in congested locations, is another advantage provided by cell electric automobiles.

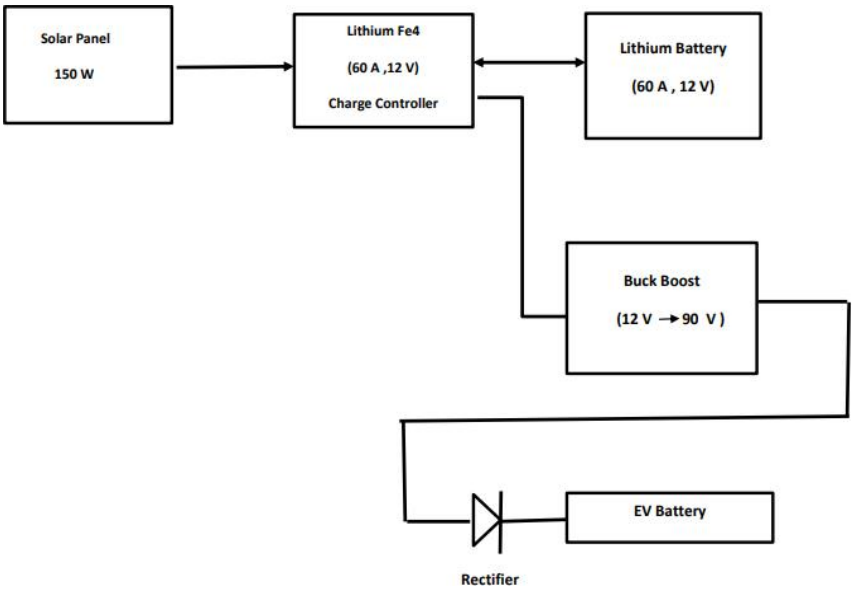


Fig. 4. Solar-powered IoT-enabled EV Charging Station

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 9, May 2023

The mannequin really uses torches equipped with LDR sensors to fine-tune the area for generating power from the source, supporting the continuous drift of energy, much as a solar PV array plays a key role in a project. Since the sun's tilting perspective extends from 0° to 180°, two sensors—one in the left and one in the right—should be constructed for either direction. The buck controller stabilises the control at that point when the converter gets the gathered electric supply from the PV phone. An Arduino analogue entry is provided the regulated continuous voltage to reduce the complexity of the process. The metre makes it easier to identify normal voltage. Due to the importance of solar insulation availability depending on where the automobile is located, the features maintain the setup in outstanding condition.

3.1 Requirements

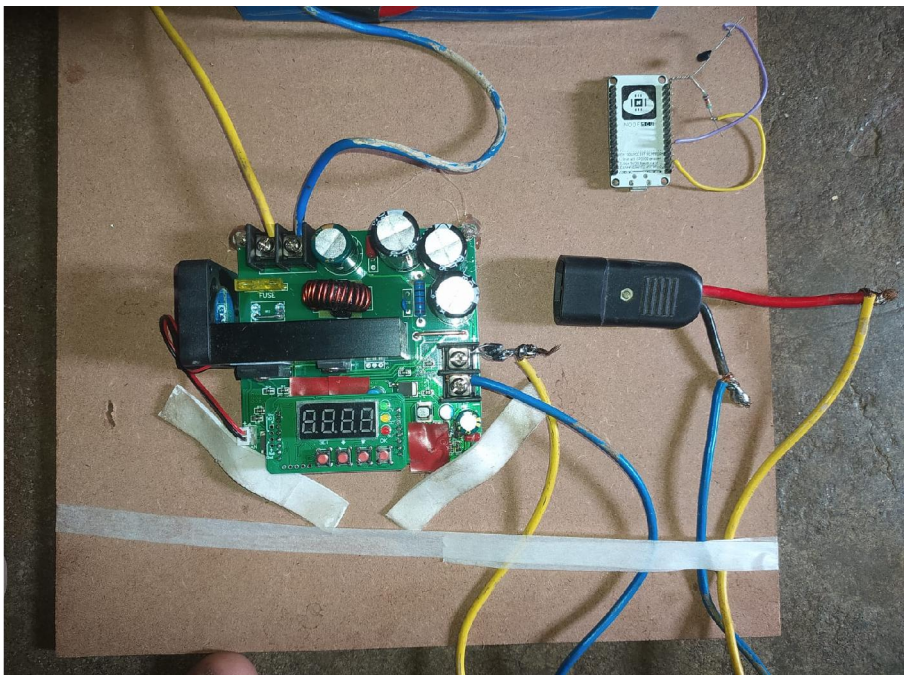
A. Software Requirements :

1. IoT
2. Arduino

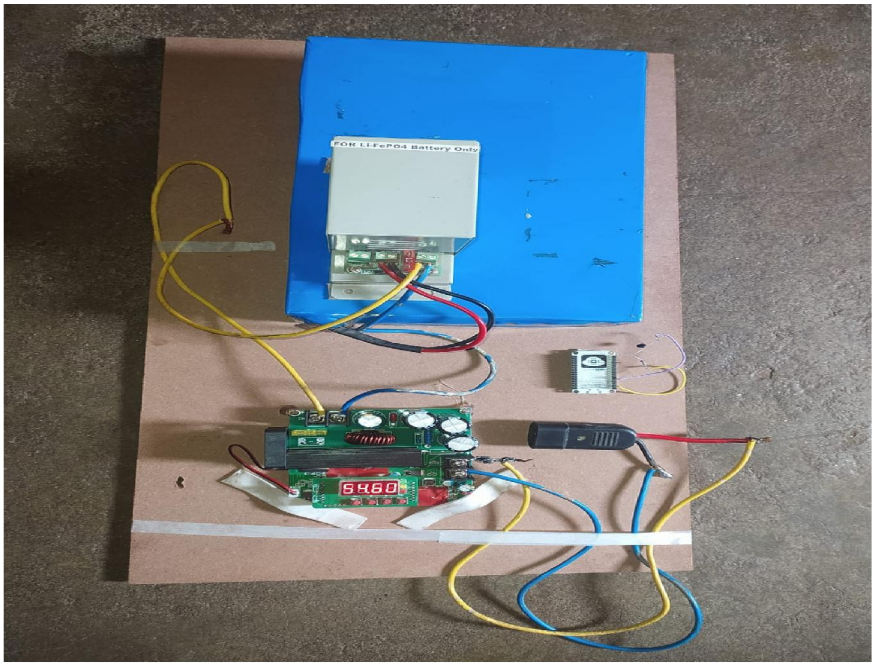
B. Hardware Requirements:

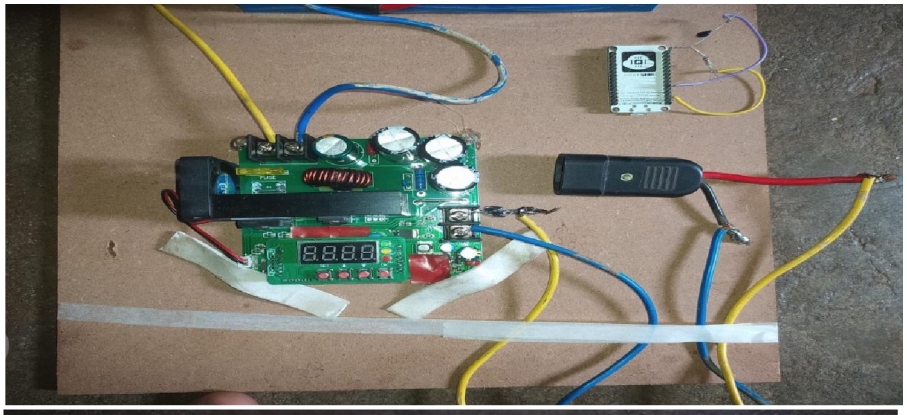
1. Arduino Uno.
2. LDR Sensor
3. Servo Motor
4. LCD Display
5. GSM
6. Solar Cell
7. 12v Battery
8. Voltage Sensor

IV. PROJECT OUTPUT



IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 9, May 2023





DOI: 10.48175/568

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 9, May 2023

V. CONCLUSION

An Internet of Things (IoT)-based battery sensor monitors the battery's present state as part of an energy storage management system. The IoT built here utilises a cloud platform for management. The car's driver can easily figure out how to go to the charging station and can see when the battery voltage is reduced. The data that is stored in the Arduino can last till the battery dies. In order to monitor the distribution of the various users, some users for the e-vehicle that approaches the station are upgraded and stored in the database for later use.

REFERENCES

[1]. H. Ananda Kumar and K. Uma Maheswari, "Supervised machine learning techniques incognitive radio networks during cooperative spectrum handovers, March 2019.
[2]. García-Olivares, Transportation in a 100% renewable energy system, 2018.
[3]. Roshini and Ananda Kumar, "Hierarchical cost-effective leach for heterogeneous wireless sensor networks," International Conference on Advanced Computing and Communication Systems, Jan. 2020.
[4]. H. Anandakumar and K. Umamaheswari, "An Efficient Optimized Handover in Cognitive Radio Networks using Cooperative Spectrum Sensing," Intelligent Automation & Soft Computing, pp. 1–8, Sep. 2017.
[5]. M. Suganya and H. Anandakumar, "Handover based spectrum allocation in cognitive radio networks," 2013 International Conference on Green Computing, Communication and Conservation of Energy (ICGCE), Dec. 2013.
[6]. H. Anandakumar and K. Umamaheswari, "A bio- inspired swarm intelligence technique for social aware cognitive radio handovers," Computers & Electrical Engineering, vol. 71, pp. 925–937, Oct. 2018.
[7]. Anandakumar, "Energy Efficient Network Selection Using 802.16g Based Gsm Technology," Journal of Computer Science, vol. 10, no. 5, pp. 745–754, May 2014.