RFID SOLAR CHARGING STATION FOR E.V'S

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ABSTRACT

Design and development of RFID Smart Card based Accessing and Payment for Ev Charge station. the main trend of development in new energy vehicles field, electric vehicle is bound to have a great development all over the world. However, it must have convenient public charging facilities and services before the vehicles become popular. As the vehicles need a long time when they charge, and the charging stations are widespread and unattended operation, it requires the drivers accomplish the charging operation by self-service, and the charging system should automatically complete the identification of the users' identity, battery charging and fee management. In this project user authorized by smart card then enter the amount for charge. After payment done then he is allowed for charging mobile/EV for time according to the payment amount. In this project initially we have to swipe RFID card and need to enter password. If password is correct then it asks amount. After entering amount EV Charge will ON and according to amount. For wrong password buzzer will be ON. Amount will reduce from RFID card based on entered amount. For insufficient amount buzzer will be ON. All this information will be displayed on 16X2 LCD display. RFID reader (EM-18) Interfaced to Arduino through UART interfaces. AC pump operated by relay which is connected to Arduino digital pin. 4X4 matrix keypad connected to Arudino digital pins.

Keywords: solar charging, EV vehicles, RFID card, UART, 16X2 LCD display.

1. INTRODUCTION

With an increased number of Electric Vehicles (EVs) on the road's, charging infrastructure is gaining an ever-more important role in simultaneously meeting the needs of the local distribution grid and of EV users. This paper proposed system RFID system for user identification and charging authorization as part of a smart charging infrastructure providing charge monitoring and control. The RFID provides a cost-efficient solution to identify and authorize vehicles for charging and would allow EV charging to be conducted effectively while observing grid constraints and meeting the needs of EV drivers. The vehicle charging is based on voltage level. In this system we can monitor our charging level through the server at any where as the number of EVs on the road's increases, charging stations in both parking structures and private garages will become more prevalent. These stations will be responsible for meeting the requirements of the distribution grid, EV owners, and parking structure operators. For security and financial reasons, among the many functions these charging stations will perform are user authorization, authentication, and billing. Other commercial charging stations, such as Coulomb and Blink require a short-range RFID card for the same purpose.

In both cases, extra steps on the part of the user must be taken to authorize charging. The authors in propose using conventional RFID tags inside EVs and RFID readers on parking garage access gates

together with middleware and an aggregate charging controller to authorize, assign, and enable charging. However, this system still requires action from the user and is not as flexible as may be desired. The proposed improvements allow charging authorization to take place seamlessly at multiple charging stations in a single geographic location without any action on the part of the user. Vehicle Monitoring/Identification Modules (VMMs), located in EVs, act as RFID tags for vehicle identification and charging authorization.

The Internet of Things, also called thingslinked internet, it refers to a kind of network that adopts RFID (radio frequency identification) and to enable the linkage between any articles and the internet, to enable the exchange and communication of information. This paper aims to discuss the application of RFID technology in the battery charging stations, and analyse the technical advantages of RFID technology in the electric vehicle identification as well as the unified management of the battery charging compartment. Here for the output power supply SMPS (switching mode power supply) is used A smart Electric vehicle charging infrastructure is composed of electric vehicle, electric vehicle supply equipment (EVSE), connectors connecting vehicle to EVSE and secure network connecting EVSE to the IoT cloud service to transmit data using secured wireless technology. The IoT cloud service offers applications that receive, analyse and manage data in real-time to assist EV users in making real time decision that would enhance the quality of EV charging. Here while tapping the RFID tag into the RFID reader then the signal is given to the Arduino controller board. Next step the user can select the output port because of in this smart charging system has the three level of output ranges like 60V output, 48V output and 12V output ranges.

The Smart EV charging station is an innovative product developed for the growth of both two-wheeler and fourwheeler. The benefits of using this given below. In this new era of growing automobile industry, technology has been increasing day to day. As a part of development present entire automobile industry is stepping forward towards electric vehicles. The industry is rapidly transforming from an IC engine vehicle to electric vehicle. Now-adays demand for electric vehicles has been increased due to efficiency of engines and also no pollution occurs due to usage electric vehicles instead of petrol or diesel engines. The increase in electric vehicle leads to increase in charging stations as well. Increase in charging stations is necessary and wired charging consumes human work to be involved. So implementation of wireless charging is much necessary in this fast growing automobile industry. In this project a wireless car charging system is used to charge the electric vehicle wirelessly via inductive coupling. The user just needs to park the car on the charging spot marked in the charging station. This system does not require any human interaction. RFID tag identities are stored in the cloud and gives access to charge only vehicles that are linked to that station. Wireless power transmission might be one of the technologies that are one step towards future. At last, one can charge the vehicle wirelessly without human power involvement.

With an increased number of Electric Vehicles (EVs) on the road's, charging infrastructure is gaining an ever-more important role in simultaneously meeting the needs of the local distribution grid and of EV users. This paper proposed system RFID system for user identification and charging authorization as part of a smart charging infrastructure providing charge monitoring and control. The RFID provides a cost-efficient solution to identify and authorize vehicles for charging and would allow EV charging to be conducted effectively while observing grid constraints and meeting the needs of EV drivers. The vehicle charging is based on voltage level. In this system we can monitor our charging level through the server at any where any time using IOT.

2. LITERATURE SURVEY

As the number of EVs on the roads increases, charging stations in both parking structures and private garages will become more prevalent. These stations will be responsible for meeting the requirements of the distribution grid, EV owners, and parking structure operators. For security and financial reasons, among the many functions these charging stations will perform are user authorization, authentication, and billing. Basic, unnetworked, charging stations such as Leviton [1] and ClipperCreek[2] require a point of sale (POS) device to authorize and enable charging. Other commercial charging stations, such as Coulomb [3] and Blink[4] require a short range RFID card for the same purpose. In both cases, extra steps on the part of the user must be taken to authorize charging. The authors in [5] propose using conventional RFID tags inside EVs and RFID readers on parking garage access gates together with middleware and an aggregate charging controller to authorize, assign, and enable charging. However, this system still requires action from the user and is not as flexible as may be desired. The UCLA Smart-Grid Energy Research Center (SMERC) has developed a software-based EV monitoring, control, and management system that employs multiplexed charging stations capable of providing varying power to several EVs from one circuit, called WINSmartEVTM[6][7][8]. This system centers around a server-based aggregated charging controller and utilizes a user database together with a smart-phone interface for charging authorization. In order to simplify the charging authorization process and make it more convenient for users, an authentication system based on an RFID mesh network is proposed as an additional capability for the existing WINSmartEVTM framework. The proposed improvements allow charging authorization to take place seamlessly at multiple charging stations in a single geographic location without any action on the part of the user. Vehicle Monitoring/Identification Modules (VMMs), located in EVs, act as RFID tags for vehicle identification and charging authorization. Unlike the layered architecture for managing a variety of automatic identification hardware proposed in [9], the VMMs communicate directly with a network coordinator and charging control server through a ZigBee mesh network, thus simplifying the architecture. The paper is structured in the following way: first, the existing WINSmartEVTM architecture is outlined. Then the architecture of new Zigbee-based RFID charging authentication system is presented and each component of the system is described in detail. Last, the results of the implementation are presented and discussed. With an increased number of Electric Vehicles (EVs) on the roads, charging infrastructure is gaining an ever-more important role in simultaneously meeting the needs of the local distribution grid and of EV users. This paper proposes a mesh network RFID system for user identification and charging authorization as part of a smart charging infrastructure providing charge monitoring and control. The Zigbee-based mesh network RFID provides a cost-efficient solution to identify and authorize vehicles for charging and would allow EV charging to be conducted effectively while observing grid constraints and meeting the needs of EV drivers. The Internet of Things, also known as things-linked internet, is a network that connects any object to the internet via RFID (radio frequency identification), infrared sensors, and other sensing devices, allowing data exchange and communication. This paper discusses the technical advantages of RFID technology for identifying electric vehicles and managing the entire battery charging compartment, as well as how RFID technology is used in battery charging stations. Because of these advantages, RFID technology can better serve the electric vehicle industry and support effective battery charging compartment management. Electric vehicle charging stations have begun to be installed in many areas, but they are not yet complete.

3. PROPOSED SYSTEM

In this project, we're using RFID technology. RFID module consists of two parts i.e., RFID reader and RFID card which is authorized by the user. When we swipe the card then it will ask to enter the password and amount. By using keypad, we can enter the password and amount. The RFID reader is connected to the Arduino UNO. Arduino is a microcontroller which is based on the ATmega328P. For the Arduino we can write the code as per our requirements using Embedded C.
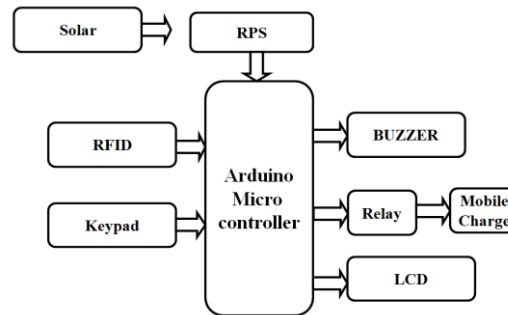
The main aim of the project is to design a system which is capable of automatically deducting the amount dispensed from user card based on RFID technology. Liquid dispensing systems are quite commonly found in our daily life in different places like offices, Bus stands, Railway stations, Petrol pumps. Here we are going to present modern era smart card access for electric vehicle charge station. System which is meant to be operated with prepaid card using RFID technology. The project mainly aims in designing a prepaid card for petrol bunk system and smart card access for electric vehicle charge using RFID technology. In current days the petrol stations are operated manually. These petrol pumps are time consuming and require more man power. To place petrol stations in distant area is very costly to provide excellent facility to the consumers. All these problems are sorted out by the use of unmanned power pump which requires less time to operate and it is effective and can be installed anywhere. The customer self-going to avail the service has to done the payment by electronic clearing system. In this proposed petrol pump automation system, we are using RFID card to access petrol at different petrol stations for electric charge of different petrol companies across the country and here, we are connecting all these petrol stations. Whenever we want to fill the tank from the fuel dispenser, we just have to place the RFID card near the RFID reader. Then the microcontroller reads the data from the RFID reader and performs the action according to the customer requirements. This digital smart card access for electric vehicle charge also provides the security for the customers for filling petrol at the Petrol stations by avoiding the involvement of human beings, hence reduces the risk of carrying money every time. This petrol pump system consists of Atmega328 microcontroller, RFID module, LCD display, Ac pump and alarm.

In this project we're using Atmega328p Microcontroller. All the components are connected to Arduino. It has total 28 pins. It has 14(D0-D13) digital input/output pins and 6(A0-A5) analog pins. Here the D0 is connected to the RFID for the user identification. D2-D7 pins are connected to 16*2 LCD display. D8 pin is connected to relay, the mobile will get charge until the relay is OFF. D9-D11 pins are connected to keypad which is used to enter the password and amount. D13 pin is connected to buzzer it gives us an alert when we entered the invalid password or amount.

The RPS is connected to pin 7 which converts 230V AC to 5V of DC. Pin 1 is connected to Reset which is used to reset the Arduino. The oscillator is connected to pin 9 and pin10, the GND is connected to pin 8 and pin 22.

4. RESULTS

Here the kit is ON by giving the Regulated Power Supply of 12V AC which is converted to 5V DC. The generated 5V DC current passes to every hardware component in the circuit.Then immediately the buzzer will give a sound that kit is reset and ready to use. Then the LCD displays like this in the below fig.,

Here we can see the kit is on and when we attach the card with the reader then it will display that enter the password, after entering the password it displays that enter the amount. Later it displays the remaining balance in our card.
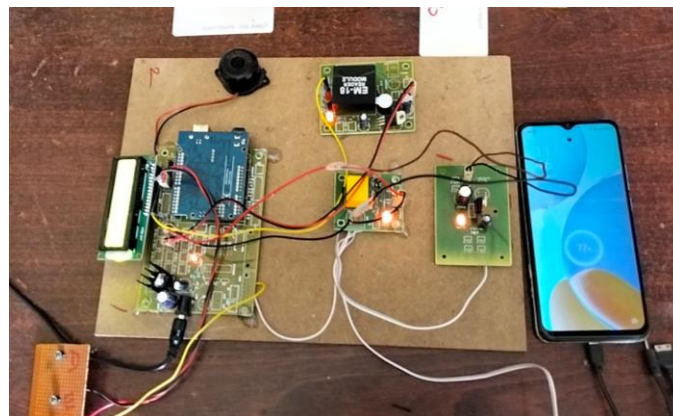
At last whenever the relay is ON, the mobile is going to be charge untill the relay is OFF. This is the final image of our project when it is in working condition.

5. CONCLUSION

We designed and implemented smart cards EV payment system for electrical vehicles using Arduino, RFID reader with smart security. microcontroller, the EV charge station is equipped with a smart card reader/write. At the EV charge station , the driver swaps the card and the smart card reader reads the

amount in the card and will display it on the LCD. The driver then enters the specific time for charging. that has to be filled using a keypad. The corresponding amount is calculated & deducted from his petro card. The electrical pump is then turned ON according to the entered amount, fills the tank and automatically turns OFF. Our electronic system performed as expected. We were able to implement all the functions specified in our proposal. The biggest hurdle we had to overcome with this project was interfacing the micro controller with the hardware components. We feel that this electronic system is very marketable because it is easy to use, comparatively inexpensive due to low power consumption, and highly reliable. By using this project one can design a secured system. For filling petrol to vehicles at the electric charge stations using Smart Card based Accessing System.

REFERENCES

[1]. Chung, J. Chynoweth, C. Chu, and R. Gadh, Science World Journal, 2014, 1-14. (2014).

[2]. Muhammad Ali Mazidi and Janice Gillispie Mazidi, "The 8051 Microcontroller and Embedded Systems," Pearson Education.

[3]. V. R. Patil, M. D. Patil and A. T. Khude, "IoT Based Prepaid Energy Meter," 2020 5th International Conference on Devices, Circuits and Systems (ICDCS), Coimbatore, India, 2020, pp. 17-20, doi: 10.1109/ICDCS48716.2020.243539

[4]. Manoj D. Patil , Rutuja V. Nerlekar , Ankita S. Patil , Namrata M. Raut, Ankita M. Virbhakt, "Wireless Charging of Battery in Electrical Vehicle using Solar Energy," International Journal of Engineering Research & Technology (IJERT), Volume 09, Issue 03, pp. 394-397, March 2020

[5]. KENNETH JAYALA's 8051 Microcontroller Architecture, Programming, and Application

[6]. Barth, H. Schaeper, C. Schmidla, T. Nordmann, H. Kiel, M. van der Broeck, H. Yurdagel, Y. Wieczorek, C. Hecht, F. Sauer, D.U. Barth, H. Schaeper, C. Schmidla, T. Nordmann, H. Kiel, M. van der Broeck, H. Yurdagel, Y. Wieczore As an educational project, create a universal adaptive battery charger. IEEE PESC 2008, June 19, 2010 IEEE PESC 2008, June 19, 2010 IEEE PESC 2008, (Power Electronics Specialists Conference)

[7]. Patil, MD, Aush, MG, Mahadik, YV, Kamble, SG, Patil, SV, Kharade, JM. Energy management between electric vehicle charging stations and electric distribution system considering quality of service using IACSO-MPA approach. Int Trans Electr Energ Syst. 2021;e13255. doi:10.1002/2050-7038.13255

[8]. Chung, P. Chu, and R. Gadh, "Design of Smart Charging Infrastructure Hardware and Firmware of The Various Current Multiplexing Charging System," PCO2013, Prague, August 25-27, 2013.