

IOT Based Smart EV L-1 Charger

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Abstract — The present days we are facing issues to lack of fuel and traffic pollution, so we are moving towards electrical vehicle. As the number of Electric Vehicles increases, but still people are not ready to prefer electrical vehicle over present days due to lack of available charging stations. As per requirement Electric Vehicle charging infrastructure will also be a basic need. Electric vehicle supply equipment (EVSE) is the basic unit of EV charging infrastructure. An EVSE control system enables various functions such as user authentication, authorization for charging, information recording and exchange for network management, and data privacy and security. The purpose of this paper, we apply the IoT-based electric vehicle charging model to managing electric vehicle (EV) charging in shared spaces, such as condominiums. Where a sensor is used to measure the current and based on the microcontroller, the device establishes communication data with the mobile application. A user interface has been developed to visualize the process happening, show the various sensor data to the user and send alerts.

Keywords: IOT- Internet of Things, Arduino Uno Board, QR Code, Communication Cable. EV-Electrical Vehicle, Wireless Charging

I. INTRODUCTION

The transition to electric mobility is a promising global strategy for decarbonizing the transport sector. India is among a handful of countries that support the global EV 30@30 campaign, which targets to have at least 30% new vehicle sales be electric by 2030. Our aim is to have the India's most connected and advanced charging network using IOT sockets with billing system.

To build low cost and effective dense charging point infrastructure. Use simple level 1 charging system. Provide IoT interface to track the energy usage. To add extra income for peoples who have extra space by installing this charger. Accessible, reliable, and affordable electricity is a prerequisite for adequate charging infrastructure provision. For a rapidly scalable EV charging network the ubiquitous low-tension (LT) electricity distribution infrastructure should be leveraged wherever feasible to provide electricity connections for EV charging.

One of the major challenges when entering the electric vehicle (EV) market is the charging process, where the main problems are related to the lack of proper infrastructure in residential (apartment) buildings due to their unpreparedness for this new reality. The apartment has a shared electricity problem, which does not meet the requirements of EV owners.

II. LITERATURE REVIEW

Literature survey is the most important step in software development process. Before developing the tool, it is necessary to determine the time factor, economy, and company strength. Once these things are satisfied, ten next

steps are to determine which operating system and language can be used for developing the tool. Once the programmers start building the tool the programmers need lot of external support. This support can be obtained from senior programmers, from book or from websites. Before building the system, the above considerations are considered for developing the proposed system. Existing System:

- Now a day's IoT is one of the strongest technologies in overall world and this is becoming most used technology in recent applications.
- There is cloud-integrated smart parking system is build using this IoT which helps EV or any users to find the parking lot and it's beneficial for EV users specially cause its charring time.
- For controlling these systems there are different types of controllers like Arduino will work as a mediator between server and sensor.

The proposed system application is created based on the java programming language. Arduino programming was used to program the microcontrollers Arduino UNO and ESP 8266 and the sensors and remaining hardware part of the system. User data and charging station owner's data is stored in Cloud Platform.

III. PROPOSED METHODOLOGY

This project was designed to develop and demonstrate level-1 charging infrastructure (software and hardware) for smart charging. This solution is helpful for EV fleet and parking garage owners, because it can help bring down the cost of adding charging infrastructure and the cost of charging large numbers of EVs through coordinated control. It could be installed within any organization using client-server-based architecture also allowing the organization to customize this application as per their requirements.

The project in four phases: (1) technology development, (2) Hardware and Software development and (3) data collection, analysis.

- In the first phase, research was conducted on relevant technologies and a system was designed.
- In the second phase, as per designed system we have developed the hardware and software .the algorithms is run in Arduino then this code installed hardware.
- In the third phase, tested hardware and see actual performing for as per designed system then data collected in Things speak cloud for energy consumption was used to estimate energy cost and validate cost reduction.

IV. COMPONENTS, HARDWARE, & SOFTWARE

A. Components and hardware to use in this project

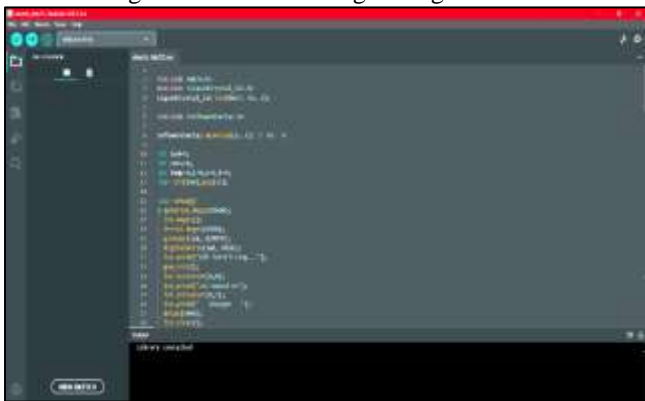
- GSM Module
- AC Voltage Sensor
- ACS 712 Current Sensor

- 5V Relay
- WIFI ESP 8266
- LCD Power Sources
- ESP 32 Espressif
- 16X2 DISPLAY JHD

B. Software to be used

- Arduino UNO

The Arduino integrated development environment (IDE) is a cross-stage application (for Windows, MAC OS, and Linux) that is written in the programming language Java. It is utilized to compose and transfer programs to Arduino compatible boards, yet in addition, with the assistance of outsider centers, other seller advancement sheets. The source code for the IDE is discharged under the GNU General Public License. The Arduino IDE underpins the dialects C and C++ utilizing uncommon guidelines of code organizing.



Code: Arduino UNO

The primary code, otherwise called a sketch, made on the IDE platform will eventually produce a Hex File which is then moved and transferred in the controller on the board. The IDE condition for the most part contains two essential parts: Editor and Compiler where previous is utilized for composing the required code and later is utilized for assembling and transferring the code into the given Arduino Module.

- Thing Speak

Thing Speak is an open-source software written in Ruby which allows users to communicate with internet enabled devices. It facilitates data access, retrieval, and logging of data by providing an API to both the devices and social network websites. Thing Speak was originally launched by Io Bridge in 2010 as a service in support of IoT applications.

Thing Speak has integrated support from the numerical computing software MATLAB from Math Works, allowing Thing Speak users to analyze and visualize uploaded data using MATLAB without requiring the purchase of a MATLAB license from Math Works. Thing Speak has been the subject of articles in specialized "Maker" websites like Intractable, Code project, and channel.

V. WORKING PROCESS

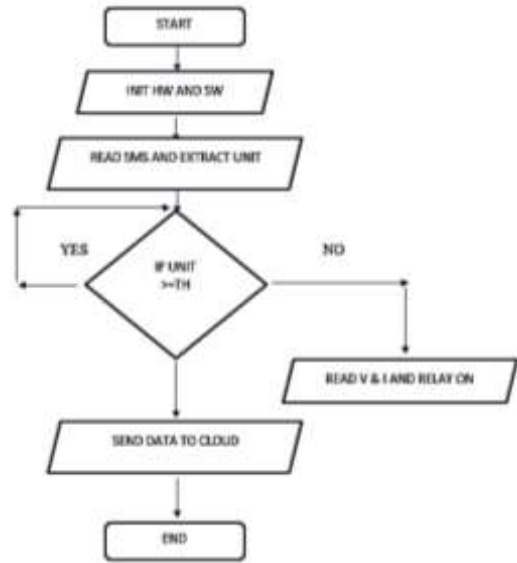


Fig. 1: Flow Chart

In this proposed work, EV owners must scan a QR code, receiving payment form owner and read this message in GSM (global system for mobile communication) Module. GSM device consists a unique number called IMEI number. After that extract unit conversion with respect to payment.

$$\text{Total power consumption in Unit (kWh)} = \text{Amount in Rs.} / \text{Cast per Unit (kWh)}$$

The micro-controller extracts unit conversion then relay will on and alert current sensor for charging electric vehicle. A current sensor used to measure the current flow and calculate total consumption. The power consumption is completed as per payment automatically disconnected power supply. The communication device will collect all data in cloud server (Thigs Speak).

VI. CONCLUSION

The proposed system id to develop an automatic charging in EV without any human iteration. It mainly concentrates to control the payment method and charging in EV make easy for user. This system built to work on payment data and consumption unit analysis with helps of IoT platform for owner. There are various sensors, controllers, software, and cloud servers (Things Speak) used which will help to make system automatic, reliable and user friendly along with development of efficient IoT platform.

VII. FUTURE SCOPE

There is wide scope of this project where it could be implemented for the various electric vehicles as well as for all other devices that are required to be charged from the charging station. Possibility to direct charging to the electric vehicle through home supply. Since, we can also develop self-power generating charging stations that can deploy power through solar.

REFERENCES

- [1] Friansa, Koko, Irsyad Nashirul Haq, Bening Maria Santi, Deddy Kurniadi, Edi Leksono, and Brian Yulianto. "Development of Battery Monitoring System in Smart Microgrid Based on Internet of Things (IoT)." *Procedia engineering* 170 (2017): 482-487.
- [2] Prabhdeep Singh Rayat, Technicity Project Report, "Defining Electric Vehicle Charging Infrastructure for smart cities using IoT. Page Defining Electric Vehicle Charging Infrastructure for Smart Cities using IOT and Smart Sensors Technicity", 2015.
- [3] Khajenasiri, Iman, Abouzar Estebsari, Marian Verhelst, and Georges Gielen. "A review on Internet of Things solutions for intelligent energy control in buildings for smart city applications." *Energy Procedia* 111 (2017): 770-779.
- [4] Tan, Yee Shee, Yen Ting Ng, and Jonathan Sze Choong Low. "Internet-of-things enabled real-time monitoring of energy efficiency on manufacturing shop floors." *Procedia CIRP* 61 (2017): 376-381.
- [5] Revath B, Tanmayee R, Prashanth C Veeru, Nuthan B S, Vishwas K Singh, Gowtham B. "A Review on Electric Vehicle Charging Systems," 2022.
- [6] K.S. Phadtare, S.S. Wadkar, S.S. Thorat, A.S. Ghorpade. "A Review on IoT based Electric Vehicle Charging and Parking System," 2020.
- [7] Rutuja Chavan. "IoT-Based Electric Vehicle Charging Station," 2022.
- [8] 2011 IEEE Intelligent Vehicles Symposium (IV) Baden-Baden, Germany, June 5-9, 2011 978-1-4577-0891-6/11/\$26.00 ©2011 IEEE 758 João C. Ferreira, V. Monteiro, João L. Afonso, "Smart Electric Vehicle Charging System", IEEE Intelligent Vehicles Symposium (IV), Baden-Baden Germany, pp. 758-763, 5-9 June, 2011.