IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

ISO 3297:2007 Certified ⁜ Impact Factor 7.918 ⁜ Vol. 12, Issue 2, February 2023

DOI: 10.17148/IJARCCE.2023.12252

Position Detection for Wireless Electric Vehicle Charging Using Online Monitoring of System

Prof. Leena Shruthi H M[1], Anushree M H[2], Archana M[3], Anand Kumar Rana[4], Vikas V[5]

Associate Professor, Computer Science, East West Institute of Technology, Bangalore, India[1]

Student, Department of Computer Science and Engineering, East West Institute of Technology, Bangalore, India[2-5]

Abstract: Wireless Power Transfer (WPT) using alluring reverberation is the invention that might relieve people from obtrusive wires. In fact, the WPT accepts a comparable fundamental theory that has only been known by the phrase "inductive power exchange" for around 30 years. WPT innovation has recently increased quickly at the control level. Because of this, stationary and dynamic charging applications for electric vehicles (EVs) can greatly benefit from the WPT. The development of remote charging for EVs from WPT was examined in this study.The charging system can be efficiently alleviated by implementing WPT in EVs. The introduction of EVs to the mainstream market has rendered battery innovation obsolete. It is believed that experts could benefit from cutting-edge achievements and advance the continued development of WPT and expansion of EV.

Keywords: electric vehicles, wireless charging, position detection, photoelectric sensor, IoT, efficiency

I. INTRODUCTION

To travel from one place to other humans have been using vehicles for transportation. Internal combustion (IC) engines are used to drive it. As the vehicle population is increased there is a vast increase in the environmental pollution rate. In future days, the concept of pollution free transportation will be of focus. Due to increasing greenhouse gas radiation, and scarcity of petroleum products for upcoming year's efficient use of electric vehicles and recharging them portably becomes important. Electric vehicle does not need petroleum products as fuel and the level of pollution caused is negligible when compared to regular vehicle. Hence, electric vehicles and efficient recharging process becomes the major concern. Main concern with electrical vehicles is charging.

Thus, the concept of wireless power transfer is proposed, where a vehicle can be charged portably. The reason for taking up this project is to make a model of wireless transfer of power for electric vehicle, which will enable dynamic charging in the electric vehicle, thereby increasing its range.Utilising radio frequency identification for location (RFID) Although it achieves excellent accuracy, the control and associated circuit are rather complex. The misalignment-sensing Coils, which take advantage of the symmetry of the magnetic field to provide measurements of the direction and magnitude of the misalignment This technique is challenging to implement and needs additional circuits, such as rectifier and filter.

The approach for detecting coil misalignment based on tunnelling magnetoresistive (TMR) sensors is presented. This sensor's drawback is that nonlinearity and saturation prevent it from being used. Due to nonlinearity and saturation, it cannot be employed in high magnetic fields. In this study, using a retroreflective photoelectric sensor to determine where the transmitter and reception coils are aligned.The suggested method is simple, exact, and trustworthy. The system is additionally controlled and monitored online using an IoT platform. The Controller starts the EV's battery's charging process. As soon as the aligned position is discovered.Through Blynk applications, real-time Battery status is accessible from any location at all time. The user receives the notification automatically when the battery is fully charged. The experimental measurements from the micro EVs with 12V batteries are used to validate the proposed system. Also discussed is the efficiency comparison between the presented technique and one without It. A representation of the proposed electric vehicle wireless charging system in its overall block diagram.

The transmitter coil, full-bridge inverter, and DC voltage supply are the charging station's main components. At the electric car that needs to be charged the rectifier circuit and receiver coil are installed.The relative position of the transmitter and receiver coils can be determined using a retroreflective photoelectric sensor. While the retroreflector is fastened to a Tx coil, the photoelectric sensor is fastened to a Rx coil. There is a 4 cm air gap between the two coils. When the centers of both coils are at the same location, the transmitter and receiver coils are said to be in a straight line.

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At this point, the greatest magnetic field coupling coefficient is attained. Therefore, the best place to park an electric vehicle at a charging station is in an aligned position. This is as a result of increased system efficiency. This best position is found using the proposed detecting technique.If the aligned position is found, the sensor output will emit a voltage. For EVs, a 12 V, 1.2 Ah battery of capacity is used.The microcontroller unit (MCU), a NodeMCU ESP8266, enables Wireless communication exists between the EV and the charging station.The receiver circuit uses the MCU1. It gathers information on the output voltage of the sensor, battery voltage (VBatt), and battery current (IBatt).The transmitter circuit's MCU2, located there, receives this data wirelessly. Therefore, by modifying Depending on the duty cycle of the full-bridge inverter's output, the charging of the EV's battery can be controlled in both constant current (CC) and constant voltage (CV) modes. Gate signal. The controller's initialization, the output voltage of the photoelectrics It has read the sensor (Vsensor). In the event that The aligned position is recognized if it is greater than zero. 4 LEDs that are currently fitted on the front panel of the EV will brighten in order to inform the user. In order for the user to park the EV at this location, the system waits for 5 seconds while it waits for this detection to be noticed by the user.

After that, it will instruct MCU2 to begin the charging procedure. The controller will then read the data for battery voltage (VBatt) and battery current (IBatt). The MCU2 will receive these data in order to determine the appropriate charging method. The Blynk applications will additionally receive Vattdata in order to continuously monitor the battery status.The battery current value will then be assessed. The battery is fully charged if the current is 0.03 A or less. The user will receive this notification right away via the controller. The MCU2 will then receive a command signal to cease the charging process. The controller is initialised first. It will then hold off starting the charging process until MCU1 issues the command signal. The inverter circuit's initial duty cycle is set to 25%.

The information about The controller then reads battery voltage and current from wireless MCU1 transmissions. If the controller will charge the battery in constant current (CC) mode if the battery voltage is less than 14.5 V. The maximum permitted charging current of 0.36 A will be maintained as the battery current.The controller will then watch for MCU1's command signal before stopping the charging procedure. Once the inverter circuit receives that signal, the duty cycle is set to 0%. This will cut off the power to the reception circuit from the transmitter from being transmitted.

II. OBJECTIVES OF THE PROPOSED SYSTEM

- To eliminate the use of cable in the charging process thus making it simpler and easier to charge the battery of an electric vehicle
- As different charging ports are available for different models it is difficult to find the specific charging station, but WPT allows to reduce the human effort.
- Battery Monitoring System using conventional technique/optimization technique.
- The main function of Battery Management System (BMS) is to ensure that the battery is protected and any operation out of its safety limit is prevented.
- Charging system for EVs can be both conductive (wired) and wireless. The heavy cable and bulky mechanical plug are needed in the conductive charger.
- High frequency current produced by an inverter circuit is supplied to the transmitter (Tx) coil to create the high frequency magnetic field.
- The IoT technology is also introduced in the proposed system where remote monitoring and controlling can be achieved.
- The use of EV is presently extended but there are a few battery associated troubles together with slow potential, length, and weight.

III. EASE OF USE

The proposed system has the following advantages over the existing systems.

- Auto Billing amount calculation
- LCD display for user information
- Empty Slot information on IOT
- Easy to use
- User friendly
- Cost effective
- Time saving

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IV. LITERATURE SURVEY

Title: Wireless Charging Station for Electric Vehicles.
Authors: Darshana wagh, International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 08 Issue: 01 | Jan 2021
Abstract: This paper presented review on wireless charging system for electric vehicle. Wireless charging is most efficient method for electric vehicle. Wireless charging provides numerous benefits as compared to wired charging. As it has wide range for travelling. It reduces the time spent on recharging the vehicle and even allows the EV's to be charged during its movement. Initially it has high cost but eventually the maintenance cost gets low.

Title: Efficient Wireless Charging for Electric Vehicle
Authors: Yash Baviskar,
Abstract: Student, Department of Electrical Engineering SVKM's Institute of Technology,Dhule Maharshtra, India. In this project we designed a wireless power transmission charging circuit for electric vehicles to increase the battery life of the vehicle and also to sort out the issue of battery overheating due to plugged in charging. In plugged in charging heat losses are more and it directly affects the life of the battery so that Battery thermal management is the main issue for electric vehicles.

Title: Analysis on Wireless Charging Technology of Electric Vehicle
Authors: Deng Fang1 , Zhang Yuanqing, Journal of Physics: Conference Series 1827 (2021)
Abstract: In this paper the charging technology of electric vehicles has been continuously improved and perfected, and its charging method has developed from traditional wired charging to wireless charging which is being perfected at present. Compared with the traditional charging method, the traditional charging method is complex, which needs to be combined with socket and charging line at the same time to complete charging, while wireless charging is to achieve wireless power transmission through the specific working principle of electric vehicles, and it is convenient and quick to operate.

Title: Wireless Charging of Electrical Vehicle on Road
Authors: Mr. Suraj Hussainsaheb Mulla (2021), International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Abstract: This paper has dealt with Wireless Charging Systems for Electric Vehicle Batteries. An Inductive Power Transfer (IPT) system for an E-bike battery charging has been designed and assembled. The target is to build a prototype of toy car charging. After the magnetic design of the IPT coils, the electric model of the coupling structure has been gained and acquired from an electronic simulation tool, in order to complete the design of the whole system.

Title: Wireless Charging of Electric Vehicles
Authors: Asst Prof.Swapna Manurkar, International Research Journal of Engineering and Technology (IRJET) (2022)
Abstract: This paper has outlined a comprehensive overview of wireless charging technology for EVs. This paper has outlined a comprehensive overview of wireless charging technology for EVs.WPT technology offers the possibilities for better energy performance, lower environmental impacts, lower life cycle cost, and more convenience and operational safety benefits. With the advancement of EV technology, charging infrastructure and grid integration facilities, EV popularity is expected to increase significantly in the next decade. In this context, wireless charging has aroused wide attention since it is spark-free, independent of environment and applicable to unmanned operation.

V. METHODOLOGY

The system comprises of a transmission and receiver part. Our project makes use of the following components: on the transmitting unit with help of step down transformer, Rectifier Bridge, filter, high frequency section and transmitting coil.

- In transmitter section, the Transistor is generating high-frequency AC current across the coil and the coil is generating a magnetic field around it. As the coil is center tapped, the two sides of the coil start to charge up. One side of the coil is connected to the resistor and another side is connected to the collector terminal of NPN transistor. During the charging condition, the base resistor starts to conduct which eventually turns on the transistor. The transistor then discharges the inductor as the emitter is connected with the ground. This charging and discharging of the inductor produces a very high frequency oscillation signal which is transmitted as a magnetic field.

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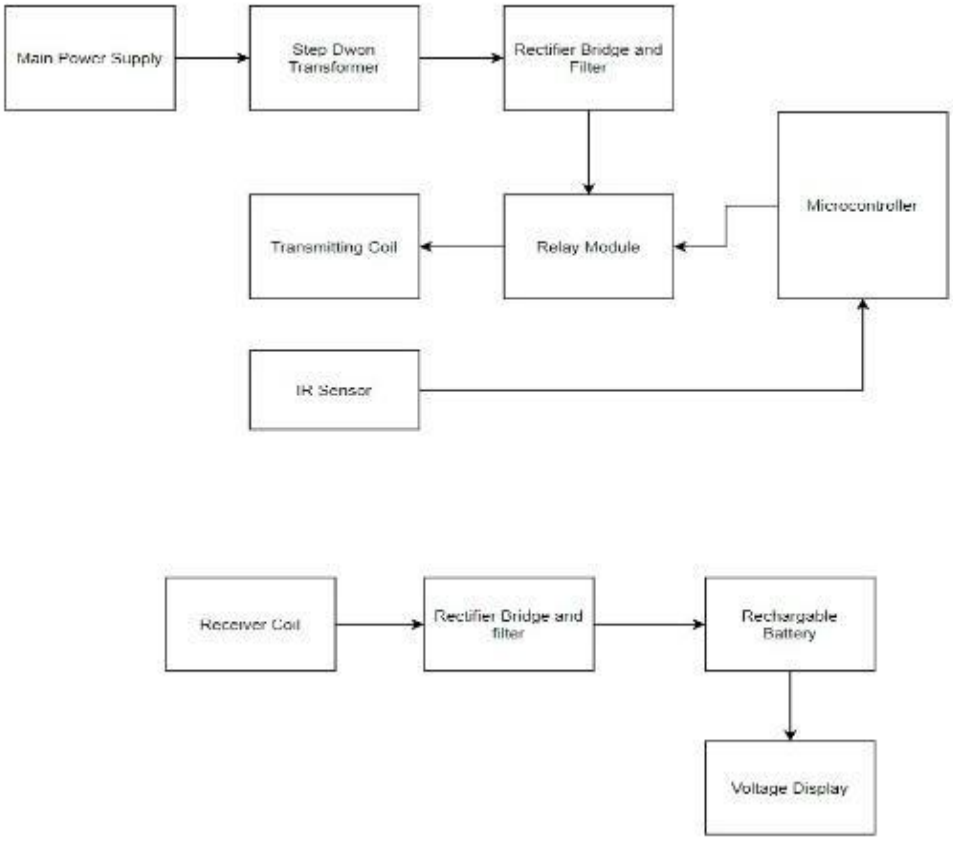
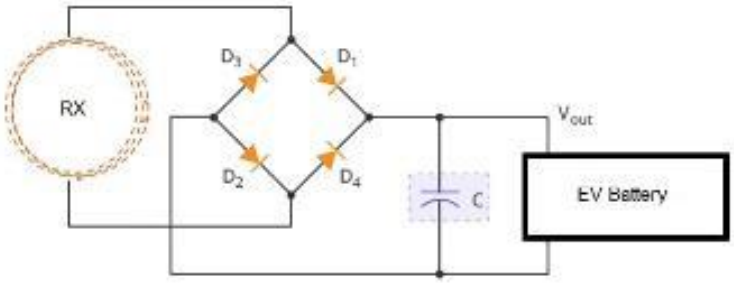


Fig : Block Diagram Of Proposed System

• On the receiver side, that magnetic field is transferred into the other coil, and by the Faraday's law of induction, the receiver coil start producing EMF voltage which is further used to charge the battery. On the receiver unit: receiving coil, rectifier bridge, filtering, battery, in the receiver section side, after receive this power, converting into pure dc using Rectifier Bridge and filter. After that storing this into battery.

We are connecting IR sensor with microcontroller for start and stop charging slot. Once vehicle will be in front of IR sensor, the charging will be trigger on using Relay switch and once vehicle will be not in front of IR sensor, the charging will be stop. This slot information user will able to see on IOT page from remote location. Based on this slot status also we will calculate the bill amount.



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VI. POSSIBLE OUTCOME

- Wireless charging of Electrical vehicle
- Auto Billing amount calculation
- LCD display for user information
- Empty Slot information on IOT

VII. CONCLUSION

The technique to detect aligned position between transmitter and receiver coil used in the wireless charging of electric vehicles, is presented. The retroreflective photoelectric sensor is adopted. The experimental results show that system efficiency can be increased with the proposed method. Moreover, online monitoring of battery status and notification of fully charged battery have successfully achieved through IoT platform. The proposed system is simple, accurate, and easy to implement. Future research direction will be the analysis and design of the system to improve overall efficiency. . Comparison results of the system efficiency at aligned position and 75% misalignment. Clearly, high system efficiency is obtained throughout the operation when the proposed system is adopted. Without presented technique, the system efficiency is low due to the the misalignment between a coupled coil. Display of the Blynk applications which is used to monitor the battery status in real-time. The notification of fully charged battery via Line applications is also illustrated. As different charging ports are available for different models it is difficult to find the specific charging station, but WPT allows to reduce the human effort. The main function of Battery Management System (BMS) is to ensure that the battery is protected and any operation out of its safety limit is prevented.

VIII. ACKNOWLEDGEMENT

We are appreciative to have reached this point in our mission because it required a lot of help and work from many people to finish and had such a big impact on our enterprise. We are immensely appreciative and humbled by everyone who has helped us transform these concepts into something more profound.

We would especially like to express our gratitude to **Miss. Leena Shruthi H M**, **Associate Professor,** (Department of Computer Science and Engineering, East West Institute of Technology), who gave us the wonderful opportunity to work on this wonderful project that also allowed us to conduct a great deal of research. We also wish to express our gratitude to the computer science and engineering professors whose suggestions enabled us to move past a lot of seemingly insurmountable obstacles.

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