"IOT BASED SMART EV WIRELESS CHARGING LANE WITH REAL TIME LOCATION TRACKING"

Sanjog Harak, Yogeshwari Ghegade, Gayatri Sonawane, Priyanka Devkar, Prof. Chanchal Jadhav

Department of Electrical Engineering Shatabdi Institute college of engineering (Pune University) Nashik, India

ABSTRACT

In this system, an inductive wireless charging lane for electric vehicle and as well as the GPS system for tracking the real time location of lane is introduced, However the traditional electrical cable charging for EV's brings up some problem. For instance, EV's parked in charging stations hours to get full charged. To avoid the limitations of position and time, the wireless power transmission is proposed for an alternative solution for EV's charging. The complete system is smart and internet connected. To user and the owner can easily monitor or track the system using web application. In additional these system also including the hardware and software along with android application. In this project an experimental setup to develop wireless charging lane using renewable source i.e. Solar system.

Keywords: *Electric vehicles, IOT- Internet of things, Electromagnetic compatibility; Finite element method; wireless charging system; Wireless power transfer; Wireless electric vehicle charging system.*

1. INTRODUCTION

Energy in the form of electricity plays a very important role in the life of a normal man. Electricity is one of the greatest wonders of science. Next to man, it is the most important and revolutionary creation in this world of ours. It has practically revolutionized the world .The gradual but excessive use of electricity has come to bring about stupendous changes in industry. With it our modern gigantic tools are worked. Computers as also calculators sum up totals and make other calculations with the utmost accuracy. Newspapers and books are printed in millions overnight. There is not a single phase of human life that is not indebted to electricity for its progress .The modern age has, therefore, been truly called the "age of electricity."

Wireless power transfer is the transfer of electric energy from a power source to an electric load without a direct physical connection between them, usually via an electromagnetic field (Electromagnetic Induction) Residual magnetism. Inductive Coupling consists of two coils one is source coil and the other one is receiving coil.

An alternating current in the transmitter coil generates a magnetic field which induces a voltage in the receiver coil. It is the simplest method of wireless power transfer the power can be transmitted. The efficiency of the power transfer depends on the coupling between the inductors and their quality. The example of inductive coupling is the transformer. In transformers, there is a core which guides and acts as a path for the flux from primary to secondary. Wireless electricity acts as Coreless transformer (Air-cored).

Wireless charging is the well-known Faraday's law of induced voltage, commonly used in motors and transformers. This thesis is about a device to transfer power wirelessly instead of using conventional copper cables and wires. Wireless power charging is becoming more and more common in new gadgets like smarts phones, tablets and laptops. Wireless power transmission is carried out between two inductive coils (transmitter coil and receiver coil). As the current through an inductor is what generate the electromagnetic field, this is what drove both coils.

LITERATURE REVIEW

1. **Electric Vehicle Charging System using Wireless Power Transmission, IoT and Sensors, 2020 International Research Journal of Engineering and Technology (IRJET):** In this paper, a wireless charging system is used to charge the vehicle wirelessly via inductive coupling. The transmission of electrical energy from source to load from a distance without any conducting wire or cables is called Wireless Power Transmission. The concept of wireless power transfer was the greatest invention by Nikola Tesla. Also, an Internet of things based collection system is designed in which a person can use the RFID to pay the charging charges of that vehicle. The system checks if the person has sufficient balance and then deduct the charging charges and update the balance. The Internet of Things describes the network of physical objects that uses sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems. This system doesn't require any human interaction. The result of this project is we can charge our vehicles wirelessly via inductive coupling and pay our charging charges through RFID tags. Wireless power transmission might be one of the technologies that are one step towards the future. This project can open up new possibilities of wireless charging that can use in our daily lives.

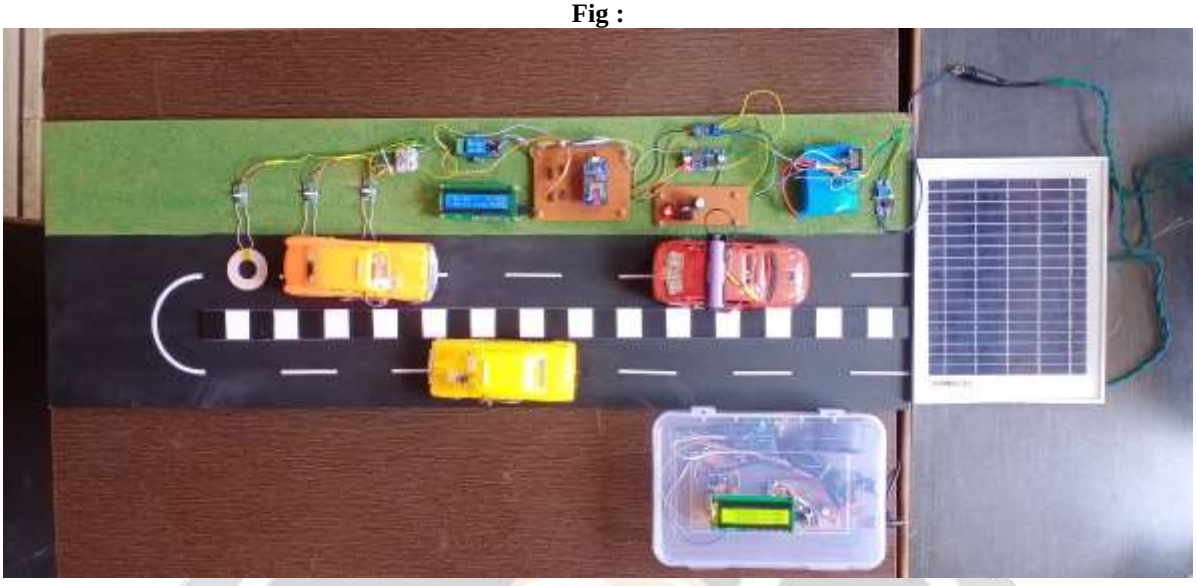
2. **Wireless Mobile Charger Design Based on Inductive Coupling, 2019 International Journal of Trend in Scientific Research and Development (IJTSRD):** In this paper, authors have been proposed wireless charging system by using inductive coupling. There was a growing market to construct the wireless charging system in the various kinds of electronic devices. There were many kinds of methods in wireless charging system. Among them, inductive coupling method was the simplest method. The system used Arduino microcontroller to produce the required frequency for driving the induction coil because it gave more accurate frequency than other controllers. In this circuit, N channel mode MOSFET IRFZ44N was used for driving the inductive coil because of its accurate switching timing and ratings. An important issue associated with all wireless power systems was limiting the exposure of people and other living things to potentially injurious electromagnetic fields. Finally, the wireless charger for mobile phones became an important role of human life style because of its simple design and safety for humans. The most powerful output can be obtained at switching frequency of 100 kHz for the design shown in earlier sections.

3. **A Review Paper on Wireless charging of mobile phones, 2014 International Journal of Engineering Research & Technology (IJERT):** In this paper two methods for wireless charging of mobile phones are studied. Nowadays Mobile communication not only restricted for voice transmission but also used for various multimedia applications like transfer of text, images, videos, playing games etc. Continuous use of mobile phones needs charging of the batteries again and again. Imagine a system where your cellular phone battery is always charged, You don't have to worry if you forget the charger. In this paper two methods are studied first is wireless charging of mobile phones using microwaves which eliminates the need of separate charger for mobiles .In this method the charging of mobile phones is done using microwaves when we talk on that particular mobile .The microwave frequency used is 2.45Ghz.The second method is charging of mobile phones using Bluetooth.

4. **Shared Solar-powered EV Charging Stations: Feasibility and Benefits, 2016 IEEE:** In this paper, we explored the benefits of integrating renewable solar energy with EV charging infrastructure placed at car-sharing service's parking lot. We formulated a Linear Programming approach that maximized both solar energy utilization and customer satisfaction. Comprehensive evaluation of our algorithm was performed using real-world EV charging traces. They demonstrated the feasibility of a grid-isolated solar-powered charging station and show that a PV system proportional to the size of a parking lot adequately apportions available solar energy generated to the EVs serviced.

5. **System design for a solar powered electric vehicle charging station for workplaces, 2018 Applied Energy:** This paper analyses the PV system design and EV charging in a holistic manner considering the above aspects. The new contributions of the work compared to earlier works are as follows: 1. Determination of the optimal orientation of PV panels for maximizing energy yield in Netherlands and comparing it with the use of tracking systems. 2. Possibility of oversizing the PV array power rating with respect to the power converter size based on metrological conditions of the location. 3. Dynamic charging of EV using Gaussian charging profile and EV prioritization, which is superior to constant power charging. 4. Determination of grid impact of two different types of workplace/commercial charging scenario considering 5 days/week and 7 days/week EV load by running round-the-year simulation. 5. Optimal sizing of local storage considering both meteorological data and smart charging of EV.

Fig :



SYSTEM DEVELOPMENT

1) Introduction

As shown in the fig. below, two microcontrollers are used. i.e., ATMEGA328P and Node MCU. As shown, the whole system will be operated on 12V DC which will be fed from solar panel. Relay will operate as per customer's requirement to charge their own EV battery.

2) Proposed Methodology

In this project, we are going to develop a system using IoT based technology and renewable energy source i.e. solar energy. Whole system will be operated on 12 V supply using battery. Battery will be charged by solar panel. We will be using Node MCU microcontroller for interfacing Voltage sensor and to monitor voltage level.

Voltage sensor gives analog output to Node MCU. This controller converts Analog signal into digital form and provides it to LCD and Node MCU. Percentage of battery will be displayed on LCD 16X2. For wireless power transfer, we are using transmitter and receiver coil. The distance between these two coils is less than 5 mm so we get the voltage 5 volt. The transmitter coil requires 9 volt DC supply and at the end of receiver coil, we get the 5 volt supply.

We can have customized control from Android App to ON and OFF the relay for charging the battery with time. If the Relay is OFF then it will turn OFF the transmitter coil supply 9 Volt. If the relay is ON then it will turn ON the wireless transmitter coil supply 9 Volt. So it will save the battery power with the help of Android application and also will increase the battery life because timer function is available in Android application. It provides fully customized and dynamic setting to ON and OFF the relay for EV and mobile charger on time as per battery charging requirement.

3 Block Diagram

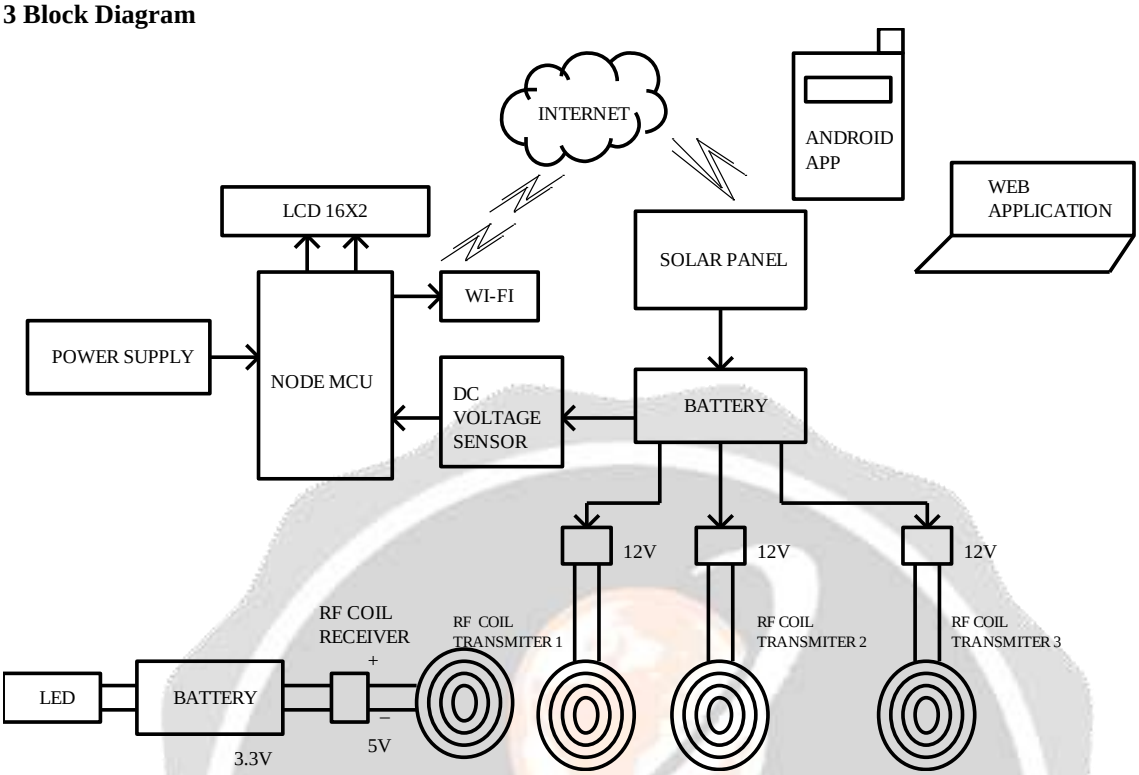


FIG : Block Diagram For Charging Module.

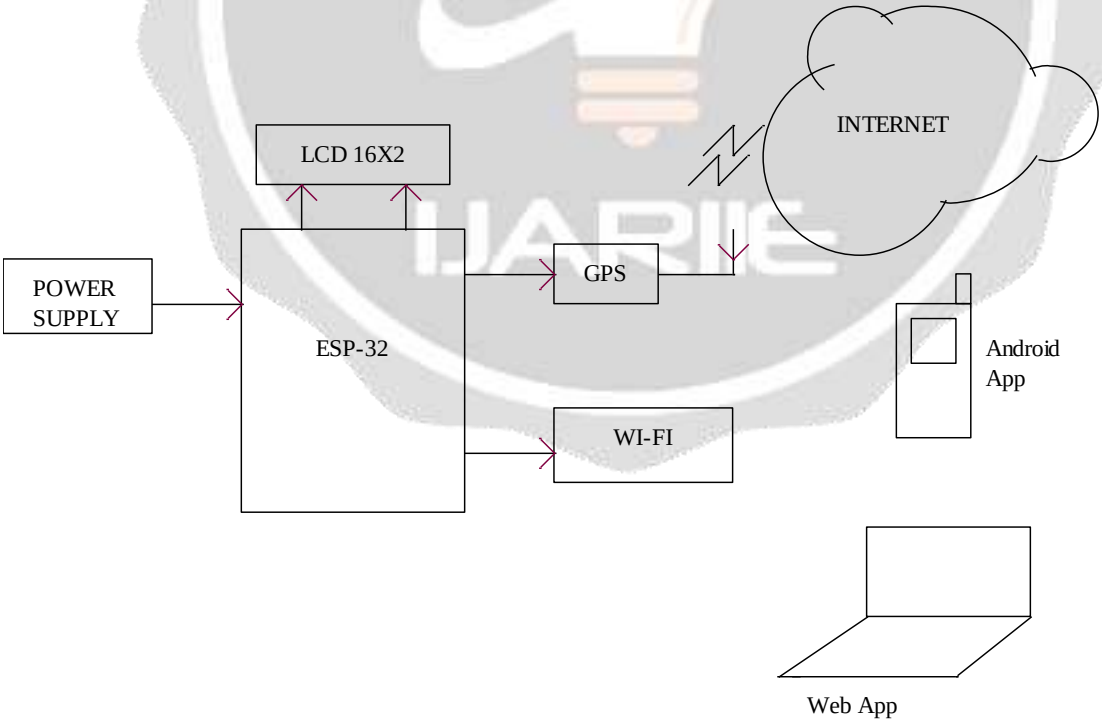


FiG : Block Diagram for ESP- 32 GPS Module.

CONCLUSION

We have successfully studied interfacing of LCD and Voltage sensor with Node MCU microcontroller. We have designed a prototype model for the implementation of EV wireless charging lane. The use of hardware and software along with the android app also will be studied. Using Node MCU microcontroller having in-built Wi-Fi technology, a project has developed in Blynk app for monitoring and controlling charging of EV battery's as well. Using ESP-32, we have interfaced GPS for real time locations for charging lane.

REFERENCES

[1] Shaikh Arbaz, Nayna Dahatonde, Nagori Meeran, Shirgaonkar Zimad, Shaikh Maseera, "**Electric Vehicle Charging System using Wireless Power Transmission, IoT and Sensors**", *International Research Journal of Engineering and Technology (IRJET)* e-ISSN: 2395-0056 Volume: 07 Issue: 05 May 2020

[2] Zaw Min Min Htun, Htay Win Mar, "**Wireless Mobile Charger Design Based on Inductive Coupling**", *International Journal of Trend in Scientific Research and Development (IJTSRD),* e-ISSN: 2456 – 6470 Volume 3 Issue 5, August 2019

[3] Ashwini Jayawant, Swati Zope, "**A Review Paper on Wireless charging of mobile phones**", *International Journal of Engineering Research & Technology (IJERT) IJERT www.ijert.org ICONECT' 14 Conference Proceedings*

[4] Stephen Lee, Srinivasan Iyengar, David Irwin, Prashant Shenoy, "**Shared Solar-powered EV Charging Stations: Feasibility and Benefits**" 2016 IEEE

[5] G.R. Chandra Mouli, P. Bauer , M. Zeman, "**System design for a solar powered electric vehicle charging station for workplaces**" ELSEVIER http://dx.doi.org/10.1016/j.apenergy.2016.01.110