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IOT Enabled Smart Charging Stations for Electric Vehicles

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Abstract.–Fuel that we are using for our vehicles has limited supply in nature. So, everyone moving towards electrical vehicle to consume fuel as possible. But still people are not ready to change electrical vehicle over present fuel vehicles. One of the reasons for this is because of price and lack of charging stations. Even if there are few charging stations are available, people must have to spend extra time for charging the vehicle. Also, car parking has become a major problem in urban cities. So, by looking at these issues we can provide a smart parking with charging availability to the most commercial buildings, petrol pumps, etc. This will reduce the efforts of finding for slot of parking. Also, there is no need to invest more time for finding charging station. This project gives you brief idea about the wireless power transfer technology for EV's and charging systems with IOT. In this project, research of IOT based smart parking methods which are implemented is studied and comparison is done between combined parkingand charging system with separated parking and charging system.

Keywords **- EV: Electric Vehicles, IOT: Internet of Things Keywords- Roundwaterlevel,Prediction,Support Vector**

I. INTRODUCTION

Nowadays, vehicles are important in the daily life and for industrial use as well. Sufficient effort is being done to withdraw the combustion Engines By Electric MOTORS.Due To Increase In Carbon Dioxide (CO2) Caused By Industries And Transportation, The Kyoto Treaty Was Signed.THIS Treaty Was Aimed To Reduce The Level Of Co2.As A Finding Electric Vehicle Is A Solution To Reduce Co2 Emissions. Electric Vehicles Are Increasing Everyday Across The World.When The Number Of Electric Vehicles Is Increasing,There Is A Need To Implement Electric Vehicles Charging Stations.

Previous Battery Monitoring System Only Monitor And Detect The Condition Of Battery And Notify The User Via Battery Indicator Inside The Vehicle.Due To Advanced Design Of Notification System, Internet Of Things (Iot)Technology Can Be Used To Notify The Manufacturer And Users Regarding The Battery Status Of Ev.In Ev's,it is important to monitor the battery's state of change (SoC) although this is not always easy because the propertiesitself.Theboom of world wide web has sharpened interest in e- money that can be transferred over the internet. SO, IT is essential to do the transaction for the charging of the vehicle with e-wallet or with e-money.For, that an e-wallet SOME FORM of digital payment system is developed for faster and ease of transaction.

II.LITERATURE REVIEW

Electrical Vehicles are easy to use and therefore accepted by client. One important need of Electric Vehicle is that it requires comfortable charging and also parking space. Proposed model designed to give useful solution to this by combining these two systems. In this paper the design of system which able to manage free parking slots and scheduling of the charging. Current parking system are not able to deal with various types of vehicles. For Electrical Vehicles there is need of charging facility with parking slots. The proposed model provides facility to book the charging space by using smartphone. Then system handle all activities related to it on the basis of information like arrival time period of vehicle, battery status etc. The main elements are customer manager, vehicle manager, map manager as well as lot manager. The software used that is Java Platform and Enterprise Edition. One more point take into account is security concept. For this it requires client ID which is also used for billing process.

This IOT based Project is a way to integrate the EV system and cloud. The project uses CAN (Control Area Network) protocol to collect big data of the vehicle. Then it uses OSGI Gateway to transfer all data to the cloud and assist to process it. All the vehicle big data is monitored in real time. IOT system uses a cloud platform and Android Applications for communication motive. Internet of Things (IoT) based smart grid was developed to monitor status of batteries in smart grid systems.

The IoT which is developed in this project uses a cloud platform and Android Applications for communication

motive. The car user can easy to check the health of their car battery and they can easily make a decision whether to take power from grid or to sell power to grid. Electric Vehicles is a good prospect although if the chances of damage to battery pack in case of overcharging or deep discharging situations prevails. To reduce the danger of damage, correctreal-time capacity determination of a battery pack is desired to increase their lifespan and to protect the appliance they power. A less complex and easy to implement algorithm i.e., coulomb counting technique is implemented and the estimate SoC contiguous with measured parameters are made accessible in real time to the user on a remote basis in form of message communication.

II.PROPOSED WORK

[1] We consider the problem of controlling the charging of electric vehicles (EVs) connected to a single charging station that follows an aggregated power supply from a main controller of the local distribution grid. To overcome with volatile resources such as load or distributed generation, this controller manages in real time the flexibility of the energy resources in the distribution grid and uses the charging station to adapt its power consumption. [2]We can schedule charging and date as our convenience. We can set remainders for charging our vehicle in time-to-time manner. We push notifications of battery performance and battery percentage after some period. We track critical electric vehicle data including real-time location, temperature, historical location,

Sound, and motion. [3] In order to let electric vehicle users, know the location and availability of the charging pile station nearby in real time, it is a feasible scheme to build an intelligent pile station management platform by applying the rapid development of cloud computing technology and mobile app based on map navigation function. [4] This research considers charging for light duty BEVs and PHEVs which can have very different charging requirements.BEVs are powered only by a large battery pack (17– 100 kWh). Once the battery in a BEV is reduced the vehicle needs to be recharged from a charge point or electricity outlet. PHEVs have a smaller battery pack (4-17kWh).

Once a PHEV battery is reduced the vehicle can continue driving with the use of its ICE. The battery can be recharged from a charge point or electricity outlet. [5] User can pay directly from the app. Our app will be redirected to any online payment application like Google Pay, Phone Pay, Paytm, PayPal, etc.

By this way user can pay for charging to their electric vehicle directly from app. [6] When you search for a place on Maps, you'll find your car's estimated battery on arrival 60%. Once navigation starts, your battery on arrival will continuously update as you drive. You can get useful information for your electric vehicle on Google Maps.[7] User can check charging station ratings from previous history of our app. They also can view description of charging station and then they decide to choose best charging station for them.[8] Sometimes you get somewhere, like work, a shopping Centre or supermarket, and all the charging spots are being used by other EV drivers. Instead of circling the car park waiting for a spot to open up, at that time our app will notify when charging spot becomes free to charge your EV.

III.METHODOLOGY

Operation Of The Project Can Be Divided Into 4 Modules:

- Electric Vehicle
- Webserver
- Charging Station
- Android App • The SoC of the battery.

The registered vehicle numbers and user details.
The times charging started and ended. Money transaction details on the vehicle side as well the charging station side using dummy bank accounts.

1.Working of Webserver

It can be considered as the ultimate controller of the entire system. It stores the details of the following in the SQL database:
It monitors the SoC received from the EV and when it goes below a predefined value it sends alert message to the user. Then user can search the Nearest charging station using app with data of location of charging station from the database. User can book the charging port with app and send the command to database. Now when user reaches at station, he needs to scan the QR placed above charging port.

After user scan, charging station checks in its database whether vehicle user is registered or not. When the matching details of the vehicle are found it sends start charging command to the charging station else it aborts the process and the user won't be able to charge. While the EV is charging, if the SoC reaches an upper threshold value it sends stop charging command to charging station. It deducts the total charging cost from the user account's database and sends it to the charging station's database. With the help of the charge timing table stored in the database, it calculates the total cost based on the following formula, Total Cost = (Start time - End time) * Cost of charge per unit time.

2.Working of charging station

On receiving enable message from the webserver, it activates charging port. When the EV stops in front of the charging station, it identifies the vehicle when user scan QR code with the APP. It sends the information of the vehicle to the webserver and checks whether the vehicle is registered on the Android App. After authentication and

recognition of the vehicle it waits for the webhost to send the start charging command and on reception of the start charging command it start the charging process by connecting the charger to the EV. As soon as the charging begins it sends the details of the start of charging time to the webhost and continues charging the vehicle until it receives stop message from the webhost. On receiving stop message, it records the end of charging time and sends the information to the webhost and disables the power supply. Also, it disconnects the charger from the EV which is now free to travel.

3.Working of Android Application:
It displays nearest charging station form user's current vehicle location. It consists of nearby charging station button onclick of this button it will displays the nearby charging stations by redirecting to the Google Map which shows the travel path of user location to that particular charging station selected by user from the list of nearest charging station. It consists of a Book port button on which the user will send Booking command of port so that no other user can use that port until this user teaches at that location. It also consists of History button onclick of this button it will fetch all the transaction history from the webserver.

III.SYSTEM ARCHITECTURE

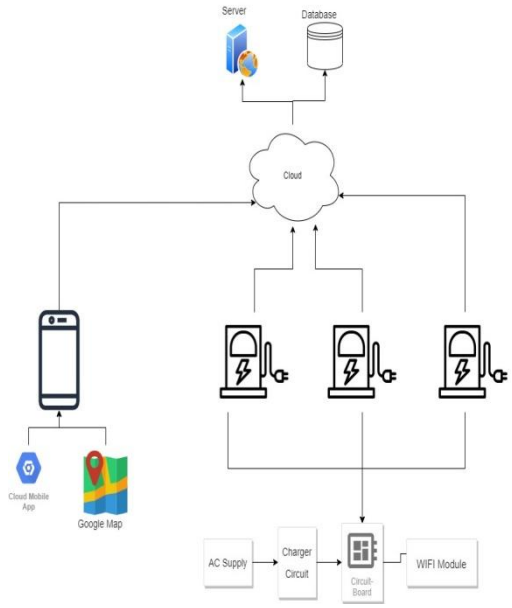

Fig.1 System Architecture.

1. The project involves hardware as well as software.
2. Hardware includes Microcontroller, Wi-Fi Module, Relay, Power supply
3. Microcontroller is programed to control relay circuit depending on user inputs
4. Wi-Fi module communicate with server and send commands to controller
5. The EV app is developed to control and activate charging station
6. In app user will scan for QR code for specific port
7. After that user need to select charging time and depending on that user need to pay price
8. After payment Wi-Fi module will read data from server and sends command to micro controller 9.Micro controller will turn on relay and charging poet will be activated for selected time
9. After that time micro controller automatically turn off the charging station.

IV.FLOW CHART

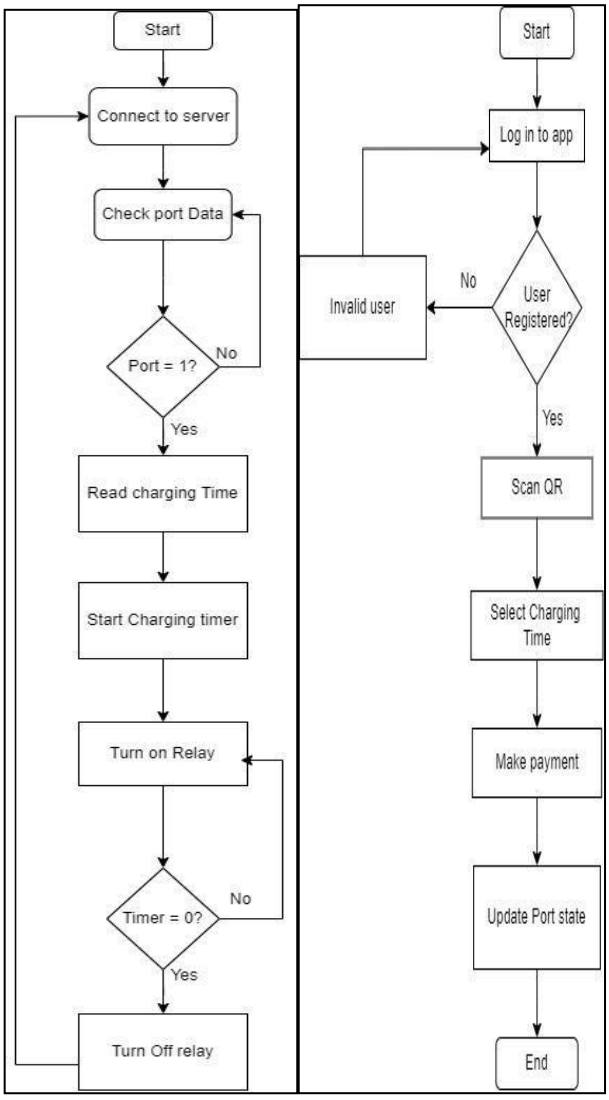

Fig. 2 FlowChart

Technology Components

- Cloud environment: AWS, Google, Azure
- Database: MongoDB, HBase, MySQL, Cassandra, Mail Chimp Integration, Postures and Redis
- Communication Protocol: OCPP
- Real-time analytics: Big Data, Hadoop, Spark, Apache Flank, Cisco.

- Find user location: Google Places API, Google Maps, Core Location Framework
- Payments: Paytm, Google pay, Phone pay, PayPal
- Push Notifications: Push, Twilio, Amazon SNS, Urban Airship, Firebase Cloud Messaging.
- MS, Voice and Phone verification: Twilio, Namo
- Front-end: ReactJS, HTML, Bootstrap and CSS for web application. Kotlin, Swift, Objective C for mobile applications.

Relay

Fig.3 Relay

A **relay** is anelectricallyoperatedswitch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal. Relays are highly versatile components that are just as effective in complex circuits as in simple ones. They can be used in the place of other forms of switches, or they can be specifically designed based on factors such as required amperage.

Wi-Fi Module

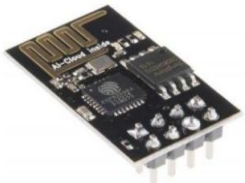

Fig.5Wi-Fi Module

Wi-Fi module, also known as serial to WIFI module, which belongs to the transmission layer of IoT. The function is to convert serial port or TTL level into embedded module which can conforming to Wi-Fi wireless network communication standard. Wi-Fi module communicates with the server and send commands to the micro-controller.

IV.CONCLUSION

In this project, it is concluded that, improvement of battery vehicle performance analyze here. The project described the design and development of an IoT-based battery monitoring system for electric vehicle to ensure the battery performance degradation can be monitored online. The objective is to proof that the concept of the idea can be realized. The development of the system consists of the development of the hardware for the battery monitoring device and a web-based battery monitoring user interface. Further modification can be done to improve the system by adding more functions into the system. The system is capable to show information such as location, battery condition and time via internet by incorporating GPS system to detect the coordinate and display it on the Google Maps application check the health of his car battery and he can easily make a decision whether to take power from grid or to sell power to grid. For future work, handling of multiple users could be implemented so as to compare the status of different users.

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