ELECTRIC VEHICLE CHARGING SYSTEM

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College ***:*** *K S Institute of Technology, Bengaluru*
Branch ***:*** *Department of Telecommunication Engineering*
Guide(s) ***:*** *Mr. Satish Kumar B*
Student(S) ***:*** *Ms. Aishwarya S*
Ms. Jeevani B
Ms. K Prathibha
Ms. Nabeela Sayeeda

Keywords:

Arduino UNO, Fast Charging, RFID, Relays

Introduction:

As technology advances, electric vehicles are drawing customer interest in several countries. The adaptation of non-combustion engine cars to address CO2 emissions and environmental concerns has been observed on a large scale. With the rise of the electric vehicle sector, it's more important than ever to develop and execute safe and dependable public charging stations. Depending on the car's battery capacity, charging an electric vehicle might take anything from minutes to days. There are three types of electric vehicle charging. Every electric vehicle comes with free L1 charging, which is worldwide compatible and requires no installation. It may simply be plugged into any 120V grounded outlet. It may be useful for persons whose workplaces or other locations have L1 charging stations, allowing them to charge their electric vehicles all day for the commute home. As it can't keep up with long distances, many users refer to L1 as an emergency charger. The L2 charger is permanently linked to a 240V circuit in a garage or driveway and operates at a high input voltage of 240V. These chargers are extensively used in places such as parking garages and lots. This just takes roughly 3 hours to charge for an average driver who drives 37 miles every day. Even yet, if the trip is longer than the vehicle's range, it will require a rapid top-up along the way, which L2 charging may supply. L3 chargers are the fastest electric vehicle chargers on the market. They usually run on 480V and aren't seen in most households. They're best for high-traffic areas, such as highway rest stops and commercial malls, where the EV can be recharged in an hour or two. There is no industry standard for these chargers, and they are not generally compatible. A smart electric car charging station is described as "vital infrastructure" that serves as a fuel station for combustion engine vehicles as well as a smart grid. Because these smart stations will be automated and connected by interoperable network systems, they will fall under the vulnerable subset category, which has concerns for data privacy and security. Multiple threats, similar to a smart grid with a significant technology breakthrough, can allow a hostile component to elevate privilege. Threats encompass, but are not limited to, breaching the confidentiality, integrity, and availability of user and system data. These actions can be carried out maliciously

via the physical interfaces that connect the electric vehicle to the charging station or a wireless communication link for billing and metering systems.

Objectives:

The drawbacks noticed in previously proposed system are authentication and user-specific time for charging. In the era of digital and encrypted payments, a user-specific and unique card which holds the cash required for the recharge seems to be preferable than the manual payment methods. Additionally, it turns out to be more favorable to the users, when it is their choice to decide the amount of time, they would like the EV to be charged depending on their needs and requirements. This EV charging system aims to subsidize and nullify the effect of these factors and provide a user-friendly design for charging.

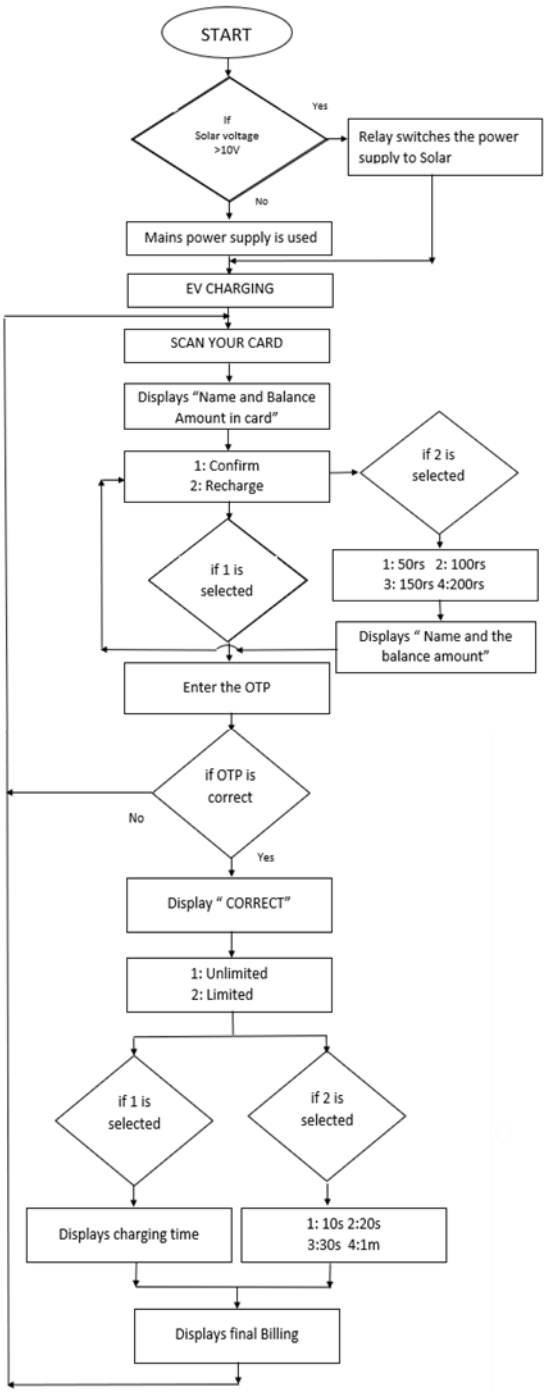
Methodology:

The electric vehicle charging system can be powered by two supplies i.e., Mains and Solar power supplies. An AC adapter comprises of a transformer, a rectifier, and an electronic filter. The voltage from the external mains supply is stepped down by the transformer and is converted from Alternating Current to Direct Current using a rectifier. The voltage regulator is used to maintain a constant and stable level of voltage that is required for different functioning components of the system. Arduino UNO is the controller of the system to which all the functioning components are interfaced to. When the voltage from the solar supply is measured beyond ~8V, the power supply is switched from mains to Solar using a 2-channel relay module, which is controlled by the Arduino UNO. The RFID scanner is incorporated in the system, which is majorly used for user authentication and transaction purpose. Once the RFID card is scanned, the specific user's details will be displayed on the 16*2 LCD display. The user will also be notified about the current balance in the card and is also given the provision to recharge the card. A Keypad is incorporated in the system, which is used to take the input from the user regarding the Card OTP, charging time and the recharge amount, as per the user's requirements. A fast-charging module is connected to the system, which boosts the power level and enhances the speed of charging.

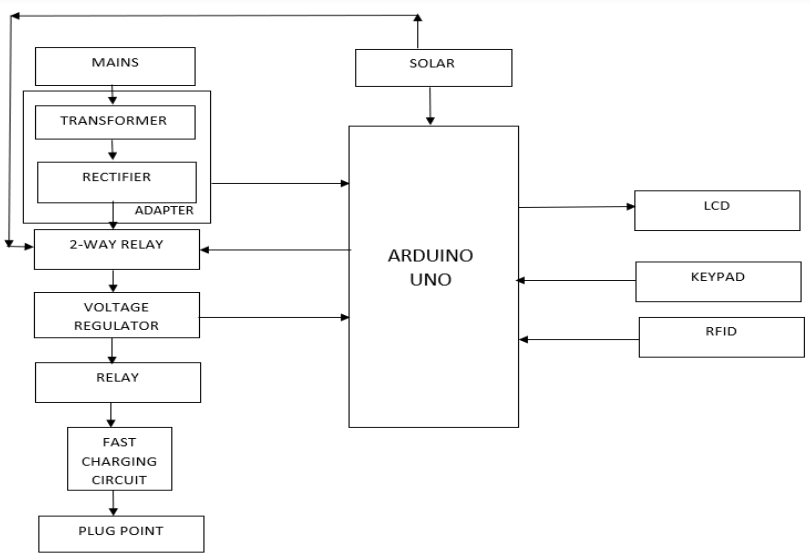
Conclusion:

The proposed proof of model for EV charging system is developed with several features which facilitates the users with several benefits.

1. Enhanced user interface using the card system, which also ensures an authorized and encrypted system.
2. Provides a sustainable energy source in the form of solar power supply.
3. A smart charging system which is implemented with a fast charging and a system based on user-specified inputs.
4. The system provisions for a user-friendly interface where they can choose the required charging time and recharge amount.



Flow Chart



Block Diagram

Scope for future work:

This proof of model, if implemented in real-time, can be powered up using AC supply and a high-end setup, shall be verified against the industry's practice. The real-time charging systems can be given the ability to monitor the availability of slots to charge the vehicle, i.e., the users can be updated about the available station for charging to avoid traffic in the station.