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IOT & RFID BASED WIRELESS VEHICLE CHARGING USING ARDUINO

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Abstract:

The automotive industry is swiftly changing from an Internal Combustion age to the new one to an electric vehicle from an engine vehicle. The demand for electric vehicles is rising, which also causes a rise in the number of charging stations. The wireless charging system proposed in this project, used to charge the vehicles wirelessly using inductive coupling. The automobile only needs to be parked on the charging location for picking the charge. Wireless Power Transmission is the term used to describe the transmission of electrical energy from a source to a load at a distance without the use of conducting wires or cables. There is no need for any human contact with this device. One of the technologies that may be used in the future is wireless power transmission possibly to overcome the problems that encountered using the conventional charging system

Keywords— Wireless charger Module transmitter & Receiver , Arduino Uno(Microcontroller), RFID, Battery, Liquid Crystal Display, Node MCU.

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I.INTRODUCTION

We exist in a highly developed technological world. New tools are created daily to make our lives easier. Despite this, we still charge our daily electronic gadgets with traditional wires. The conventional wiring system gets muddled when several electric cars are being charged simultaneously. Additionally, it consumes many of the charging port's receptacles. What if there was a method to charge all of these electric vehicles simultaneously without using cables and without creating a mess? is a possible question at this time. We gave it some thought and came up with an idea. The solution to this problem is inductive coupling, a rapid and effective technique for wireless power transmission..

Wireless power transmission (WPT) is the efficient transmission of electric power from one place to another across a hoover or an environment without the use of wire or any other substance. When instantaneous or continuous energy transfer is needed but conventional cables are excessively expensive, this can be used. difficult, dangerous, unwanted, or impossible. Power can be transferred over short, middle, and long distances using electromagnetic wave power transfer, resonant induction, and inductive coupling. Power can now be delivered to locations that would otherwise be difficult or impractical to access thanks to the invention of WPT technology. Utilizing inductive coupling to power the batteries of electric vehicles may be the next big thing.

The objective of this piece is to design an electric vehicle wireless charging station and charging platform that can wirelessly transmit electricity through space and charge an electric vehicle's battery. Inductive coupling is used in the system to transmit electricity from a transmitter to a resistive load or the battery of an electric car.

If effective, recharging the battery of an electric car made more straightforward and uncomplicated by eliminating the need for cords. Additionally, it would ensure the security of the battery because there would be no possibility of harm.

II. LITERATURE SURVEY

Akhil A. G. , Harisankar S. , Jishnu K. , Sreenand S. , Vivek Vijay, Asha C. A., Dr. Preetha .P[1] Electric vehicle wireless charging system in conjunction: For the past ten years, energy-efficient alternatives to automobiles with internal combustion engines have been steadily developing in the form of electric vehicles. With increasing horsepower and range, EVs are becoming more dependable. By offering wireless charging to electric automobiles, this technology can increase their accessibility. A fascinating development that makes charging for electric vehicles more practical is wireless charging. This method of charging makes electric vehicles more usable, and wireless power transfer enables power to be transferred from a power source without messy cords. This study describes Magnetic Resonant coupling, one of the most effective wireless power transmission techniques, and its real-world uses in electric vehicles. The effectiveness of wireless power transfer and how it declines as distance increases is analysed.

Subudhi, P.S. and Krithiga, S. [2] Wireless Power Transfer Topologies Used for Static and Dynamic Charging of EV Battery: electric vehicles (EV) are thought to be a good replacement for cars powered by conventional internal combustion (IC) engines in the transportation industry. The recommended way for charging an electric vehicle battery these days is wireless charging. An in-depth analysis of the various techniques for wirelessly charging an EV battery is done in this research. Static EV charging and dynamic EV charging are two different methods for delivering power wirelessly to charge an EV battery. Inductive and capacitive methods are used for power transfer in static wireless EV battery charging techniques, however only inductive methods are used in dynamic wireless EV battery charging .

B. S. T. Reddy, K. S. Reddy, K. Deepa and K. Sireesha [3], "A FLC based Automated CC-CV Charging through SEPIC for EV using Fuel Cell" Greener transportation options have been made possible by the energy extraction from renewable sources and its use in Electric Vehicles (EVs). The difficulty with EVs now is battery charging. The methods of charging EV batteries using constant current (CC) and constant voltage (CV) have various benefits over conventional charging methods. The batteries in EVs can be charged directly using a fuel cell, which is one method of creating DC energy. The on-board fast charging can be easily accomplished using the fuel cell as the DC source thanks to a variety of power converters, although the Single-Ended Primary Inductor Converter (SEPIC) would work most effectively in the aforementioned scenario.

P. R. Shabarish, R. Krishna, P. Prasanth [4], Fuzzy based Approach to Enhance the Wireless Charging System in ElectricVehicles The infrastructure for electric vehicle (EV) charging is limited to the place and time. To facilitate the EV charging at parking lots and slow-moving traffic, the wireless charging system is proposed. An attempt has been made to transfer the power from a DC microgrid to the vehicle through the Wireless Power Transmission (WPT) system. The system involves single-stage inverter, inductive coupling, single-stage rectifier and boost converter to meet the rated voltage of the battery in EV. However, output voltage variations are predominant due to the change in battery impedance with the state of charge (SoC).

Hence, a fuzzy logic controller is proposed to maintain the constant voltage across the load which is analysed in MATLAB/Simulink. The performance of the controller is evaluated with the Integral Square Error (IS
E) and the dynamic response of the controller is evaluated by time-domain analysis.

P.Jyothi,K.Sudarsana Reddy,V.S.Kirthika Devi[5], Analysis of Wireless Power Transfer Technique for Electric Vehicle, Similar to regular automobiles, electric vehicles (EV) have an electric motor in place of the combustion engine. To provide a mechanical output, a motor needs an electrical source. Battery is incorporated into EVs to power the motor for this reason. Because a charger is necessary to charge the battery that is directly connected to the car in a plug-in electric vehicle, the charging process can be extremely time-consuming for consumers. In some instances, a fully charged battery is substituted for a drained battery, even though the infrastructure is far more intricate and expensive. By removing the issues with plug-in charging, wireless power transfer (WPT) technology makes charging of electric vehicles (EVs) straightforward. The cable-free power transfer may be revolutionised by this, which makes the wireless life. The wireless charging system is reviewed in this paper, including the classification of WPT based on the distance factor, the general block diagram and system components, the derivation of the efficiency formula, the simulation of the WPT circuit using PSIM software, and the hardware implementation of WPT for lighting an LED.

Muralikrishnan, P. and Kalaivani, M.[6] IOT Based Arduino Uno-based electric vehicle charging station Although electric cars are predicted to overtake other forms of transportation in the future, they currently have a dearth of charging stations and a lengthy charging time as their major drawbacks. In order to shorten the charging time and increase the charging station's efficiency, we designed the charging station using rapid charging technology in wired or wireless modes. When a battery for an electric car is charged with an AC supply and an AC to DC converter, there are numerous losses due to conversion and in the form of heat. This increases the charging duration and reduces the charging station's efficiency. To address this issue, the charging station should include a separate battery pack from which the electric cars will be charged using DC to DC quick charging technology. This would speed up the charging process and increase the charging station's effectiveness. Websites for charging stations are periodically updated with details about each electric vehicle's expense and power consumption. The efficiency and charging speed of the charging station can be increased by installing charging ports or wireless charging pads in the parking lots of hotels, parks, theaters, retail malls, and traffic signals.

The idea of a charging station that works like a petrol station will be explained in this article. So that the vehicle's battery can be charged while it is stopped, we will use a wireless charging pad. The station covers every technological advancement that can help the client save precious time. This applies to the RFID system's intelligent payment system, which deducts money based on the length of charging time by reading RFID tags placed on the vehicle's windscreen.

III. PROPOSED SYSTEM

Electric vehicle wireless charging stations can be categorised into four kinds based on operating techniques. Wireless Capacitive Charging SystemWireless Charging System for Permanent Magnetic Gear Wireless Inductive Charging System Resonant Inductive Wireless Charging System Wireless charging system that uses induction.

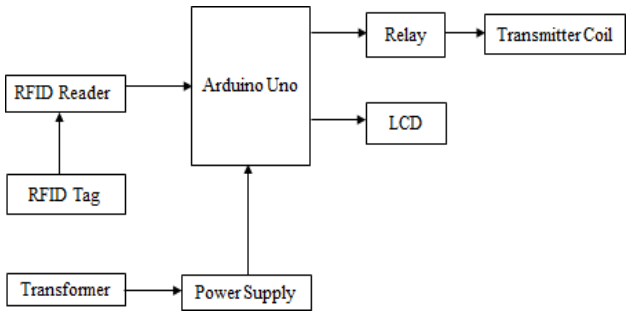
The transmission side and the receiver side are shown here. We attach an RFID reader to an Arduino in the transmitter, which serves as the input. The Arduino's output is connected to a relay, which is connected to the transmitter coil. If an RFID chip is scanned here When the Reader is up against the Relay, which interfaces with the wireless emitter coil, the relay will turn on. The receiver coil receives the electricity after that. The receiver's battery receives a boost. The LCD shows the Receiver coil charging time, which is also uploaded to a cloud service. To halt the charging, the same RFID tag should be read once more.

OBJECTIVES OF THE PROPOSED SYSTEM :

- The objective of this project is to implement an electric vehicle wireless charging station and charging platform to transmit electrical power wirelessly through space and charge the battery of an electric vehicle.
- The system will work by using inductive coupling to transmit power from a transmitter to a receiver or battery of an electric vehicle.
- In this project, a wireless charging system is used to charge the vehicle wirelessly via inductive coupling. we just simply need to park the car on the charging spot.
- This project can open up new possibilities of wireless charging that can use in our daily lives.

BLOCK DIAGRAM :

TRASMITTER:

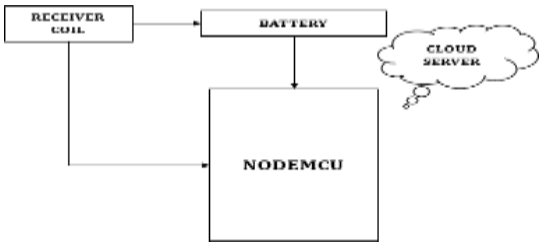


Block Diagram of Proposed Method For Transmitter The transmitter section we are having an arduino microcontroller which has the entire code dumped in it. It will get the data from RFID reader and will display the status of charging.Delay will get tricked so that the power will be transmitted from the station.In the station we have a step-down transformer which will convert the 220 volts ac to 12 volts ac at its output and that is been given to a power supply board.Power supply port will convert ac to dc voltage along with it will reduce the voltage towards 5 volts using a regulator on it. So these are the components that are used in transmitter section.

RECEIVER :

When it comes to receiver section we are having While the transmitter portion contains the power transmitter coil and a battery that will be charged using

this receiver coil, the receiver section also includes a Nodemcu microcontroller and a led indication coil. Therefore, the driver of the car must always have the card on him in order to scan the car, get charged, and charge the car. Make sure you've updated your hotspot credentials, which are project one username project one password one two three four five six seven eight nine, to ensure that this nodemcu microcontroller on the receiver section will connect to that hotspot and upload the data, such as battery voltage, to a cloud platform that is things pick server so you can log into thingspeak.com and can view in the form of graphical chart there.



Block Diagram of Proposed Method For Receiver

Therefore, the driver of the car must always have the card on him in order to scan the car, get charged, and charge the car. Make sure you have changed your hotspot credentials as username project one password one two three four five six seven eight nine before turning on the devices to ensure that this nodemcu microcontroller on the receiver section will connect to that hotspot and upload the data like battery voltage to a cloud platform that is things pick server so you can log into thingspeak.com and can view in the form of graphical chart there you canNow let's get to the actual implementation. You must turn on the transmitter portion before you can turn on the receiver section by flipping the switch that is currently connected to your hotspot by rmc. You should be able to see the brightness of this led flash on the receiver coil if the car is parked as shown and the user has swiped his car charging started.

IV. Flowchart

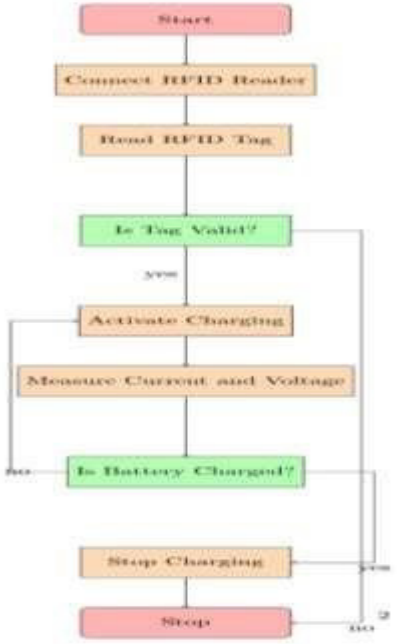
This diagram shows the steps involved in using an RFID reader and RFID tags to charge a battery. The procedure starts with the system being turned on and the RFID scanner being connected. The reader starts to detect the RFID tag as soon as it is connected.

The system proceeds to the next step, which is activating the charging tag, if the tag is legitimate. This signifies the beginning of the battery charging procedure.

The system then proceeds to detect the voltage and current of the battery being charged after the charging tag has been activated. This is done to keep an eye on the charging procedure and make sure the battery is filled properly.

The system will proceed to the next step, which is to cease charging the battery, if the battery is fully charged. If the tag is invalid, however, the system will instantly proceed to the "stop charging" step without turning on the charging tag.

This diagram summarises a procedure for charging a battery with an RFID reader and tags, including steps for validating the tag, starting the charging procedure, watching the charging procedure, and terminating the charging procedure.



Flow Chart of the Alogorithm

V.IMPLEMENTATION

Stage 1: Considering the problems of existing methods and giving solution to that problem by considering the basic requirements for our proposed system.

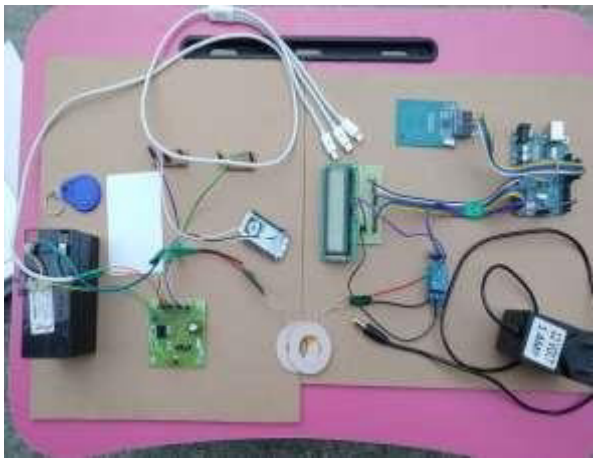
Stage 2: Considering the hardware requirement for the proposed system

For this we need to select the below components:

1. Microcontroller
2. Materials for the suggested setup (ex: sensors, drivers etc)
3. Results (ex: relays, loads)

Stage 3: Now that the hardware needs have been taken into account, let's look at the software requirements. We can choose from a variety of coding, compiling, and debugging tools depending on the microcontroller we use. Based on

our requirements, we must write the source code for the suggested system, compile it, and debug it in the software.After completing all of the hardware and software prerequisites, we must combine them to operate our system. To do this, we must first burn our source code onto a microcontroller. Once this is done, we must link all of the input and output modules as needed, as shown in Fig.



Proposed System

VI. RFID Technology

Radio frequency is used in RFID. In general, radio frequency identity (RFID) tags use one of two types of data transmission based on how electromagnetic fields behave at the chosen frequency. Active, inactive, and semi-passive RFID tags are distinguished. Here, we've used passive RFID, which works without an internal power source by using a tiny electric current generated in the antenna. The RFID reader and Arduino Mega are connected in this document. By simply scanning the RFID tag that is affixed to the car's windshield, one can pay at the charging station. Depending on how long an electric car takes to charge, the payment is subtracted.

VII. SOFTWARE REQUIREMENT

The official programme called Arduino.cc's Integrated Development Environment, or Arduino IDE, is primarily used for writing, compiling, and uploading code to Arduino devices. With this open source software, which is simple to setup and use to begin compiling code while on the go, nearly all Arduino modules are compatible.

Introduction to Arduino IDE:

Open-source software called Arduino IDE is primarily used for creating and compiling code into Arduino Modules.

Because it is official Arduino software, code compilation is so simple that even the average person with no prior technical expertise can start learning. It operates on the Java Platform, which has built-in functions and commands that are essential for debugging, editing, and compiling the code in the environment. It is readily accessible for operating systems like MAC, WindoLinux, and aaand runs on the Java Platform.

Several Arduino modules are accessible, including the Uno, Mega, Leonardo, Micro, and many more.On the board of each of them is a microcontroller that is actually programmed and takes data in the shape of code.

VIII. RESULTS

This is overall view of IOT and RFID based vehicle wireless charging using aurduino when power is not supplied to it To implement our IOT and RFID based wireless vehicle charging we have designed a experimental setup as shown in above Fig.Where we use arduino uno as a main controlling unit.We include NodeMCU as a WIFI module in our system to connect our external device hotspot and check the voltage using Thingsspeak.com.

Fig 1:Transmitter section connected to power

The power supply is given to the kit then the module looks as shown in Fig 1. the aurduino uno,RFID reader,Relay are showing indications as shown in below Fig we can say that the relay is not triggered here.In this case LCD is also turned ON as shown

Fig 2: we can see the LCD Fig 3: Working mode with power supply

project main objective wireless vehicle charging. Before we are swiping the RFID tag against the reader LCD will show this message means it is ready for providing charging whenever we swipe tag against the reader.

Fig 4:After Swiping Second RFID Tag Against the Reader

IX. CONCLUSION&FUTURE SCOPE

We demonstrated the Wireless Power Transmission in this device. As the number of electrified vehicles on the market rises. Our cars can be charged using the wireless charging technology. The effectiveness and application of the charging port in this system are examples of future technology. This essay also discusses emerging technologies, such as RFID device payments. For those conducting study in the area of wireless electricity transmission, this will be useful. And many people had created the best innovations, including wireless mobile device charging as well as other technological devices. Due to the rising desire for electric vehicles, this may represent the potential future for charging station development.

FUTURE SCOPE

There are several methods to enhance the IOT and RFID based wireless vehicle charging using Arduino to make it more effective, dependable, and user-friendly. Here are some suggestions for potential enhancements:

Including the Raspberry Pi: The Raspberry Pi board can be used in place of the Arduino board to enhance wireless vehicle charging systems. The Raspberry Pi is a more capable and flexible single-board computer that is perfect for managing massive wireless charging networks because it can carry out complex data processing and analytics. Advanced analytics and data- driven optimisation of charging habits, energy use, and battery health may be made possible by the integration of Raspberry Pi. Additionally, it can offer conveniences like cloud-based data storage, real-time data tracking, and remote firmware updates.

upkeep the wireless charging apparatus. In general, incorporating Raspberry Pi can Enhance the wireless car charging system's effectiveness, scalability, and intelligence to make it more flexible to upcoming advancements in electric vehicle technology.

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