A SMART AIS BASED PORTABLE WIRELESS ELECTRIC CHARGING VEHICLES

K. Sridharan *, M. Aakash *, D. Karthik *, M. H. Mohideen Nakem *, R. Vignesh *

* Department of Information Technology,
Panimalar Engineering College, Chennai, Tamilnadu, India

Abstract
The use of automobiles has grown dramatically, and so has the demand for petrol and diesel. As a result, electric cars are being introduced in our country. To charge electric vehicles (EVs) in public areas, only vehicles parked in designated spaces have the capacity to charge, while others do not; it is also not cost effective to offer separate charging sites at each parking slot. Hence, this research work has designed an autonomous robot-like mobile charger, which is portable and can charge electric vehicles (EVs) at different parking spaces. Vehicle charging can be done wirelessly in order to reduce the requirement of cables. In order to ensure the comfortability and autonomous charging of the battery, the inductive charging system has been developed. Due to the advantages of the non-contact method, manufacturers are working hard to commercialize this method.

Keywords - Electric vehicle, wireless charging, parking slot, less pollution, Automated Identification System-AIS

I. INTRODUCTION

Compared with traditional high-performance vehicles, the limited variety of electric vehicles is the another disadvantage, that is, the charging process is cumbersome and time-consuming. To understand that a high-power DC load is being connected, the wire diameter must be increased. And it's bulky, so people may not be able to load the car. In order to overcome the shortcomings of the existing system, the proposed system discloses an automatic charger for mobile electric vehicles, which solves these problems.

In the existing system, charging module is installed under slots of vehicle parking in public places. The drawback of this system is that Electric vehicles must be parked at designated locations and installed at charging stations before they can be charged. This brings up several problems. First of all, electric vehicles must leave the designated parking space immediately after charging before they can use the charging point. Second, with the popularity of electric vehicles, it may be necessary to install charging stations in all parking lots.

To overcome the drawbacks in the existing system, the proposed system reveals an automated mobile charger for EVs. When an EV which is parked in a slot of a public parking, requests for charging, the signal is sent from the slot to mobile charger through Wireless Sensor Network (WSN). After receiving the signal by the charger via WSN, it moves to the slot from which the signal is sent. Before initiating the charging process, it is necessary to check whether the vehicle is parking at proper position. For that, an IR sensor is used to detect the position of vehicle. If the EV is not parked properly, information will be displayed in LCD. When the vehicle is parked properly, the charger begins to charge EV’s battery. At the same time, EV checks the capacity of battery using voltage sensor. If the capacity of battery is increased by 100%, EV sends a signal to charger through RF transmitter to halt the charging process.

II. RELATED WORK

In their previous work, they combined the task of allocating berths with the programming of electric vehicle charging stations, creating a new problem, the task of allocating locations (PAP) [3]. To solve this problem, we use a meta-heuristic algorithm called Simulated Annealing (SA) and display the results in the programming table. Our findings are aimed at reducing loading time. In addition, the length of the trolley and the length of the charging station are also considered in order to allocate a sufficient number. To this end, we have selected a variety of electric vehicles, and considered their battery life and charging time and other characteristics. We developed an optimized charging plan, and the results showed that the charging...
time of 3, 5, and 10 electricians was significantly reduced. [13].

If the charging control of electric vehicles (EV) is improper, the increasing popularity of vehicle electrification will have a negative impact on the electrical system, especially in the distribution network [19]. Electric vehicles were proposed and tested using simulation [4]. Fuzzy logic controllers are used to monitor and control the charging process of electric vehicles to maximize the benefits of electric companies and electric vehicle owners [14]. The power distribution network shifts the charging of electric vehicles to off-peak hours, and the advantage of electric vehicle owners is that the charging cost of electric vehicles is lower [5]. The controller adjusts and monitors the charging power of the electric vehicle based on the electricity price signal from the energy supplier and the charging status of the electric vehicle battery (So C). The controller requires basic communication with the utility company to receive electricity price signals every 1 hour. [1][6]. MATLAB/SIMULINK is used to run simulations and test the effectiveness of the proposed smart charging method. The results show that, compared with uncontrolled charging, the proposed smart charging method reduces the impact of charging electric vehicles in the power distribution network. [2][9].

Analysed the electric vehicle road activity model considers the temporal and spatial distribution characteristics of electric vehicles on the basis of real data, making it possible to obtain a distribution model of key factors affecting charging of electric vehicles. The charging capacity map of electric vehicles during working days and non-working days, and then the charging capacity of large electric vehicles can be quickly calculated and its potential to respond to demand can be analysed [7][18]. The algorithm can quickly and easily calculate the charging power of electric vehicles according to the temporal and spatial distribution of electric vehicles [14][17].

III. PROPOSED SYSTEM

The proposed system reveals an automated mobile charger for EVs. When an EV which is parked in a slot of a public parking, requests for charging, the signal is sent from the slot to mobile charger through Wireless Sensor Network (WSN). After receiving the signal by the charger via WSN, it moves to the slot from which the signal is sent. Before initiating the charging process, it is necessary to check whether the vehicle is parked at proper position. For that, an IR sensor is used to detect the position of vehicle. If the EV is not parked properly, intimation will be displayed in LCD. When the vehicle is parked properly, the charger begins to charge EV’s battery. At the same time, EV checks the capacity of battery using voltage sensor.
The wireless network used to conduct the charging process from the parking section to the electric vehicle section.

In the proposed method of charging reveals an automated mobile charger for EVs. When an Electric vehicle which is parked in a slot of public parking, requests for charging, the signal is sent from the slot to mobile charger through Wireless Sensor Network (WSN). After receiving the signal by the charger via WSN, it moves to the slot from which the signal is sent. Before initiating the charging process, it is necessary to check whether the vehicle is parking at proper position. For this purpose, the IR sensor is used to detect the position of vehicle. If the EV is not parked properly, intimation will be displayed in LCD. When the vehicle is parked properly, the charger begins to charge EV’s battery. At the same time, EV checks the capacity of battery using voltage sensor. If the capacity of battery is increased by 100%, EV sends a signal to charger through RF transmitter to halt the charging process.

**A. Transport Network**

1. **Voltage regulator:** Power offer voltage will be step down by a potential electrical device (0-220V) - (0-5V) level. Then the secondary of the potential electrical device that's created with the assistance of operational amplifier are connected to the exactitude rectifier in Fig. 7. A blessings of mistreatment the exactitude rectifier are that the output it'll offer are High voltage output is direct current, all other circuits can provide root mean square value.

2. **Diode Bridge:** A circuit with four diode are connected is called as Diode Bridge. The crosswise contrary corners of the network by which a input is applied to the circuit, and the output is taken from the remaining two corners.

   There is a forward potential at point B and a backward potential at point A. The forward potential at the point where the electrical equipment works normally can bias A D4 forward and D3 backward.

   The subsidiary potential at purpose B can reverse D2 and forward bias D1. At this point current flow can meet up with D3 and D1 that are forward biased and; D4 and D2 are prejudice and can current flow is stopped.
A way for electrons flow are through purpose B by D1, Go up by RL, by D3, through the secondary side to the electrical equipment, and then vice versa to destination B. This route is indicated by a solid Waveforms (2) and (1) are detected by D2 and D1.

The first half of the cycle is followed by polarization through the secondary winding of the electrical inverter device, where D2 and D4 are directly polarized and D1 and D3 are reversed. In fact, the electron flow from target A to D4 can pass through the secondary windings of RL, D2, T1 and return to point A. This path is indicated by the broken arrows. Waveforms (3) and (4) will be discovered across D2 and D4. The present flow through RL is often within the same direction. In the air flow through the RL, the voltage generated by this electric field corresponds to the vibration voltage shown (5). Since every half of the voltage is applied, current will flow through the load (RL), so the bridge rectifier can be a full-wave rectifier.

The main advantage of the bridge rectifier over the traditional full-wave rectifier is that the output voltage of the bridge rectifier with this transformer is almost twice that of the traditional full-wave circuit.

### Addressing Modes:

**Direct Addressing:** In this method, we access the register by looking up the data in the memory directly from the opcode and using the RP1 and RP0 bits of the STATUS register to select the memory bank.

**Indirect Addressing:** To implement indirect addressing, a File Select Register (FSR) and indirect register (INDR) are used. In addition, when using this method we choose bank using bit IRP of the STATUS register. Indirect addressing treated like a stack pointer, allowing much more efficient work with a number of variables.

![Fig. 8 Pin diagram for LCD Module](image)

**B. Infrared Radiation Sensor:**

Infrared equipment (IR equipment) is a device used to measure and detect infrared radiation in the environment. In addition, the IR device calculates the movement error of the object and the related heat. Generally all objects in the infrared spectrum emit some kind of thermal radiation. We cannot see with the naked eye, but the infrared sensor can detect it.

The electrode is just a rectifier with an infrared barrier (light emitting diode), the sensor is a coupled infrared photodiode, sensitive to infrared light of the same wavelength, such as infrared LEDs, infrared detectors are very small microchips, and the detector configuration is the focus. It is infrared light. And these output voltages are proportional to the amount of infrared light received.

![Fig. 9 Pin diagram IR sensor](image)

**Voltage Sensor:** This DC sensor are mainly used to measure the potential difference between the electrical component of two ends. This can be used to measure the DC voltage in the circuits. Sensors is devices that can sense or identify and react to certain types of electrical or optical signals. By fixing the Secondary circuit pins to PCB. A sensor integrates all the primary connections. Ripple voltage, electrical isolation between the primary side and the secondary side. A voltage detector indicates that there is a voltage exceeding the limit value. The voltage sensor is equipped with a microcontroller, which can significantly improve the accuracy, precision and consistency of the sensor value. After connecting the voltage sensors, they will be calibrated and the saved calibration (in volts) will be auto loaded.

The DC voltage sensor will be able to detect and even monitor and measure the power supply voltage. You can then take these measurements and convert them into readable signals. Dedicated electronic recorder, but sometimes observers read the sensor output manually. If multiple voltage sensors are used on a circuit, make sure they have a common ground to ensure accuracy. Its working principle is magnetic modulation, which is used to measure DC voltage. The output of the sensor is proportional to the DC input voltage. This allows continuous monitoring of the DC voltage of the system. It has the following features are

- Under-voltage, over-voltage, or voltage band models
• Powered from sensing input lines or from separate DC supply
• Available with time delays on pull-in and/or drop-out or with customized voltage-time trip curves

Fig. 10 Voltage sensor

It has the following merits,
• No need to insert cable for wireless charging
• More user-friendly approach
• More economical
• Size of battery pack can be reduced by increase in charging points
• Cost is low
• Reduced weight
• Manual assistance not required
• Low maintenance required

IV. HARDWARE AND RESULT ANALYSIS

Hardware Setup:
The proposed system of the hardware setup is given below in the Fig 11. The potable wireless charging system consists of two major part of which one is the electric vehicle section and the other is parking slot section. Once the vehicle is parked at the parking slot the location details are obtained as shown in figure. IR sensors are used to locate the parking location of the vehicle.

Fig. 11 Hardware setup of the proposed system

Result Analysis:
The request received for charging. From the Parking slot section, once the charging request is given then the request received in the electric vehicle section. Once the request received then the charging process will start as shown in the Fig 14. Once the charging is completed the voltage sensor sense the voltage and thus the vehicle gets charged by using wireless network.

Fig. 12 Charging Request Sent

Fig. 13 Request received for charging

Fig. 14 Vehicle charging in progress
V. CONCLUSION & FUTURE SCOPE

Conclusion:
Conductive automatic charging system is a new theme in the industry of the electric vehicle. As the charging power increases, the cable becomes more difficult to handle, so the load on the vehicle can be very high. Some pilot projects are already using automatic charging systems, but they are currently in operation. Prototype conditions. The proposed concept of an automatic charging robot for parking lots outlines possible solutions. Consider the importance of ensuring that every EV can be charged through the system.

Future Scope:
In future the electric vehicles are the emerging industry. This type of system is required for the future. It is the new solution for the future vehicles. By increasing this idea more usage of the electric vehicles can rise which leads to the better environment friendly in the near future.

REFERENCES
[1] V. Raveendran, N. K. Krishnan and M. G. Nair, “Smart Park as a shunt active filtering system in metro railways,” 2016 International Conference on Energy Efficient Technologies for Sustainability (ICEETS), Nagercoil, 2016, pp. 613-618.
[2] Electric Vehicle Charging Stations at Airport Parking Facilities, Airport Co-operative Research Program, Synthesis 54, Transportation Research Board, Washington D.C.
[3] V. Raveendran and M. G. Nair, “Vehicle-to-grid transactions and shunt active filtering capability of SmartParks equipped with modified Icos controller,” 2014 IEEE Students’ Conference on Electrical, Electronics and Computer Science (SCEECS), Bhopal, 2014, pp. 1-7.
[4] Hussain Shareef, Md. Mainul Islam, Azah Mohamed, A review of the state-of-the-art charging technologies, placement methodologies, and impacts of electric vehicles, In Renewable and Sustainable Energy Reviews, Volume 64, 2016, Pages 403-420.
[5] Bass, Robert and Zimmerman, Nicole, "Impacts of Electric Vehicle Charging on Electric Power Distribution Systems" (2013). Electrical and Computer Engineering Faculty Publications and Presentations. Paper 166.
[6] Gomez I.e. Morcos M.M. Impact of EV Battery Charger son the Power Quality of Distribution Systems, IEEE Transactions on Power Delivery, vol. 18 no. 3 p. 975-981, Jul 2003
[7] A. Lucas et. al. Grid harmonic impact of multiple electric vehicle fast charging, ELECTRIC POWER SYSTEMS RESEARCH vol. 127 p. 13-21, 2015
[8] Balda J. et al. Effects of harmonics on equipment. IEEE Transactions on Power Delivery, Vol 8, No 2, April 1993, p.672-680
[9] K. S. Ng, C.-S. Moo, Y.-P. Chen, and Y.-C. Hsieh, “Enhanced coulomb counting method for estimating state-of-charge and state-of-health of lithium-ion batteries,” Appl. Energy, vol. 86, no. 9, pp. 1506–1511, Sep. 2009.
[10] T. Weigart, Q. Tian, and K. Lin, “State-of-charge prediction of batteries and battery–supercapacitor hybrids using artificial neural networks,” J. Power Sources, vol. 196, no. 8, pp. 4061–4066, Apr. 2011.
[11] S. Chen, L. Tong, and T. Ho, “Optimal deadline scheduling with commitment,” in Proc. Annu. Allerton Conf. Commun., Control, Comput., pp. 111–118, 2011.
[12] M. M. Golea, M. Boile, S. Theofanis. A luma-optimal based heuristic for the berth scheduling problem. Transportation Research Part C, 18(5), pp. 794-806, 2010.
[13] Intermational Energy Agency, “Global EV Outlook 2017: Two million and counting,”IEA Publ., p. 66, 2017.
[14] Y. Chen, A. Oudalov, and J. S. Wang, “Integration of electric vehicle charging system into distribution network,” in 8th International Conference on Power Electronics - ECCE Asia, 2011, pp. 593–598.
[15] S. Shao, T. Zhang, M. Pippasas Kompor, and S. Rahman, “Impact of TOU rates on distribution load shapes in a smart grid with PHEV penetration,” 2010 IEEE PES Transm. Distrib. Conf. Expo. Smart Solut. a Chang. World, pp. 1–6, 2010.
[16] Visal Raveendran et.al-”Vehicle-to-Grid Support by Electric Vehicle Charging Stations operated at Airports and Metro Rail Stations” published in IEEE 2018
[17] Antti Supponen et.al-“Power quality in distribution networks with electric vehicle charging - a research methodology based on field tests and real data” proposed in IEEE 2018
[18] Nanjing, Jiangsu “Calculation of electric vehicle charging power based on spatial -temporal activity model” published in IEEE 2019 June 12
[19] Ahad Jawandust Qurebouh et.al-“Optimized Scheduling for Solving Position Allocation Problem in Electric Vehicle Charging Stations” published in 2019 February 15.