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Solar & Wind Based Electric Vehicle Charging Station Using Wireless Charging Lane

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Abstract: ***In this system, we are introducing an inductive wireless charging lane for electric vehicles and battery swapping/charging station. In recent years, under the background of global warming, electric vehicles (EVs) using clean energy are getting more attention among the developed and developing countries, since they can help reduce the emission of carbon dioxide. However, there are problems with the traditional electric cable charging for EVs. As, EVs have to be parked in the charging stations managed with electric chargers with cables in order to get powered and it usually takes at least a couple of hours to get full charged. So to avoid this limitation of position and time, the wireless power transmission (WPT) is proposed for an alternative solution for EVs charging. Through inductive coupling effect, EVs can be charged continuously as long as they drive along the roadway, under which coupled coils are laid. The basic WPT system only consists of two coils, one connected to a load while the other connected to a source. The structure of either the single transmission coils or single receiving coils are discussed by most of the research. In the efficiency of wireless power transmission of inductive coupled coils is calculated in the condition of vertical and horizontal deviations. The complete system is smart and internet connected so user and the owner can easily monitor or track the system using Web application and Android App.***

Keywords: Electric Vehicle, Synchronous Generator, Non-renewable energy sources, Solar Energy, Wind Energy, Internet of things, Embedded System, Edge computation, Cloud, Rest , API WPT System .

I. INTRODUCTION

Since electric vehicles have been utilized in the 1990s, their dispersion into the vehicle market has not been up to the mark because of the reason that these vehicles need to recharge once in 60 to 70 km drive and are less cost effective. The hybrid vehicles play a major role in the present market and it obtains their energy from the combustion engine. However, in order to alleviate the utilization of gasoline, the plug-in electric vehicles (PHEVs) entered into the market and it takes the energy from the grid for driving. At present the carbon emission has increased drastically due to conventional IC engine vehicles. The electric vehicles (EV) have captured the attention of many developed and developing countries since they reduce carbon emission and effectively global warming. However, the traditional cable charging has some constraints such as EVs have to be parked and it takes at least two hours to completely charge the vehicle. In this system, charging of EV by wireless power transfer (WPT) is presented. The issues with cables charging such as position and time are overcome by WPT. With the precipitous development of WPT technology, dynamic charging for moving electric vehicles became a reality. With the inductive coupling effect EVs can be charged without interruption. Multiple receiver and/or multiple transmitter configuration are used in many practical applications.

II. LITERATURE SURVEY

1. World's first electrified road for charging vehicles opens in Sweden

The world's first electrified road that recharges the batteries of cars and trucks driving on it has been opened in Sweden. About 2km (1.2 miles) of electric rail has been embedded in a public road near Stockholm, but the government's roads agency has already drafted a national map for future expansion. Sweden's target of achieving independence from fossil fuel by 2030 requires a 70% reduction in the

transport sector. The technology behind the electrification of the road linking Stockholm Arlanda airport to a logistics site outside the capital city aims to solve the thorny problems of keeping electric vehicles charged, and the manufacture of their batteries affordable. Energy is transferred from two tracks of rail in the road via a movable arm attached to the bottom of a vehicle. The design is not dissimilar to that of a Scalextric track, although should the vehicle overtake, the arm is automatically disconnected.

1. **Evatran: Plug less Charging Systems Compatible With 80% Of EVs By 2017**

As a reminder, Evatran sells its wireless charging systems under the Plug less brand name. The company currently offers products that work with a range of different models, including the Tesla Model S, Nissan LEAF, and Chevy Volt. Green Car Reports provides more: "The Evatran wireless system uses inductive charging, in which a magnetic field is created by running electricity through a coil. As with other similar systems, one coil is placed on the ground, and another is mounted to the vehicle's underside. Evatran claims the receiving coil that attaches to the vehicle is just 1.0 inch thick, ensuring that clearance won't be an issue."

2. **WiTricity Is Buying Qualcomm Halo's Wireless Electric Car Charging Tech**

Wireless electric vehicle charging is the ideal technology for EV drivers who literally want to think about charging their car as little as possible. With enough magnetic resonance pads installed in the ground and in cars, people could simply go about their business the exact same way they do today but would almost always have a fully-charged car when they pull out of their special parking spot. That's the dream, anyway, and WiTricity announced today that it has taken another big step towards making it a reality with the acquisition of "certain technology platform and IP assets" from its former competitor Qualcomm Halo. As part of the deal, Qualcomm Halo will now become a minority WiTricity shareholder. Detailed financial aspects of the acquisition were not announced.

GOALS AND OBJECTIVES

- To develop a Solar and wind based charging station to charge electric vehicles and to avoid the limitation of position and time.
- To increase the use of electric vehicle.
- To helping to reduce harmful air pollution from exhaust emissions
- To use renewable energy to recharge your EV, you can reduce your greenhouse gas emissions even further.
- Search the nearest charging station and its status using application

MOTIVATION OF THE PROJECT

The previous experiences with the fast draining of EVs and then no supply of electricity for them till long miles has been an issue for the nations adopting the EVs. Currently, some of the most popular EV manufacturer is Tesla but due to limited availability of charging stations it has been difficult in the recent times to cover long distance journeys with the EV's. The proposed solution however is the direct and efficient solution to the problem as the solution includes charging lanes which means cars can continue their journeys while charging their batteries wirelessly.

III. ARCHITECTURE DESIGN OF PROJECT

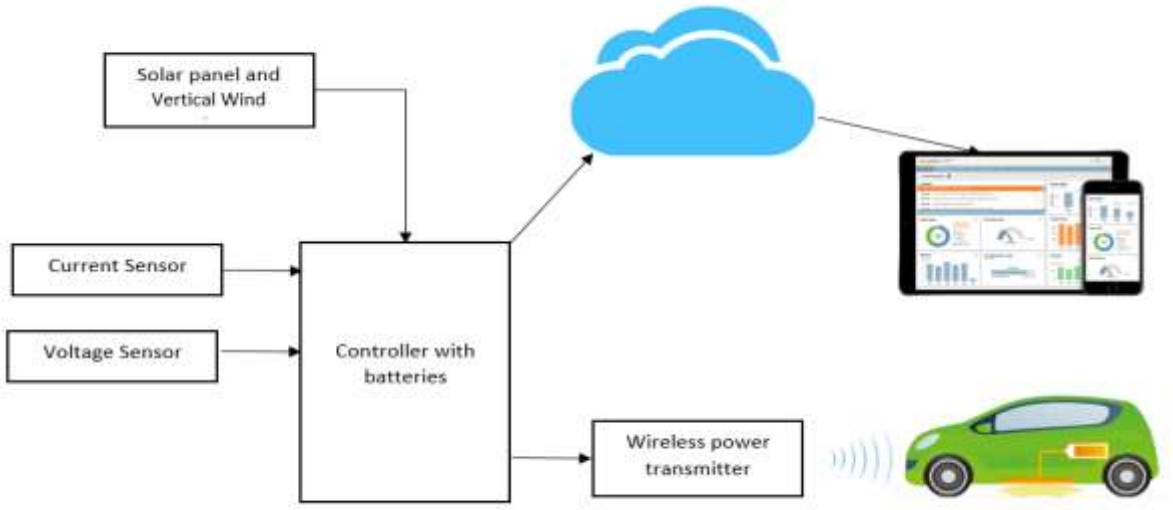

Fig.1 Architecture Design

IV. DESIGN AND MODELING OF SYSTEM

1. DATA FLOW DIAGRAM LEVEL 0

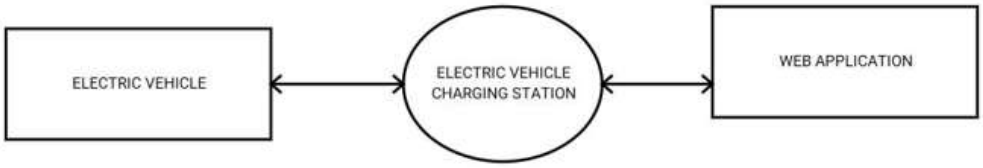

Fig.2 DFD Level 0 Diagram

2. DATA FLOW DIAGRAM LEVEL 1

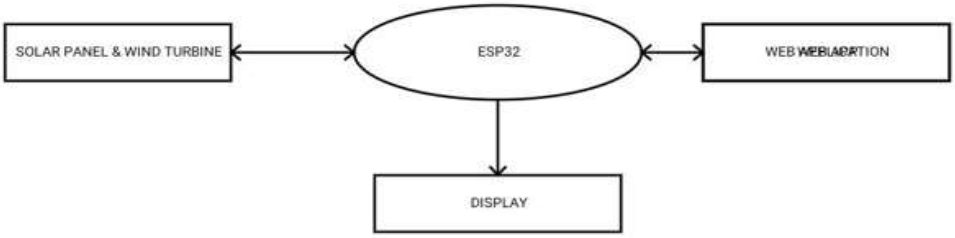

Fig.3 DFD Level 1 Diagram

USE CASE DIAGRAM

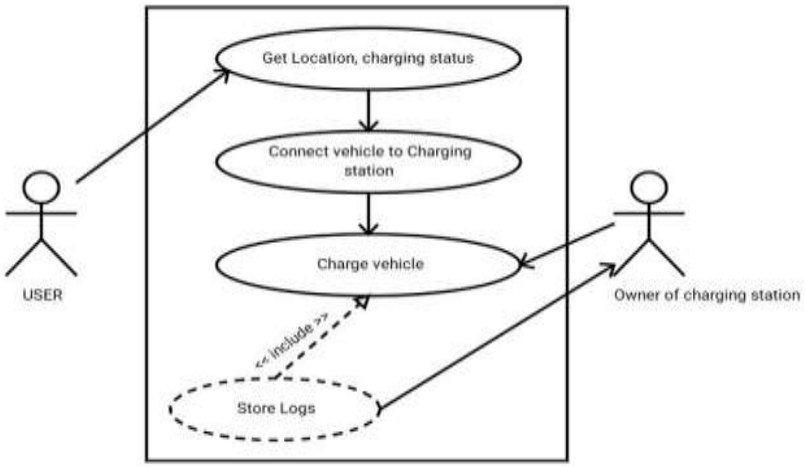

Fig.4 Use Case Diagram

ACTIVITY DIAGRAMS

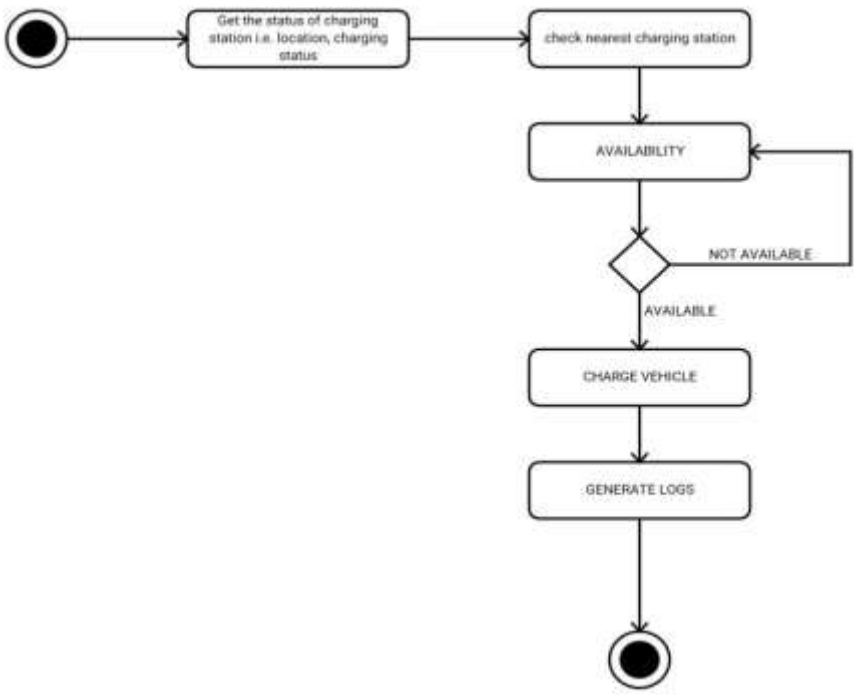

Fig.5 Activity Diagram

CLASS DIAGRAM

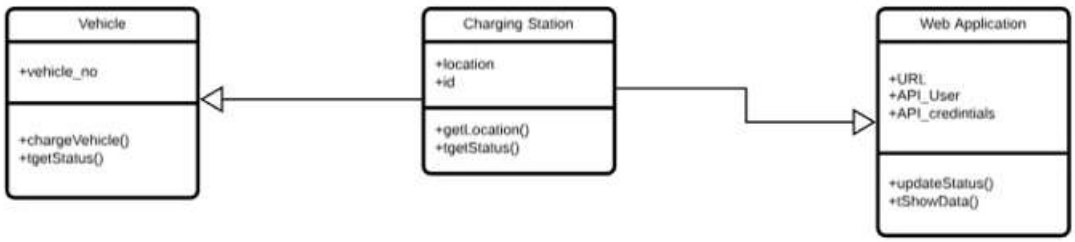

Fig.6 Class Diagram

V. COMPONENTS

NODE MCU:- NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term ”NodeMCU” by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS. As Arduino.c began developing new MCU boards based on non-AVR processors like the ARM/SAM MCU and used in the Arduino Due, they needed to modify the Arduino IDE so that it would be relatively easy to change the IDE to support alternate toolchains to allow Arduino C/C++ to be compiled for these new processors. They did this with the introduction of the Board Manager and the SAM Core. A ”core” is the collection of software components required by the Board Manager and the Arduino IDE to compile an Arduino C/C++ source file for the target MCU’s machine Language.

WIRELESS CHARGING MODULE:- This Wireless Charging Module is an inductive wireless charging module suitable for any electronic projects requiring 5V supply. It comes with two coils a transmitter coil and a receiver coil. The transmitter coil needs to be connected to a 12V DC power supply. The receiver coil would provide 5 V DC @ 600mA when transmitter is held close to it. Semtechs exhilarating portfolio of wireless charging products has transformed connectivity as we know it. Our out-of-the-box ready infrastructure can be used in essentially any environment, providing wireless charging capabilities for standards-compliant mobile phones and tablets

VERTICAL AXIS WIND TURBINES: - Vertical axis wind turbines (or VAWTs) have the main rotor shaft arranged vertically. Key advantages of this arrangement are that the turbine does not need to be pointed into the wind to be effective. This is an advantage on sites where the wind direction is highly variable. VAWTs can utilize winds from varying directions. With a vertical axis, the generator and gearbox can be placed near the ground, so the tower doesn’t need to support it, and it is more accessible for maintenance.

SOLAR PANEL: A solar panel is an assembly of solar cells that can convert light directly into electricity. By combining the capacity of several solar panels, part of a family's electricity needs can be covered. At the moment, depending on the type of panel, 5 to 19 using solar panels you can convert sunlight, which is free and inexhaustible, into electricity. This conversion is achieved thanks to the so-called semiconductor material from which each solar cell is made

SENSORS: Sensors are basically a device which can sense or identify and react to certain types of electrical or some optical signals. A current sensor is a device that detects and converts current to an easily measured output voltage, which is proportional to the current through the measured path. When a current flows through a wire or in a circuit, voltage drop occurs. Also, a magnetic field is generated surrounding the current carrying conductor. A voltage sensor is a sensor is used to calculate and monitor the amount of voltage in an object. Voltage sensors can determine both the AC voltage and DC voltage level. Voltage and current sensors.

VI. SYSTEM IMPLEMENTATION

In this system, a simple prototype of power generation using wind and solar and wireless charging lane will present and through the experiment, it is showing that this lane can provide a scale-down model with wireless power transmission for EVs, which makes the idea of charging-on-the-way into reality preliminarily. Because of low transfer efficiency, future work focuses on the optimization of the wireless charging lane. We also included an IOT and Embedded system to monitor system from locally as well as from remote location.

- **Energy generation:** We are using vertical wind turbine and Solar panels to generate electricity without any air pollution
- **Wireless and wired charging:** We have developed a wireless power transmission module using copper coil and T5336 IC. User can charge vehicle using wired adapter as well as wirelessly during driving.
- **Android App**: The Android app is used to find the nearest charging lane and monitor the available charging at charging station

SCREENSHOTS:

Fig- Charging Station
In Above Fig the Station displays the amount availability of charging currently in the charging station

Fig- Model of Charging Station

In Above Fig we can see the model representation of Wireless Charging lane where the car is getting charged while passing through charging lane, the vertical wind turbine, and solar panel can also be seen.

Fig- Mobile App

In Above Fig shows the Map where Location of Charging station can be searched and availability of charging in the station can be analysed.

CONCLUSION

In this system, a simple prototype of wireless charging lane will present and through the experiment, it is showing that this lane can provide a scale-down model with wireless power transmission for EVs, which makes the idea of charging-on-the-way into reality preliminarily. Because of low transfer efficiency, future work focuses on the optimization of the wireless charging lane. In addition, some control strategy can also be introduced into the proposed system. For instance, coils will not be powered until the vehicle is detected by position sensors.

ACKNOWLEDGMENT

We take this opportunity to express our hearty thanks to all those who helped main the completion of the Project and Seminar on ` SOLAR & WIND BASED ELECTRIC VEHICLE CHARGING STATION USING WIRELESS CHARGING LANE'

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