

RECHARGEABLE VEHICLE ACCUSING TECHNIQUE FOR CLEVER HOME ERECTION WITH A PHOTOVOLTAIC SYSTEM

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Abstract - Due to the increased penetration of electric vehicles (EVs) and photovoltaic (PV) systems, additional applications for homes/building energy management system (EMS) is need to determined when and how much to charging an electric vehicle in an individual home/building. These papers present a smart E V charging method for smart homes/buildings with a PV system. The paper consists of two parts: EV charging schedule algorithms for smart homes/buildings and implementation of prototype applications for home/building E M S. The propose EV charging algorithm is designed to determined the optimal schedules of EV charging based on predicted PV output and electricity consumption.

The implement proto type applications for home/building EMS can provide EV charging schedules according to user preferences. Numerical results are provided to demonstrate the effectiveness of the proposed smart EV charging method.

Index terms - Home Energy Management System, Building Energy Management System, Smart Electric Vehicle Charging, Photovoltaic System

I. INTRODUCTION

Increases in fuel prices and environmental concerns have led to alterations in the configuration of power systems. One of the Significant changes is the increasing use of new energy resources such as renewable energy resources, electric vehicles (EVs), and high-capacity, high-power batteries in a power grid[1-4]. Many experts have noted that these new energy resources can overcome fuel price and environment problems. If EVs can be deployed at low cost, they can be used to improve the energy Efficiency and renewable energy penetration. This perspective is from the power system operation and control[5-9]. However, there is a lack of research on the operation of individual electric vehicle such as efficient determination of when and how much to charge an electric vehicle in an individual home/building. There are only a handful of papers on individual EV charging. Most of these studies focus on the EV charging scheduling problem without considering other electricity consumption and generation resources such as photovoltaic (PV) systems[10-15]. In a smart home/building environment, however, EV charging is likely to not to be independently controlled, but to be controlled by the central energy management systems of individual homes/buildings for enhancing energy efficiency. In this case, EV charging is determined in accordance with any other electricity consumption requirements, generation resources, and real-time prices from a smart meter[16-19]. Thus,

smart EV charging requires an integrated operating management system.

Considering all energy resources in individual homes/buildings. This paper presents a cost-effective method for improving EVs charging efficiency in a smart home/building environment[20-26]. Smart EV charging is one of critical technologies used for home energy management systems (HEMS) as well as in building energy management systems (BEMS). In this paper, a smart electric vehicle charging algorithm has been developed and implemented for smart homes/buildings with a PV system. The proposed Algorithm can be divided into two stages: prediction and scheduling. In the prediction stage, the PV output and electricity consumption are forecasted using a time series model with weather sensitivity. In the scheduling stage, the EV charging schedule is determined based on the result of the first stage as well as EV and electricity price information[27-31]. The EV charging scheduling is optimized subject to various constraints such as vehicle charge level and battery capacity, charging rate, and user preference[32-36].

II. BLOCK DIAGRAM

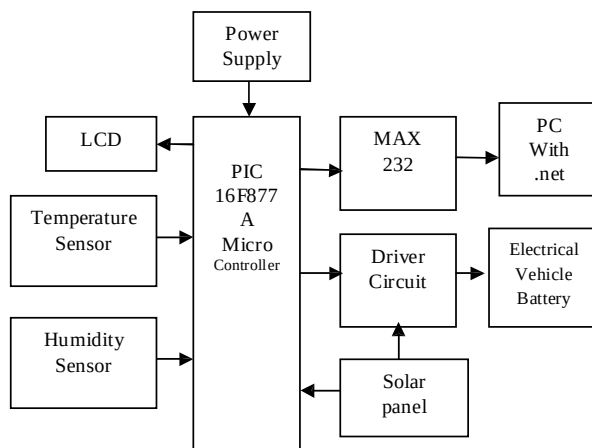


Fig.1.Block Diagram

III.BLOCK DIAGRAM DESCRIPTION

Power Supply Unit

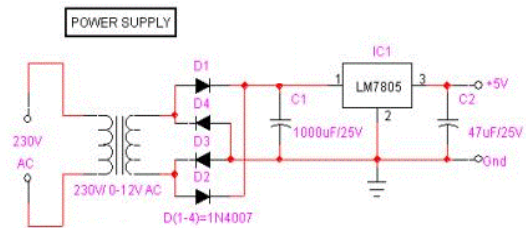


Fig.2 Power Supply Circuit

The power supply section is the important one. It should deliver constant output regulate power supply for successful work of the project. A 0-12V transformer is used for this purpose. The primary of this transformer is connected in to main supply through on-off switch & fuse for protecting from overload and short circuit protection[37-41]. The secondary is connected to the diodes to convert 12V AC to 12V DC voltage. And filtered by the capacitors, which is further regulated to +5v, by using IC 7805.

PIC16F877A Microcontroller

The PIC16F877A CMOS FLASH based 8-bit microcontroller are upward compatible with the PIC16C57, PIC12C678 and PIC16C70 devices. It features 200 ns instruction execution, 256 bytes of EEPROM data memory, self programming, an ICD, 2 Comparators, 8 channels of 8-bit Analog to Digital (A/D) converter[42-45], 2 capture compare PWM functions, a synchronous serial port that can be configured as either 3-wire SPI or 2 wire I2 C bus, a U SART, and a Parallel Slave Port.

Humidity sensor

Humidity are the presences of water in air. The amount of water vapour in air can affect human comfort as well as many manufacture process in industrial. The presence of water vapour also influences various physical, chemical, and biological processes. Humidity measurement in industry is critical because it may affect the business cost of the product and the health and safety of the personnel.

Driver circuit

The ULN2003 is a monolithic high voltages and high currents Darlington transistors arrays. It consists of seven NPN darlington pairs that features high voltage output with common cathode clamp diode for switching inductive load. The collector current rating of a single Darlington pair is 400mA. The darlington pair may be paralleled for higher current capability. Application include relay driver, hammer driver, lamp driver, display driver (LED gas discharge), line drivers, and logic buffers.

Temperature sensor

Temperature is the most measure process variable in industrial automation. Temperature sensors are used to convert temperature value to an electrical value. Temperature Sensors is the key to read temperatures correctly and to control temperature in industrial application. A large distinction can be made between temperature sensor types. Sensor differs a lot in properties such as contact way, temperature range, calibrating method and sensing element. The temperature sensor contain a sensing element enclose in housing of plastic or metal. With the help of conditioning circuits the sensor will reflect the change of environmental temperature.

In the temperature functional module we developed we use LM34 series of temperature sensors. The LM34 series are precision integrated circuit temperature sensors, whose output voltage

is linearly proportional to the Fahrenheit temperature.

The LM34 thus has an advantage over linear temperature sensor calibrate in degrees Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Fahrenheit scaling. The LM34 does not require any external calibration or trimming to provide typical accuracies of 1.2°F at room temperature and 11.2°F over a full -50 to +300°F temperature range. The LM34 is rated to operate over a -50° to +300°F temperature ranges.

LCD CIRCUIT

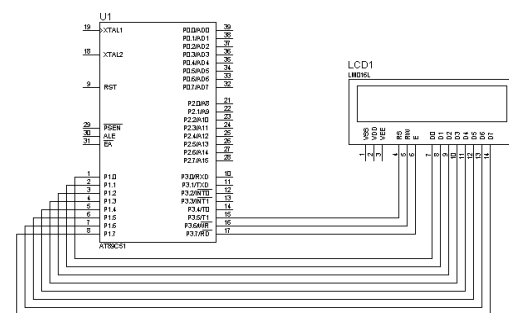


Fig.3 LCD Circuit

IV. SMART ELECTRIC VEHICLE CHARGING ALGORETHM FOR SMART HOMES BUILDINGS WITH P V SYSTEM

In this section, the proposed smart EV charging algorithm is discussed. The block diagram of the two-stage smart EV charging algorithm is shown in Fig. 2, and a more detailed explanation is provided in the following subsections. A. Prediction Model with Weather Adjustment for PV Output and Electricity Consumption Predictions of PV output and electricity consumption are required for reducing electricity costs of smart homes/buildings with a

PV system. The proposed algorithm is designed to use a time series model with weather adjustment for the predicting PV output and electricity consumption. The prediction procedure is as follows:

Step1. Data Selection: Historical data collected from the most recent qualifying days are selected. Unlike PV output, the electricity consumption typically varies by the day-type (i.e., weekend or weekday). For increasing the accuracy of the Electricity demand forecast, historical electricity consumption data should be selected from relevant past data based on the day type of a predicted day.

Step2. Prediction: Using the data selected in Step 1, the PV output and electricity consumption are estimated using the time line of the proposed prediction algorithm is illustrated in Fig. 3, where the total period is divided into two sub-periods: pre-scheduled period and scheduled period.

V. IMPLEMENTATION OF SMART ELECTRIC VEHICLE CHARGING METHOD FOR SMART HOMES/BUILDINGS WITH PV SYSTEM

This section describes an implemented prototype EMS application for smart EV charging in smart homes/buildings with a PV system. The flowchart of the proposed smart electric vehicle charging algorithm is shown in Fig. 4. The proposed HEMS or BEMS application in this research is composed of five components: input data module, data gathering module, prediction module, optimization module, and reporting module.

Input data module: This module is designed to obtain user-defined data such as electric vehicle information (initial SOC, target SOC and departure time), scheduled time duration, and day-type of scheduling day. All input data can be imported from files in a spreadsheet file. Data gathering module: This module involves selecting

The electricity tariff, historical electricity consumption and PV output data that satisfy user-defined criteria. Prediction module: This module is designed to forecast the hourly electricity consumption and PV output over the scheduled duration using the exponential smoothing model With the weather adjustment. Optimization module involves formulating an optimization problem for smart EV charging using MILP and determining smart EV charging schedule.

Report module: In this module, all output data can be exported to a spreadsheet file. The module configuration of the implemented

Prototype EMS application for smart EV charging in smart homes/buildings with a PV system. Each module and its function are described.

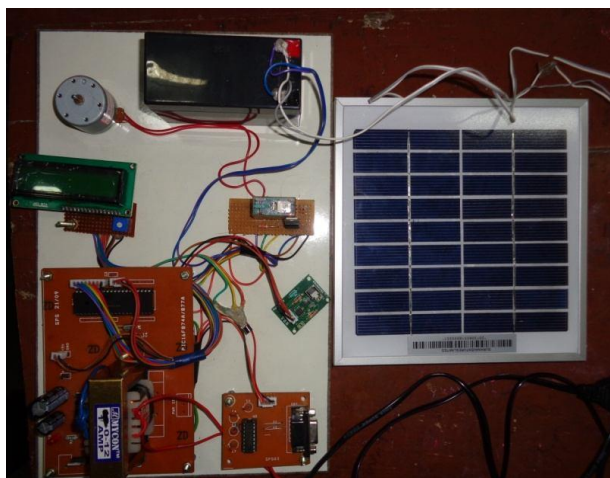
The prototype EMS application based on the proposed method for scheduling EV charging in smart homes/buildings with a PV system was implemented. Shows user interface screenshots of the implemented prototype EMS application. Shows the initial screen of the implemented application. User-defined data in spreadsheet format can be read.

VI. NUMERICAL RESULTS

In this section, the numerical results are presented. For smart EV charging scheduling, a commercial building with a 50-kW PV panel system was considered in this study. For generating 50-kW PV data, data from the 3-kW PV panels installed in a school were used and converted. Fig.6 shows the PV systems installed on the roof of the school building. In addition, for determining the electricity consumption of a Commercial building, commercial building data were obtained from a utility company in Korea. In this case study, 12 electric cars were used. The EVs were divided into three groups depending on their initial SOC.

VII. CONCLUSION AND FUTURE WORK

The EMS applications are required to determined optimal EV charging scheduling for smart homes buildings with a PV system. In this paper a cost effective E V charging method is propose and implement for smart homes/buildings with a P V system. The propose smart EV charging algorithm for smart homes buildings consists of two stages prediction of PV output and electricity consumption, and EV charging scheduling. Numerical result is present to demonstrate the effectiveness of the propose method. Further work is required for considering the effects of PV Output and electricity consumption forecast errors, and vehicle to grid on the performance of the propose method.



REFERENCES

1. Nimal, R.J.G.R., Hussain, J.H., Effect of deep cryogenic treatment on EN24 steel, International Journal of Pure and Applied Mathematics, V-116, I-17 Special Issue, PP-113-116, 2017
2. Parameswari, D., Khanaa, V., Deploying lampont clocks and linked lists, International Journal of Pharmacy and Technology, V-8, I-3, PP-17039-17044, 2016
3. Parameswari, D., Khanaa, V., Case for massive multiplayer online role-playing games, International Journal of Pharmacy and Technology, V-8, I-3, PP-17404-17409, 2016
4. Parameswari, D., Khanaa, V., Deconstructing model checking with hueddot, International Journal of Pharmacy and Technology, V-8, I-3, PP-17370-17375, 2016
5. Parameswari, D., Khanaa, V., The effect of self-learning epistemologies on theory, International Journal of Pharmacy and Technology, V-8, I-3, PP-17314-17320, 2016
6. Pavithra, J., Peter, M., GowthamAashirwad, K., A study on business process in IT and systems through extranet, International Journal of Pure and Applied Mathematics, V-116, I-19 Special Issue, PP-571-576, 2017
7. Pavithra, J., Ramamoorthy, R., Satyapira Das, S., A report on evaluating the effectiveness of working capital management in googolsoft technologies, Chennai, International Journal of Pure and Applied Mathematics, V-116, I-14 Special Issue, PP-129-132, 2017
8. Pavithra, J., Thooyamani, K.P., A cram on consumer behaviour on Mahindra two wheelers in Chennai, International Journal of Pure and Applied Mathematics, V-116, I-18 Special Issue, PP-55-57, 2017
9. Pavithra, J., Thooyamani, K.P., Dkhar, K., A study on the air freight customer satisfaction, International Journal of Pure and Applied Mathematics, V-116, I-14 Special Issue, PP-179-184, 2017
10. Pavithra, J., Thooyamani, K.P., Dkhar, K., A study on the working capital management of TVS credit services limited, International Journal of Pure and Applied Mathematics, V-116, I-14 Special Issue, PP-185-187, 2017
11. Pavithra, J., Thooyamani, K.P., Dkhar, K., A study on the analysis of financial performance with reference to Jeppiaar Cements Pvt Ltd, International Journal of Pure and Applied Mathematics, V-116, I-14 Special Issue, PP-189-194, 2017
12. Peter, M., Dayakar, P., Gupta, C., A study on employee motivation at Banalari World Cars Pvt Ltd Shillong, International Journal of Pure

- and Applied Mathematics, V-116, I-18 Special Issue, PP-291-294, 2017
13. Peter, M., Kausalya, R., A study on capital budgeting with reference to signware technologies, International Journal of Pure and Applied Mathematics, V-116, I-18 Special Issue, PP-71-74, 2017
 14. Peter, M., Kausalya, R., Akash, R., A study on career development with reference to premheerasurgicals, International Journal of Pure and Applied Mathematics, V-116, I-14 Special Issue, PP-415-420, 2017
 15. Peter, M., Kausalya, R., Mohanta, S., A study on awareness about the cost reduction and elimination of waste among employees in life line multispeciality hospital, International Journal of Pure and Applied Mathematics, V-116, I-14 Special Issue, PP-287-293, 2017
 16. Peter, M., Srinivasan, V., Vignesh, A., A study on working capital management at deccan Finance Pvt Limited Chennai, International Journal of Pure and Applied Mathematics, V-116, I-14 Special Issue, PP-255-260, 2017
 17. Peter, M., Thooyamani, K.P., Srinivasan, V., A study on performance of the commodity market based on technical analysis, International Journal of Pure and Applied Mathematics, V-116, I-18 Special Issue, PP-99-103, 2017
 18. Philomina, S., Karthik, B., Wi-Fi energy meter implementation using embedded linux in ARM 9, Middle - East Journal of Scientific Research, V-20, I-12, PP-2434-2438, 2014
 19. Philomina, S., Subbulakshmi, K., Efficient wireless message transfer system, International Journal of Pure and Applied Mathematics, V-116, I-20 Special Issue, PP-289-293, 2017
 20. Philomina, S., Subbulakshmi, K., Ignition system for vehicles on the basis of GSM, International Journal of Pure and Applied Mathematics, V-116, I-20 Special Issue, PP-283-286, 2017
 21. Philomina, S., Subbulakshmi, K., Avoidance of fire accident by wireless sensor network, International Journal of Pure and Applied Mathematics, V-116, I-20 Special Issue, PP-295-299, 2017
 22. Pothumani, S., Anuradha, C., Monitoring android mobiles in an industry, International Journal of Pure and Applied Mathematics, V-116, I-20 Special Issue, PP-537-540, 2017
 23. Pothumani, S., Anuradha, C., Decoy method on various environments - A survey, International Journal of Pure and Applied Mathematics, V-116, I-10 Special Issue, PP-197-199, 2017
 24. Pothumani, S., Anuradha, C., Priya, N., Study on apple iCloud, International Journal of Pure and Applied Mathematics, V-116, I-8 Special Issue, PP-389-391, 2017
 25. Pothumani, S., Hameed Hussain, J., A novel economic framework for cloud and grid computing, International Journal of Pure and Applied Mathematics, V-116, I-13 Special Issue, PP-5-8, 2017
 26. Pothumani, S., Hameed Hussain, J., A novel method to manage network requirements, International Journal of Pure and Applied Mathematics, V-116, I-13 Special Issue, PP-9-15, 2017
 27. Pradeep, R., Vikram, C.J., Naveenchandra, P., Experimental evaluation and finite element analysis of composite leaf spring for automotive vehicle, Middle - East Journal of Scientific Research, V-12, I-12, PP-1750-1753, 2012
 28. Prakash, S., Jayalakshmi, V., Power quality improvement using matrix converter, International Journal of Pure and Applied Mathematics, V-116, I-19 Special Issue, PP-95-98, 2017
 29. Prakash, S., Jayalakshmi, V., Power quality analysis & power system study in high voltage systems, International Journal of Pure

- and Applied Mathematics, V-116, I-19 Special Issue, PP-47-52, 2017
30. Prakash, S., Sherine, S., Control of BLDC motor powered electric vehicle using indirect vector control and sliding mode observer, International Journal of Pure and Applied Mathematics, V-116, I-19 Special Issue, PP-295-299, 2017
 31. Prakesh, S., Sherine, S., Forecasting methodologies of solar resource and PV power for smart grid energy management, International Journal of Pure and Applied Mathematics, V-116, I-18 Special Issue, PP-313-317, 2017
 32. Prasanna, D., Arulselvi, S., Decoupling smalltalk from rpcs in access points, International Journal of Pure and Applied Mathematics, V-116, I-16 Special Issue, PP-1-4, 2017
 33. Prasanna, D., Arulselvi, S., Exploring gigabit switches and journaling file systems, International Journal of Pure and Applied Mathematics, V-116, I-16 Special Issue, PP-13-17, 2017
 34. Prasanna, D., Arulselvi, S., Collaborative configurations for wireless sensor networks systems, International Journal of Pure and Applied Mathematics, V-116, I-15 Special Issue, PP-577-581, 2017
 35. Priya, N., Anuradha, C., Kavitha, R., Li-Fi science transmission of knowledge by way of light, International Journal of Pure and Applied Mathematics, V-116, I-9 Special Issue, PP-285-290, 2017
 36. Priya, N., Pothumani, S., Kavitha, R., Merging of e-commerce and e-market-a novel approach, International Journal of Pure and Applied Mathematics, V-116, I-9 Special Issue, PP-313-316, 2017
 37. Raj, R.M., Karthik, B., Effective demining based on statistical modeling for detecting thermal infrared, International Journal of Pure and Applied Mathematics, V-116, I-20 Special Issue, PP-273-276, 2017
 38. Raj, R.M., Karthik, B., Energy sag mitigation for chopper, International Journal of Pure and Applied Mathematics, V-116, I-20 Special Issue, PP-267-270, 2017
 39. Raj, R.M., Karthik, B., Efficient survey in CDMA system on the basis of error revealing, International Journal of Pure and Applied Mathematics, V-116, I-20 Special Issue, PP-279-281, 2017
 40. Rajasulochana, P., Krishnamoorthy, P., Ramesh Babu, P., Datta, R., Innovative business modeling towards sustainable E-Health applications, International Journal of Pharmacy and Technology, V-4, I-4, PP-4898-4904, 2012
 41. Rama, A., Nalini, C., Shanthi, E., An iris based authentication system by eye localization, International Journal of Pharmacy and Technology, V-8, I-4, PP-23973-23980, 2016
 42. Rama, A., Nalini, C., Shanthi, E., Effective collaborative target tracking in wireless sensor networks, International Journal of Pharmacy and Technology, V-8, I-4, PP-23981-23986, 2016
 43. Ramamoorthy, R., Kanagasabai, V., Irshad Khan, S., Budget and budgetary control, International Journal of Pure and Applied Mathematics, V-116, I-20 Special Issue, PP-189-191, 2017
 44. Ramamoorthy, R., Kanagasabai, V., Jivandan, S., A study on training and development process at Vantec Logistics India Pvt Ltd, International Journal of Pure and Applied Mathematics, V-116, I-14 Special Issue, PP-201-207, 2017.
 45. Pradeep, R., Vikram, C.J., Naveenchandran, P., Experimental evaluation and finite element analysis of composite leaf spring for automotive vehicle, Middle - East Journal of Scientific Research, V-17, I-12, PP-1760-1763, 2013

