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A Smart Management System on Highway Charging Station for Electric Vehicles

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***ABSTRACT** Electric vehicles are becoming a popular choice due to their low maintenance, less charge per travel. However, there are certain factors holding back the widespread use of Electric Vehicles such as lack of infrastructure, queuing period in charging stations etc. To achieve goals using IOT platforms and sensors like temperature, voltage, current sensor with database stored in raspberry pi. To gain objectives proposed system uses stationary power method. With stationary wireless power transfer system, achieve maximum efficiency of power transfer. This project is to develop a system which will show a complete detail of the battery level and also the details will be stored in the form of logs in the system itself which includes Voltage, Current, Power, consumption of power, live tracking with GPS navigation system. Moreover, if the battery level is too low it will show the IOT platform and a notification will be sent to the user. The system will show the nearest charging station with respect to the Electric Vehicles live location.*

***Keywords:** IOT, Electric Vehicle, Raspberry Pi, Arduino Uno Board, QR code, Android App, Communication Cable.*

I. Introduction

As of now electric charging stations are limited in India due to which people can't find the right charging station which will save their time and money. EV charging stations requires space like parks, malls, societies. For private and semi-public charging stations, this space is available in the parking areas of the societies, apartment buildings, or of commercial orpublic or institutional areas. Due to this there is more difficulty for EV owners to find charging stations nearby them. The problem is not only to find the charging station butalso to charge it quickly because of the time required to charge the EV's. This leads to inconvenience of EV users as requires a lot of time so need of slot booking is require in the charging of EV's. As electrical vehicle industry is growing in India and less charging stations are available India and also new registrations of charging station is growing so there is no availability of these growing charging station on virtual Maps.

This leads to inconvenience of user for finding charging station virtually. When a customer buys an electric car, the maintenance of these cars is not like the ordinary cars. One has to seek some help such as an Electric vehicle charging station finder app to find charging stations. An electric vehicle charging station finder app can save our time to find these charging station rather than search independently. One cannot find charging stations like the petrolor diesel or CNG station which are available everywhere. Due to this problem we have to plan the refuelling (charging) of these cars, but with the help of our apps which directly navigate us to nearby EV charging station. In this article, we will be going through every aspect of an Electric vehicle charging station finder app. An Electric Vehicle Charging Station Finder App will show the nearby location of charging across stations across our locality as well as nearby your destination. We will get various information about the stations such as how many ports are available and how variety of chargers available at that station. The app provides, real-time availability of the stations, photos of the stations, and cost of the charging of car at the station. The users can contribute to app also by adding a new electric vehicle charging station as they discover. In this project we will primarily focus on the basic idea of our project which we are going to develop. To give you our project's basic idea we have organized this paper in chapters; second chapter is literature survey which includes several documents, manuals, analysis papers which are associated with our plan of the project, third chapter focus on the method which we will going to follow during implementation of our project, and fourth chapter is technology stack, which focus on technologies we will be using during our project, fifth chapter is discussion, in which we will discussing in what manner we will be working on this project. In this project we will develop an app which will be helpful for Electric charging station owners (Vendors) also. This app will give all booking of users for charging their vehicle at the vendor station. This app will provide comfortable and easy to use interface for user as well as for vendor.

A. System Design

I. Methodology

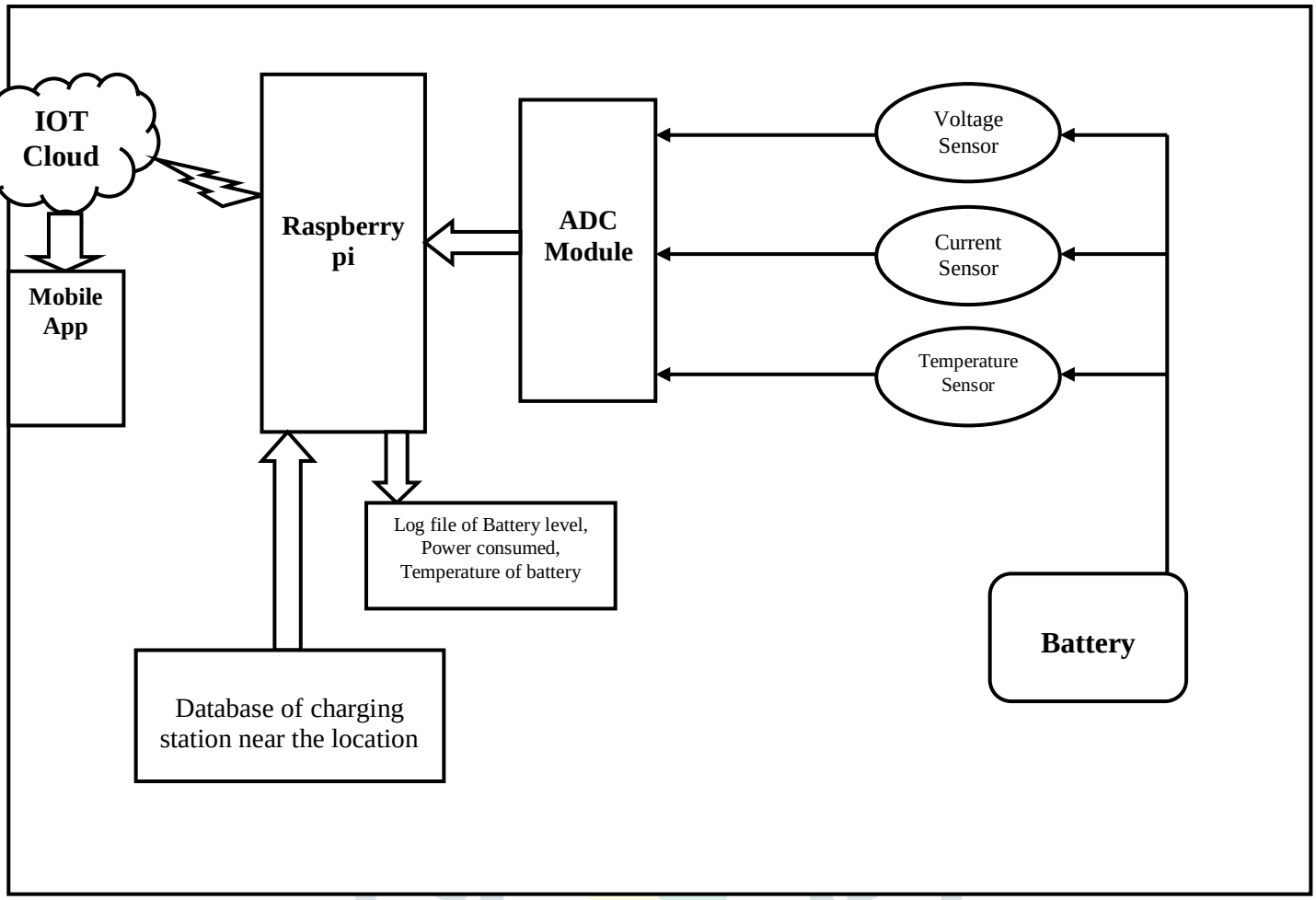

Fig.1 Block Diagram

Battery management system for Electrical vehicle is automated system. In this the system generate massage of Nearby charging station, when the battery charged value get low from its desired value. As we can see there is voltage sensor, current sensor and temperature sensor. This sensor checks the value of respective parameter andconvey their values to Raspberry pi with the help of ADC (Analog to Digital converter) this convert analog values of sensors to digital values after that Raspberry pi check values from sensors and if it is low than desiredvalue it generates message of nearby charging station. And show this message on thing speak and test message on mobile with help of GSM module. These spaces are connected to the Raspberry pi using the press buttons. The ON or OFF buttons show us availability of slots to that specific charging station. The indicators are nothingbut LEDs also connected to the raspberry pi. When the push button is on the indicator will remain CLOSEDindicating that the slot is full that it is not available and when the press button is OFF the indicator CLOSES indicating that a slot is available for charging. Android app that downloads data to the cloud and we can see thecurrent state of space availability in the Android app. The Android app will also show the location of the chargingstation via googlemap. This turn on and off data will be uploaded to Thing Speak cloud.

III. RESULTS

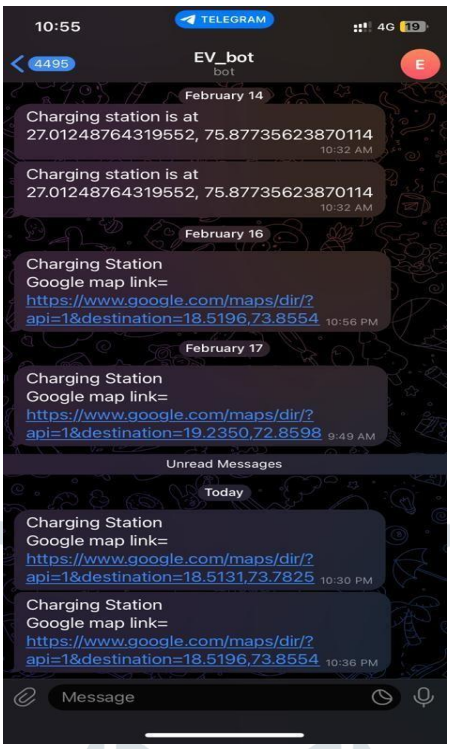

Fig.2 Telegram Chatbot Output

System develops the Android app that displays the user interface of current location and nearby charging stations from user current location. After clicking on the charging station, the user gets information about the number ofslots available and from any time available ornot available for charging. Users can find a route to the charging station by clicking the google map option, the user will find the route from the current location to the selected charging station.

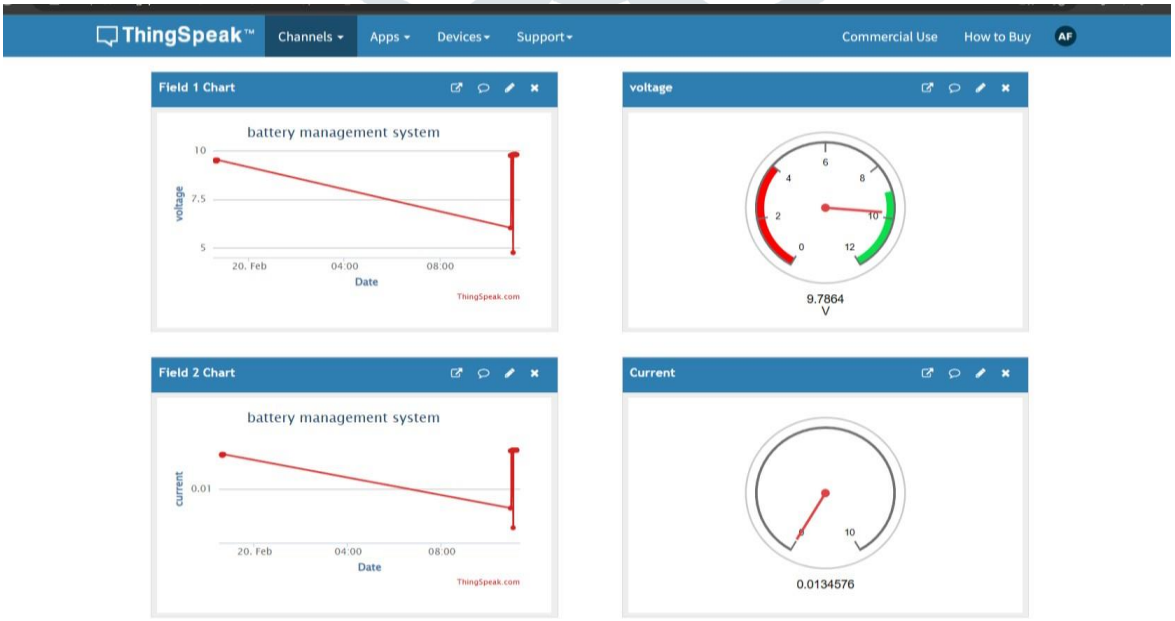

Fig.3 Thing Speak Output

Voltage sensor calculations

As you can see from the above circuit diagram the **voltage detection sensor module** signal pinS is connected to An1 pin of analog digital converter. The -ve pin of sensor is connected to GND pin and +ve pin is connected to Vcc of Raspberry pi . On the other side battery +ve and
-ve pins are connected to VCC and GND respectively. When the we connected the battery to voltage sensor VCC and GRD it measures the voltage in analog value which read by analog digital converter and conver it into to digital form. Now this digital value is given to Raspberrypi, but user can't understand the digital value for this we done some calculation as following,

$$Vout = [adc\ output\ \times \quad \frac{Vref}{255}]$$

Where's,

Vout - It is battery Voltage

Adc output – It is Value that read by ADCVref – the battery total voltage.

Current sensor calculations

As you can see from the above circuit diagram the **current detection sensor module** signal pin OUT is connected to An2 pin of analog digital converter. The -ve pin of sensor is connectedto gnd pin and +ve pin is connected to Vcc of Raspberry pi. Then we connect battery +ve and
-ve pins are connected to VCC and GND respectively in series connection. When the we connected the battery to current sensor VCC and GRD it measures the current in analog value which read by analog digital converter and convert it into to digital form. Now this digital value is given to Raspberry pi, but user can't understand the digital value for this we done some calculation as following.

$$Current = [adc\ output\ \times \frac{sensor\ Current\ Capacity}{255}]$$

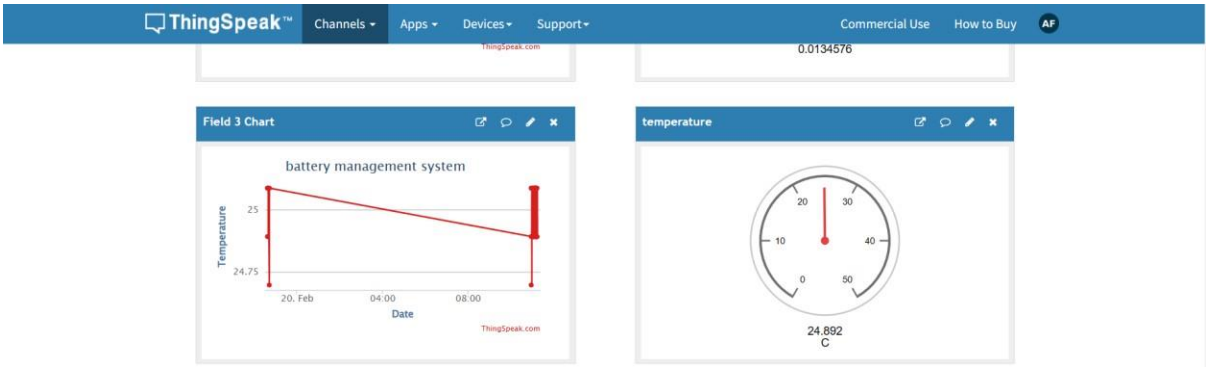

Fig.4 Thing Speak Output

Temperature sensor

In the temperature sensor is already mounted on ADC module. To access it we need to use I2C protocol, basically it is communication protocol which is use for device interfacing. By using this we directly get battery temperature on it.

IV. CONCLUSION

In terms of the problem of lack of fuel and environmental pollution to reduce pollution as well as fuel consumption, we have to use electric vehicles to contribute to the spread of the use of electric vehicles. Charging stations must be provided so the user has easy access to the charging station, especially in our time when the Internet service is available and Internet

of things technology is used to display the locationsof the available charging stations, whichreduces the time to reach them. The state of charge (SOC) of a battery pack must be accurately estimated online by the battery management system (BMS). To overcome this issue, Data-Driven estimating approach to estimate the SOC is used and traditional machinelearning techniques are commonly used such as support vector machine (SVM), fuzzy controller, and artificial neuralnetwork (ANN). Since SOC represents the amount of energy available inside the battery, the SOC is displayed by using an application to reduce power consumption and extend battery life. Charging the batteryneeds time to reduce the loss of timein the charging process.

It is suggested to put stations inside the park to take advantage of the shopping time of charging the electricvehicles. Various sources of charging inside the charging stations such as solar energy and wind energy canalso be used as the main electricity grid.

V. REFERENCES

[1] Manshadi, S.D., Khodayar, M.E., Abdelghany, K. and Uster, H. (2018) Wireless Charging of Electric Vehicles in Electricity and Transportation Networks. IEEE Transactions on Smart Grid, 9, 4503-4512. https://doi.org/10.1109/TSG.2017.2661826

[2] Subudhi, P.S. and Krithiga, S. (2020) Wireless Power Transfer Topologies Used for Static and DynamicCharging of EV Battery: A Review. International Journal of Emerging Electric Power Systems, 21, ArticleID: 20190151. https://doi.org/10.1515/ijeeps-2019-0151

[3] Rana, M.M., Xiang, W., Wang, E., Li, X. and Choi, B.J. (2018) Internet of ThingsInfrastructure forWireless Power Transfer Systems. IEEE Access, 6, 19295-19303. https://doi.org/10.1109/ACCESS.2018.2795803

[4] Arif, S.M., Lie, T.T., Seet, B.C., Ayyadi, S. and Jensen, K. (2021) Review of Electric Vehicle Technologies, Charging Methods, Standards and Optimization Techniques. Electronics, 10, Article 1910. https://doi.org/10.3390/electronics10161910

[5] Dost, P., Spichartz, P. and Sourkounis, C. (2015) Charging Behaviour of Users Utilising Battery ElectricVehicles and Extended Range Electric Vehicles within the Scope of a Field Test. 2015 International Conference on Renewable Energy Research and Applications, Palermo, 22-25 November 2015, 1162-1167. https://doi.org/10.1109/ICRERA.2015.7418592

[6] Hannan, M.A., Hoque, M.M., Hussain, A., Yusof, Y. and Ker, P.J. (2018) State-ofthe- Art and Energy Management System of Lithium-Ion Batteries in Electric Vehicle Applications: Issues and Recommendations. IEEE Access, 6, 19362-19378. https://doi.org/10.1109/ACCESS.2018.2817655

[7] Gholizadeh, M. and Salmasi, F.R. (2014) Estimation of State of Charge, Unknown Nonlinearities, and State of Health of a Lithium-Ion Battery Based on a Comprehensive Unobservable Model. IEEE Transactions on Industrial Electronics, 61, 1335-1344. https://doi.org/10.1109/TIE.2013.2259779

[8] Florea, B.C. and Taralunga, D.D. (2020) Blockchain IoT for Smart Electric Vehicles BatteryManagement. Sustainability, 12, Article 3984. https://doi.org/10.3390/su12103984