Wireless power charging and identification of theft electric vehicle using Block chain technology

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Abstract. Vehicles have become an indispensable part of every human’s life. Almost, every work depends on vehicle for transportation. Without the vehicle our work would be crucial. Though a vehicle have many benefits, it also creates a major threat for the environment by its pollution. Additionally, the existing system fails to charge the Electric Vehicle (EV) system as there is no separate charging system. This can be implemented by our proposed system wireless power charging technology using inductive coupling method. Consequently, existing system also fails to identify the theft EV in an efficient manner. This issues can be solved by using a mobile application with vehicle information. The application maintains the blockchain server which continuously monitors theft Electric Vehicle by sending, vehicle information to all rechargeable stations. In case, the theft Electric Vehicle enters the charging station the information is passed to the authorized person of the Electric Vehicle. As a result the proposed system integrates Wireless charging and anti-theft vehicle in an efficient way when compared with the existing system.

1. Introduction

Electric vehicle are expected to be the next revolutionary technological force for transportation and development. These vehicle have the ability to revolutionize the use, generation and redirection of energy. The negative climate effect of traditional vehicle can be overcome with Electric vehicle (EV). Conventional vehicle produce many carbon emission that are dumped into the natural world and therefore make humans resistant to pollution and greenhouse gas. An electric vehicle [1-5] is a big step forward in order to contribute significantly to the world.

Blockchain can be defined in the simplest sense as a data structure containing transactional records while maintaining protection, transparency and decentralization. It is a distributed ledger which is entirely accessible to everyone in the network and it is incredibly difficult to alter the information when it's stored in a block chain. The three different types of blockchain are private, public and hybrid. The applications of blockchain is crypto currency, healthcare, digital voting, real estate, food safety.

The objective of the work is to provide a wireless charging system to the electric vehicle [6-10] using inductive coupling method so that several vehicles can be charged at a time and to implement an antitheft vehicle such that vehicle can be tracked easily with the help of blockchain technology.

Presently the existing system fails to charge the EV automatically[11-15]. It also focuses only on the hardware battery charging methods, but there is lag in software (service) research especially for billing system[16-19]. Additionally, the smart meters are used to calculate the charge independent of the value measured in Electric Vehicle (EV) and the amount paid at charging station.
2. Proposed System

2.1 Architecture of Proposed System

Figure 1 shows the architecture of proposed system, first step is the owner has to register information which is stored in the server. Incase, if the vehicle is robbed, then the owner has to register a complaint about his EV through the server which has the information about the vehicle in terms of vehicle RFID(Radio Frequency Identification). Whenever the theft vehicle comes to the charging station, RFID is verified through the RFID tag and reader by using blockchain server. If the RFID of the vehicle matches with the complaint in the information server then it sends a message to the owner that the vehicle is detected. Subsequently, if there is no match in the vehicle RFID, then charging is possible.

![Fig.1 Block diagram of Proposed Work](image)

2.1.1 Components used in Proposed System

i) **PIC MICROCONTROLLER:** The best advantageous PIC Microcontroller PIC16f877A is used in the proposed Wireless power charging technology is shown in Figure 2. PIC has 40 pins and 5 ports in that 33 pins are used as input/output and remaining 7 pins are used for future purpose. It has two 8 bit and one 16 bit timer. The PIC microcontroller cost is very less and easy to manage. One of the key benefits of microcontroller is flash memory technology in that the program can be written and erased easily.

![Fig.2 PIC Microcontroller](image)

ii) **RFID TAG:** An integrated circuit and an antenna are included as the RFID tag is shown in Figure 3 RFID tag are produced from durable plastic for inserting the tag between the plastic layers.
Tags can be applied to employee ID cards, cars, shoes and human belonging with different shape and dimension. This tag includes 12 unique numbers.

![RFID Tag](image)

**Fig.3 RFID Tag**

iii) RFID READER: The proposed system choose the RFID reader EM-18 RFID with 125 kHz is shown in Figure 4. The chosen RFID reader is more compatible with 5V power supply and desired antenna. The reader collects the information through the microcontroller and display the card number as output.

iv) VOLTAGE REGULATOR: An integrated IC (voltage regulator) is shown in Figure 5. It is a constant fixed output voltage independent of load or input voltage changes. It is based on the embedded circuit. A linear power regulator operates by changing the resistance automatically by means of a feedback loop, by varying the input voltage with constant output voltage.

![RFID reader module](image)

**Fig. 4 RFID reader module**

![Voltage Regulator](image)

**Fig. 5 Voltage Regulator**
2.1.2 Prototype model of the proposed system

The prototype model of proposed system comprise of two sections namely,

- Antitheft electric vehicle detection.
- Wireless power transfer.

In first, Tomcat 6 configuration provides several additional features that make it a useful platform to build and deploy web applications and web services. It is used for configuration purpose. MySQL Query Browser shows the information stored in the blockchain. Different result sets are tabbed so that by selecting the correct tab, it can quickly switch between the browsers. The routines and the table columns are stored in the database. The complaint is registered in the blockchain and the theft information is displayed in the Query browser.

In second, the power supply 230V AC supply is applied to the system the voltage regulator convert 230V to 5V and it is given to the PIC Microcontroller which consist of RFID Reader, transmitter coil and Receiver coil. A power transfer between the transmitting coil and the receiving coil occurs as a theory of electromagnetic induction.

The wireless power supply needs a spindle at both ends (senders and receivers). The spindle is connected through a power chord by a plug stage. The receiver coil receives power from the transmission coil and the voltage rectification is performed to charge the engine. Once the car starts to charge, its ID is send to the server and checks that any user sends a query about vehicle theft to the server. If server finds any match regarding the request query immediately it sends as report to the owner about the theft vehicle. The complete process of the proposed system is shown in Figure 7.

![Fig. 6 Block diagram of Prototype Model](image-url)
3. Results and Discussion
This section gives a brief discussion about the result obtained by the proposed system. This system consists of both hardware and software. The components used in hardware are PIC microcontroller, RFID tag, reader, voltage regulator. The tools used in software are My SQL Query browser and Tomcat.

To identify the theft vehicle, the android application is used which is available in the google playstore. This application sends a request to login the owner about his information such as username, password and IP address which is shown in Figure 8 and it also asks to provide vehicle information such as zigbee number (i.e. RFID number), vehicle number, username and phone number is shown in Figure 9. These are the information stored in the blockchain server.

The complaint is registered by server using RFID number. Consequently, the hardware prototype which is used for wireless power transfer charge the EV after verification of the RFID tag and reader. If the complaint information matches with the vehicle information then the message is send to the number given by the owner is shown in Figure 11. If the information not matched, then the vehicle is allowed to charge. The charging process in this prototype is indicated by using LED as in Figure 12.
4. Conclusion
Several vehicles can be charged at a time by using wireless charging method. It helps to consume less time compare to the previous charging method. The implementation of antitheft electric vehicle system is used to identify the theft electric vehicle and this can be implemented by using blockchain technology. It is an advanced technology which is used to secure the information of the electric vehicle and this is also used for complaint registration. When the EV reaches the charging station, the RFID reader reads the information from the blockchain and this information is verified with the complaint registered in the blockchain and if the tag information does not match the complaint information the vehicle is allowed to charge else the vehicle is blocked in charging station and the information is send to the particular owner of the EV. There are two main advantage of this system (1) secure the electric vehicle (2) charging by wireless method.
5. References

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