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Management System of EV Charging Stations

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ABSTRACT: Recently, automakers like Tesla and Tata introduced and released new electric vehicles onto the market. Several of the stations are also equipped to charge these vehicles. However, given the state of affairs, it takes these cars anywhere from fifteen to thirty minutes to fully charge. Other patrons may have to wait a considerable amount of time if the station is packed and every slot has been taken. Our goal is to create a system that will address these kinds of problems. We are working on a system that will link all of the charging stations for electric cars. Those who wish to drive long distances in their electric vehicles will find our method handy as it allows them to find the station of their choosing while saving time. It will be quite simple to use. Your reservation will be made for the specified time period if it is available. If not, the system will prompt you to enter your new timetable. To confirm their reservation, users of this method must pay a portion of the whole fee online. Additionally, our system will show the shortest map route to the specified station. Additionally, charging stations will be able to examine all available slots, booked slot lists, and manage slot timing through an interface that our system will give. Our plan is to create this solution specifically for Android-powered gadgets. We will use Google Maps API for direction sensing and time-slot allocation approaches to construct this system. Voice instructions will be used by our chatbot system to control software. A user can swiftly make payments with the aid of an online payment gateway. People can see and book the right station with ease and save a ton of time by using the system.

KEYWORDS: Smart management, charging slot, EV Cars, Map.

I. INTRODUCTION

In recent years, global warming and the depletion of fossil fuels due to mass consumption of energy resource has become an increasingly recognized world problem. To control these problems, the installation of renewable energy systems, which do not depend on fossil fuels, is an effective countermeasure. In Japan, since the government has introduced Feed-in tariffs (Fit), the introduction of photovoltaic systems has been expanded rapidly. However, the output power from increased number of photovoltaic systems is extremely large and tends to have a bad effect on the system frequency and distribution voltage. To address this problem, the Japanese government has begun reconsidering the Fit system. Adding to this problem, the cost of PV installation is decreasing year by year. Therefore, in the future, the price of PV power is expected to decrease greatly. In this study, EV charging stations that near-exclusively purchases power from PV systems on smart houses and sells power to electric vehicles (EV) and smart houses is proposed as an aggregator. The EV charging station has the need to utilize a fixed battery for electricity trading.

II. RELATED WORK

This paper [1] proposes the use of a coreless axial flux permanent magnet machine, which has the attributes of low stator mass, negligible core loss and virtually zero cogging torque, as the propulsion motor. A three-phase inverter with its dc bus fed from a three-port DC/DC converter, which accepts inputs from a solar panel and battery powers the propulsion motor. Gallium nitride (GaN) devices are used in the threeport converter, allowing very high switching frequencies thereby reducing the size of the transformer which provides galvanic isolation between the two sources and output. The three-port converter ensures operation of the solar panel at its maximum power point and also allows bi-directional power flow between the propulsion motor and battery depending on operating conditions. Operation over a wide range of speeds, which is required by the solar race car application, is achieved by the new approach of current weakening. This method involves raising the dc bus voltage of the motor side inverter at speeds exceeding the rated.

As small-sized[2] superconducting magnetic energy storage (SMES) system is commercially available at present, the function and effect of a small-sized SMES in an EV charging station including photovoltaic (PV) generation system is studied in this paper, which provides a practical application of small-sized SMES. The comparison of three quick response energy storage systems including flywheel, capacitor (super-capacitor) and SMES is also presented to clarify

the features of SMES. SMES, PV generation system, and EV battery are connected to a common dc bus with corresponding converters respectively. Voltage source converter (VSC) is used for grid-connection. With characteristic of quick power response, SMES is utilized to maintain the dc bus steady. During the long-term operation of EV charging station, an energy management strategy is designed to control the energy transfer among PV units, SMES, EV battery, and power grid. The EV charging station system is modeled in MATLAB/SIMULINK and simulation tests are carried out to verify the function and performance of SMES.

Having a network [3] of fast charging stations seems necessary in order to make EVs more attractive and to achieve larger uptake of them. Currently, 50 kW quick chargers that can charge a typical EV in about an hour are commercially available. However, a 240 kW fast charging level which can charge a typical EV in 10 minutes has been introduced in standards. It is expected that this high power fast chargers will be available in near future. A charging station must supply charging power in multi-megawatt levels when multiple EVs are being fast charged simultaneously. Here, charging station topology plays a crucial role in enabling future growth and providing fast charging with best quality of service, lowest cost and minimum grid impact. This paper presents a topological survey of charging stations available in the literature. Various charging station topologies are presented, compared and evaluated based on grid support, power density, modularity and other factors.

Electric vehicles (EVs)[4] are being introduced by different manufacturers as an environment-friendly alternative to vehicles with internal combustion engines, with several benefits. The number of EVs is expected to grow rapidly in the coming years. However, uncoordinated charging of these vehicles can put a severe stress on the power grid. The problem of charge scheduling of EVs is an important and challenging problem and has seen significant research activity in the last few years. This review covers the recent works done in the area of scheduling algorithms for charging EVs in smart grid. The works are first classified into two broad classes of unidirectional versus bidirectional charging, and then, each class is further classified based on whether the scheduling is centralized or distributed and whether any mobility aspects are considered or not. It then reviews the key results in this field following the classification proposed. Some interesting research challenges that can be addressed are also identified.

In order to interface one PV port[5], one bidirectional battery port and one load port of PV-Battery DC power system, a novel non-isolated three-port DC/DC converter named Boost Bidirectional Buck Converter (B3C) and its control method based on three domain control are proposed in this paper. The power flow and operating principles of the proposed B3C are analyzed in detail, and then the DC voltage relation between three ports is deduced. The proposed converter features high integration and single-stage power conversion from both photovoltaic (PV) and battery ports to the load port, thus leading to high efficiency. The current of all the three port is continuous, so the electromagnetic noise can be reduced. Furthermore, the control and modulation method for B3C has been proposed for realizing Maximum Power Point Tracking (MPPT), battery management and bus voltage regulation simultaneously. The operation can be transitioned between conductance mode and MPPT mode automatically according to the load power. Finally, experimental verifications are given to illustrate the feasibility and effectiveness of the proposed topology and control method.

III.OPEN ISSUES

A lot of work has been done in this field thanks to its extensive use and applications. This section mentions some of the approaches that have been implemented to achieve the same purpose. These works are mainly differentiated from the techniques for smart management of EV charging stations systems.

IV. PROPOSED SYSTEM

We propose a Smart EV Charging station System where we used slot booking system to book EV vehicle charging station to charge vehicles. We further categories this slots according to charging socket type. We have also used AI voice assistant to communicate user with system via vocal commands. We also used GMAPS API to show shortest route to reach at destination. The system uses NLP for AI voice assistance as well as MySQL databases for storing a system logs as well as slot management.

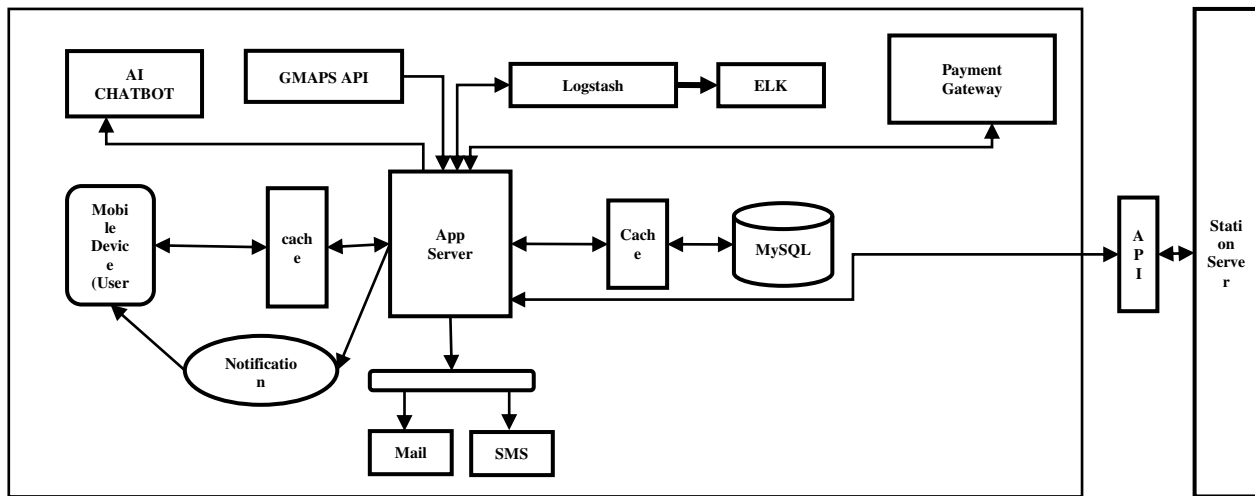


Fig 1 Booking System Architecture

V. CONCLUSION

Through this study project, we have gained knowledge on efficient reservation handling and charging station scheduling. The creation of Virtual Personal Assistants (VPAs) was taught to us. By adapting the combination node method to the dynamic location utilized in general, such as mobile phones for online transportation, this research has given rise to the concept of shortest route search system. In addition to that, we learned how to integrate payment gateways into systems.

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