Smart Management of EV Charging Station Using RFID Card

Ms. Sankpal Rutuja Dilip, Ms. Kondake Rutuja Dnyaneshwar, Ms. Bhagat Vaishnavi Dipak, Prof. Bhosale A.P

Navsahyadri Education Society's Group of Institutions, Polytechnic, Pune, Maharashtra, India

Abstract*: With an increased number of Electric Vehicles (EVs) on the roads, charging infrastructure is gaining an ever-more important role in simultaneously meeting the needs of the local distribution grid and of EV users. This paper proposed system RFID system for user identification and charging authorization as part of a smart charging infrastructure providing charge monitoring and control. The RFID provides a cost-efficient solution to identify and authorize vehicles for charging and would allow EV charging to be conducted effectively while observing grid constraints and meeting the needs of EV drivers. The vehicle charging is based on voltage level. In this system we can monitor our charging level through the server at any where any time using IOT*

Keywords: *IOT*

I. INTRODUCTION

As the number of EVs on the road's increases, charging stations in both parking structures and private garages will become more prevalent. These stations will be responsible for meeting the requirements of the distribution grid, EV owners, and parking structure operators. For security and financial reasons, among the many functions these charging stations will perform are user authorization, authentication, and billing. Other commercial charging stations, such as Coulomb and Blink require a short-range RFID card for the same purpose. In both cases, extra steps on thepart of the user must be taken to authorize charging.

The authors in propose using conventional RFID tags inside EVs and RFID readers on parking garage access gates together with middleware and an aggregate charging controller to authorize, assign, and enable charging. However, this system still requires action from the user and is not asflexible as may be desired. The proposed improvements allow charging authorization to take place seamlessly at multiple charging stations in a single geographic location without any action on the part of the user. Vehicle Monitoring/Identification Modules (VMMs), located in EVs, act as RFID tags for vehicle identification and charging authorization. The Internet of Things, also called thingslinked internet, it refers to a kind of network that adopts RFID (radio frequency identification) and to enable the linkage between any articles and the internet, to enable the exchange and communication of information. This paper aims to discuss the application of RFID technology in the battery charging stations, and analyse the technical advantages of RFID technology in the electric vehicle identification as well as the unified management

As the number of EVs on the road's increases, charging stations in both parking structures and private garages will become more prevalent. These stations will be responsible for meeting the requirements of the distribution grid, EV owners, and parking structure operators. For security and financial reasons, among the many functions these charging stations will perform are user authorization, authentication, and billing. Other commercial charging stations, such as Coulomb and Blink require a short-range RFID card for the same purpose. In both cases, extra steps on thepart of the user must be taken to authorize charging. The authors in propose using conventional RFID tags inside EVs and RFID readers on parking garage access gates together with middleware and an aggregate charging controller to authorize, assign, and enable charging.

However, this system still requires action from the user and is not as flexible as may be desired. The proposed improvements allow charging authorization to take place seamlessly at multiple charging stations in a single geographic location without any action on the part of the user.

Vehicle Monitoring/Identification Modules (VMMs), located in EVs, act as RFID tags

1.1 Implementation and Scope

Global warming and the depletion of fossil fuels due to excessive energy consumption have become urgent global concerns. To combat these issues,

the installation of renewable energy systems, independent of fossil fuels, is crucial. In Japan, the government's implementation of Feed-in Tariffs (Fit) has led to rapid adoption of photovoltaic systems. However, the increased output from these systems has negatively impacted system frequency and voltage distribution. Consequently, the Japanese government is reevaluating the Fit system. Additionally, the cost of photovoltaic installation is decreasing annually, indicating asignificant drop in future PV power prices. trading.

The main project aim is customer can pay payment without using cash by RFID card

While RFID can have multiple applications, when it comes to EV charging, RFID cards are used RFID card lets you start a charge at a public charging point by tapping your card against areader.

RFID cards are used to make it easy to pay for charging at charging point

Electric vehicle (EV) wireless charging using radio-frequency identification (RFID) is a noveltechnology that enables the charging of electric vehicles without the need for wires or cables. The technology utilizes RFID tags that are installed on the EV, which communicate with the charging pad through electromagnetic fields.

presence of the EV with the installed RFID tag, and the charging pad is activated authorization, authentication, and billing.

II. PROPOSED SYSTEM

Objectives

Reduce dependence on petroleum. Reduced Noise Pollution. Electric Vehicles do not consumeenergy when stationary. Reduce air pollution and health issue caused by it

The solar electricity produced from the sun is much cheaper than purchasing electricity from the grid or using fossil fuels

Reduce dependence on non-renewable energy sources, such as fossil fuels and nuclear power

Requirement Engineering

The system of electric vehicle wireless charging using RFID (Radio-Frequency Identification) is a technology that allows electric vehicles to be charged wirelessly through a magnetic field generated by a charging pad. The system uses RFID technology to authenticate the vehicle and initiate the charging process, making it convenient and easy for EV owners to charge their vehicles without having to physically connect a charging cable to the car. The system consists of two main components: the charging pad and the RFID tag.

PROJECT OBJECTIVE

Reduce dependence on petroleum. Reduced Noise Pollution.

Electric Vehicles do not consume energy when stationary.

Reduce air pollution and health issue caused by it

The solar electricity produced from the sun is much cheaper than purchasing electricity from the grid or using fossil fuels

Innovative Ideas of Project:

The prototype of EV charging station is proposed such that it uses the renewable energy (Solar Energy). An electrical vehicle battery recharging system composed of photovoltaic solar panel connected to the electrical power grid.

With the help of Solar panel, energy will be stored into the battery. Here we are providing RFID card toeach customer with which customer can access petrol at the charging stations.

Before using this card we have to recharge it like a prepaid card. Whenever we want to charge the vehiclebattery, just we have to enter required amount and place the RFID card near the RFID reader.

III. REPORT

3.1 Report for developing EV charging station

- The system uses a solar panel, battery, Regulator IC, wireless coils, rectifier circuit, RFIDmodule, Atmega16 controller and LCD display to develop the system.
- The system shows how to wirelessly charge an electric car. The solar panel is used to charge thebattery. RFID is used to detect users.
- Functionality provide for creating charging station
- First of all Solar Panel to Charge 12v DC lead acid battery.
- First of all 230v AC Power Supply is given to the circuit
- Rectifier Convert the AC power supply in DC power Supply.
- With help of the Regulator, Constant 5v supply to Atmega16 Microcontroller

3.2 Features of project

- Reduce dependence on petroleum. Reduced Noise Pollution.
- Electric Vehicles do not consume energy when stationary.
- Reduce air pollution and health issue caused by it
- The solar electricity produced from the sun is much cheaper than purchasing electricity from thegrid or using fossil fuels
- Reduce dependence on non-renewable energy sources, such as fossil fuels and nuclear power

3.3 Scope of project

- Reduce dependence on petroleum. Reduced Noise Pollution.
- Electric Vehicles do not consume energy when stationary.
- Reduce air pollution and health issue caused by it

Organization of the work:

- Project Setup and Planning:
- Define the project goals and objectives clearly.
- Set up a version control system to track changes and collaborate with others ifapplicable.

IV. DATA COLLECTION AND PREPROCESSING

Preprocess the data by dynamic EV charging . For power transfer in static wireless EVbattery charging techniques, both capacitive and inductive methods are employed; however, in dynamic wireless EV battery charging techniques

Model Development:

Choose a suitable machine learning or deep learning model architecture.
Implement the model using c programming libraries

Model Evaluation:

Evaluate the trained model using metrics like accuracy, frequency, recall
Analyze the model's performance and identify areas for improvement.

Testing and Validation:

After training and validation The RFID tag is installed on the vehicle, and it containsinformation such as the vehicle's unique identification number and charging requirements.

Documentation and Reporting:

Document your code thoroughly, including comments .

Write a detailed report describing the project methodology, results, and conclusions.

Deployment and Integration:

Deploy the trained model in your desired environment

Integrate the model with othersystems or services if applicable modules of EV charging stations

The system uses a solar panel, battery, Regulator IC, wireless coils, rectifier circuit, RFIDmodule, Atmega16 controller and LCD display to develop the system.

The system shows how to wirelessly charge an electric car. The solar panel is used tocharge the battery.

RFID is used to detect users

If the user is authentic then the vehicle will be detected by the infrared sensor.

V. LITERATURE SURVEY

Due to their numerous benefits, in the transportation sector, internal combustion (IC) engine-powered cars are regarded as being replaced by electric vehicles (EV). Modern electric car batteries should be charged wirelessly whenever possible. This study performs a thorough review of the various wireless EV battery charging methods. There are two alternative ways to wirelessly distribute power to charge an electric vehicle's battery: staticEV charging and dynamic EV charging [1]. For power transfer in static wireless EV batterycharging techniques, both capacitive and inductive methods are employed; however, in dynamic wireless EV battery charging techniques, only inductive methods are used. This study provides a comprehensive evaluation of these approaches with an emphasis on compensating circuit topologies, magnetic linked inductor core types, and various converters and controllers for wireless power transfer (WPT) systems. In addition, designconsiderations for a static wireless EV battery charging system are discussed in this work,along with an analysis of its equivalent circuit. This report also explains the difficulties andpotential future developments in wireless charging of EV batteries

NEEDS

- Reduce dependence on petroleum. Reduced Noise Pollution.
- Electric Vehicles do not consume energy when stationary.
- Reduce air pollution and health issue caused by it
- The solar electricity produced from the sun is much cheaper than purchasing electricityfrom the grid or using fossil fuels

SYSTEM ANALYSIS
EXISTING SYSTEM

Electric vehicle wireless charging is an emerging technology that aims to provide a convenient and efficient way to charge electric vehicles without the need for physical cables.

There are several existing systems of electric vehicle wireless charging that use different technologies, such as inductive charging, magnetic resonance, and conductive charging. Inductive charging is the most commonly used technology, where a wireless charging pad is installed in theground, and a receiver coil is installed on the vehicle.

Copyright to IJARSCT
www.ijarsct.co.in

DOI: 10.48175/568

ISSN
2581-9429
IJARSCT

571

Block diagram
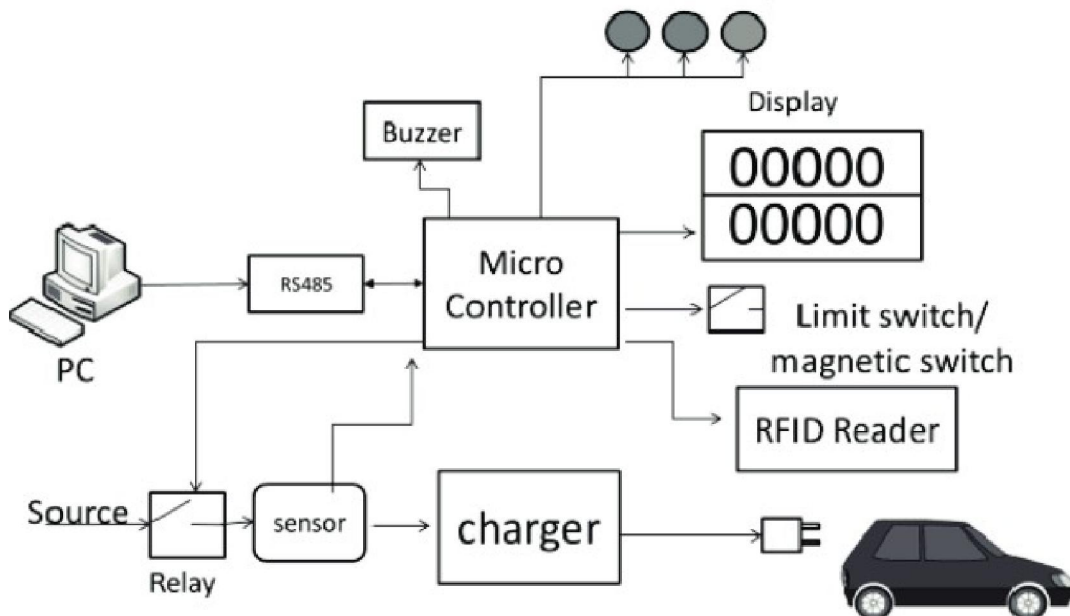
Fig1.Blog diagram

A smart Electric vehicle charging infrastructure is composed of electric vehicle, electric vehicle supply equipment (EVSE), connectors connecting vehicle to EVSE and secure network connecting EVSE to the IoT cloud service to transmit data using secured wireless technology. The IoT cloud service offers applications that receive, analyse and manage data in real-time to assist EV users in making real time decision that would enhance the quality of EV charging. Here while tapping the RFID tag into the RFIDreader then the signal is given to the Arduino controller board. Next step the user can select the output port because of in this smart charging system has the three level of output ranges like 60V output, 48V output and 12V output ranges

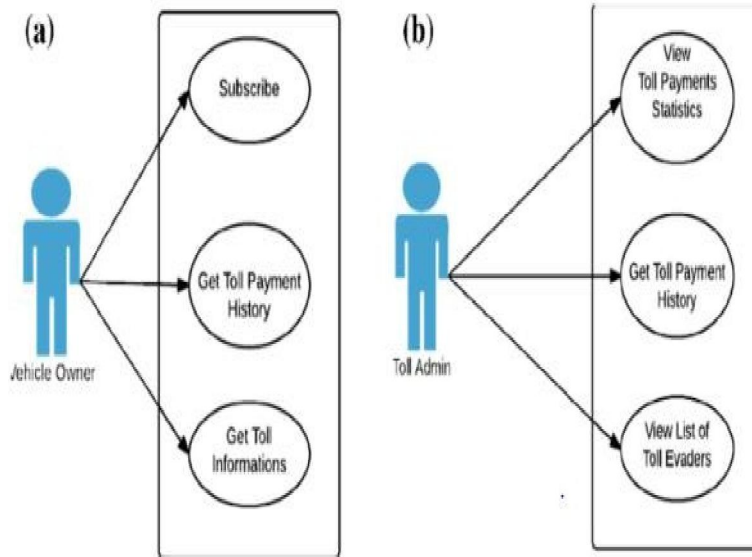**E-R Diagram:-**
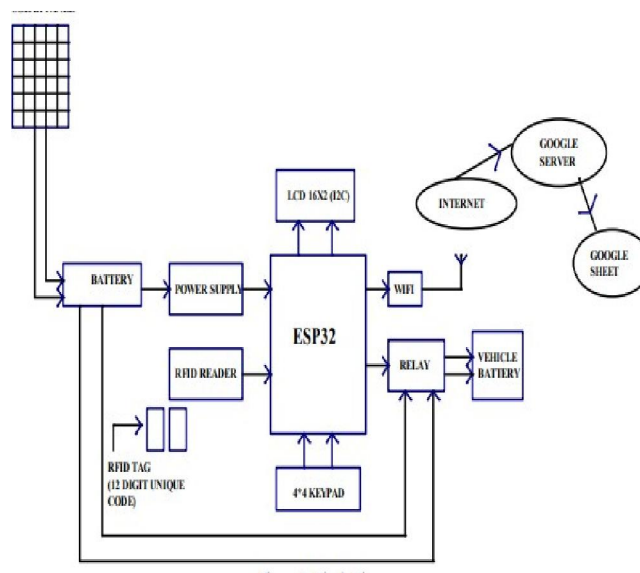
Fig 2. E-R diagram

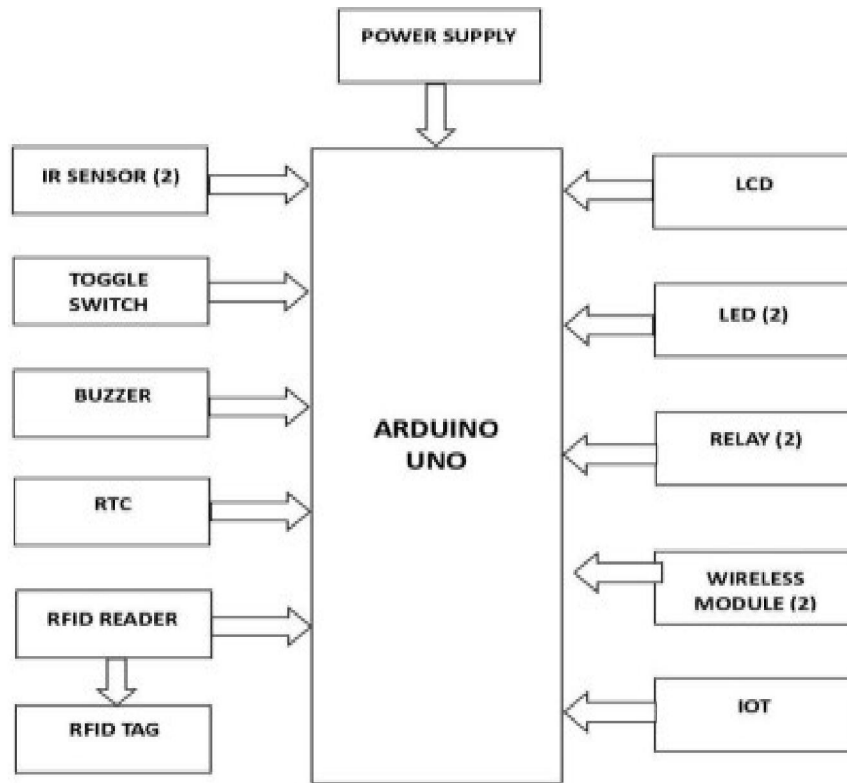**Use Case Diagram:-**

Fig3. use case diagram

PROPOSED MODEL

Fig.4.PROPOSED MODEL

VI. IMPLEMENTATION

System Requirement:

C Programming Language: C will be used to develop the management ofEVcharging station

Libraries: provides macros, type definitions and functions for tasks such as string handling, mathematical computations, input/output processing, memory management,and several other operating system services

Development Environment: An Integrated Development Environment (IDE) SpyderNotebook for writing, debugging, and testing c language code

Hardware:

- Electric Vehicle Supply Equipment (EVSE)
- Installation Services for Electric Vehicle Chargers.
- Maintenance and Repair Services for Electric Vehicle Chargers.
- Electric Meter.
- Electrical Panel.
- EV Charger Mounting Hardware.
- Charging Station Management Software.
- Payment Processing Software

Software:

- Visual studio
- Arduino ide: for programming

VII. SYSTEM OVERVIEW

Demonstration of the application:

User Interface:

Electric vehicles (EV) are receiving significant attention as an environmental-sustainableand costeffective substitute of vehicles with internal combustion engine (ICE), for the solution of the dependence from fossil fuels and for the saving of Green-House

Real-time Recognition:

EVs charging systems have been explored by several organizations around the world. Fordefining them, organizations consider the safety, the reliability, the durability, the rated power and the cost of the different charging methods

Technical knowledge:

Modularity With Structured Language.Mid-Level Programming Language

VIII. RESULT AND DISCUSSION

Electric vehicle wireless charging using RFID (Radio Frequency Identification) is a promising technology that offers convenience and efficiency to EV owners. RFID technology allows for wireless communication between the EV and the charging station, eliminating the need for cables and connectors. The EV is fitted with an RFID tag that communicates with the chargingstation to initiate and monitor the charging process

This technology is also beneficial for fleet management, as it enables remote monitoring and control of charging activities. Additionally, RFID charging systems can be integrated with renewable energy sources, further reducing carbon emissions. However, challenges still exist with the technology, such as the limited range of RFID communication and the high cost of implementation. Nonetheless, continued research and development of this technology could leadto widespread adoption and improved sustainability in the

Copyright to IJARSCT
www.ijarsct.co.in

DOI: 10.48175/568

ISSN
2581-9429
IJARSCT

574

IX. CONCLUSION AND SUGGESTIONS

Conclusion

In conclusion, electric vehicle wireless charging using RFID has the potential to revolutionize the way we charge our electric vehicles, providing greater convenience, efficiency, and sustainability. The technology offers benefits such as eliminating the need for cables and connectors, remote monitoring and control of charging activities, and integration with renewable energy sources. However, further research and development are necessary to address challenges such as the limited range of RFID communication and the high cost of implementation. With continued innovation and investment, the use of RFID technology in electric vehicle charging systems cancontribute to the transition to a cleaner and more sustainable transportation system

Limitations

1. Higher cost of installation and maintenance compared to traditional plug-in charging systems
2. Lower charging efficiency and slower charging times compared to plug-in systems
3. Limited availability of wireless charging infrastructure
4. Limitations in the range and alignment of the charging pad and the receiver coil on the vehicle
5. Higher risk of damage to the charging pad and the vehicle's undercarriage due to physical contact with the ground

Suggestions

The prototype of EV charging station is proposed such that it uses the renewable energy (Solar Energy). An electrical vehicle battery recharging system composed of photovoltaic solar panel connected to the electrical power grid. With the help of Solar panel, energy will be stored into the battery. Here we are providing RFID card to each customer with which customer can access petrol at the charging stations. Before using this card we have to recharge it like a prepaid card. Whenever we want to charge the vehicle battery, just we have to enter required amount and place the RFID card near the RFID reader

This system also provides the security for the customers for vehicle battery charging at the EV charging stations by avoiding the involvement of human beings, so to avoid the risk of carrying money every time and charge the battery on hours basis as well whenever required. All the data is display on OLED and saved in Google sheet. When vehicle is parked at the charging station, vehicle battery will be charged by charging station battery

REFERENCES

[1] Maria Carmen Falvo, Danilo Sbordone and I. Safak Bayram, Michael Devetsikiotis, "EV Charging Stations and Modes: International Standards", 2014 International Symposium on Power Electronics, Electrical Drives, Automation and Motion

[2] Michail Vasiladiotis, Alfred Rufer, "A Modular Multiport Power Electronic Transformer with Integrated Split Battery Energy Storage for Versatile Ultra-Fast EV Charging Stations", IEEE TRANSACTIONS ON INDUSTRIAL ELECTRONICS 2013

[3] http://www.GitHub repository

[4] http://www.Media Pipe GitHub repository

[5] http://www.OpenCV documentation

[5] http://www.Google.com