

Eco-System of Battery Swapping Machines and Framework for Electric Scooters in India

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Abstract: This paper presents a framework that integrates the concept of battery swapping system and networking for electric scooters in India. The proposed system introduces three main framework i.e. 1. Battery level based transaction 2. Pre-offline booking of battery form fixed station to another station with SMS confirmation. 3. Smart management of pre booked batteries and on board readily available battery including fast charging and normal charging mode.

Keywords: ARM controller, Battery level detection, GSM, RFID Tags, Battery management, pre-offline booking and charging modes.

1. Introduction

India has 2nd largest population in the world and number of internal combustion engine (ICE) vehicle is almost more than half of the population where we consider two vehicles for each for each family on average [1]. The ICE work on gasoline and diesel oils which come under nonrenewable energy resources. Global warming and Air quality index (AQI) are two main factor of degradation in span of life on earth. The replacement of fossil fuel and use of non-polluting energy resources is one the strategies. This solution is found 20 decades ago as electric vehicles countering the highly emitted polluting gas expelled for ICE but failing to take over completely due to well settled and developed infrastructure of conventional automobile system of ICE. After significant years of investment in development of infrastructure ICE, electric vehicles infrastructure is finding difficult to embark its place in Indian market.

India is finding difficult to accept the electric vehicles as there is strong market captured and solution like electric charging system is not time efficient to consider. The better solution than total replacement of ICE automobiles is lower the use of ICE automobiles and promote the use of electric vehicles with solution of battery swapping machines for instant go charged. The best way is to use lithium-ion battery which provide best efficiency and performance [3]. The idea is to promote use for shorter routes i.e. within city routes of area around 50-80 sq.km. This will improve AQI of each city and definitely help in global warming concerns.

The battery swapping system is significantly more reliable in terms of efficient space occupation and delivery time. Battery

swapping system is more effective for electric scooter with good infrastructure considering the space requirement and battery swapping time. In order to reduce the investment of fixed capital for landownership for infrastructure and full ownership of battery can be replaced with rental ownership. Which would include subsidy from government and promoting the deployment of battery swapping machines near well-developed infrastructures like private and public property along the city road Considering Indian population and potential of successful promotion of electric vehicles would increase by 2025, therefore facilities like smart management [2], offline booking is required of batteries on battery swapping machines

2. System working

The battery swapping system is equipped with ARM controller, GSM, battery charging circuit. The system verifies with RFID card with the user and attached Rfid with battery. On verification system takes battery from user through a motor and check the battery level. System provide a full charged battery if available depending on priority of pre booked a full charged battery is provided which is reserved for the customer, then the user card (RFid card) is deducted with respect to amount with which battery level was provided. The system asks the user if it wants to re-book a new battery on next station. As per user selection battery is booked.

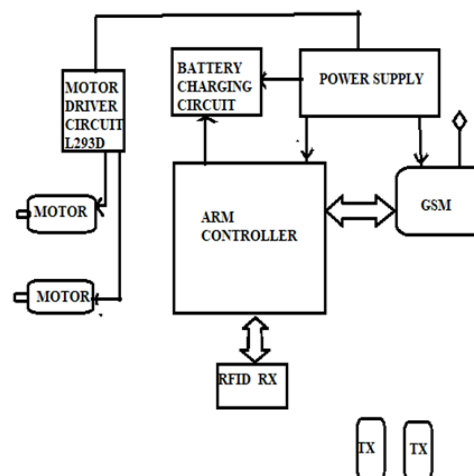


Fig. 1. Block diagram

A. Block diagram description

The system consists of a power supply which provides 3.5 volt and 12volt. ARM controller as main processing unit which controls signaling and communication and process the embedded decisions. Rfid technology is used to detect and verify the user and the battery. The GSM module is used to send the confirmation SMS to user of battery been booked successfully. Motor IC is used to drive the 12 volt motors, for battery in-out purpose. The battery charging circuit is used to charge the battery.

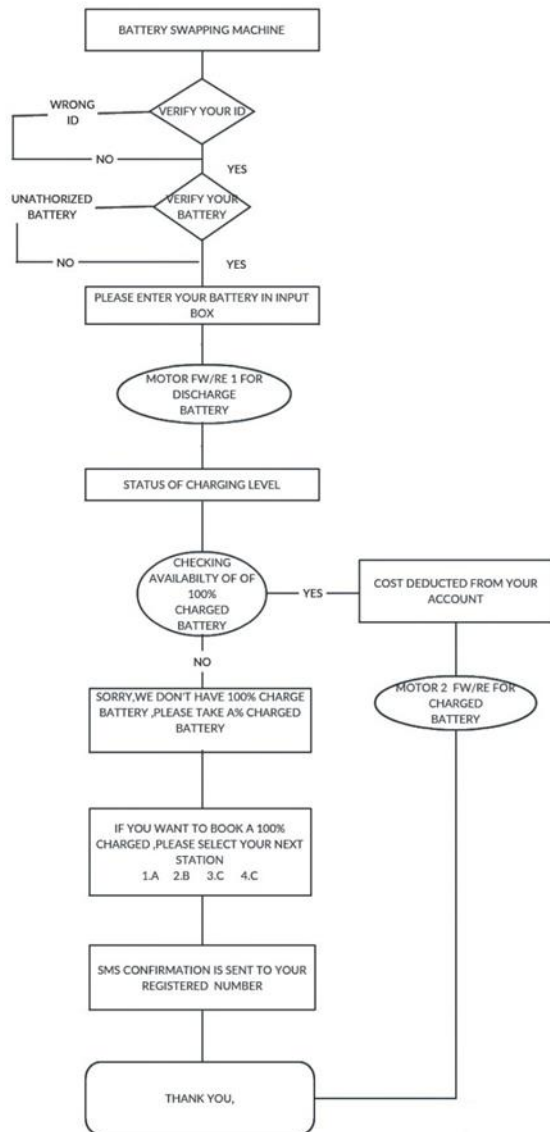


Fig. 2. Flowchart

3. Observation and result

The battery swapping system verifies the user and battery by Rfid technology. The system calculates the battery level through logic embedded in the ARM controller. The system then determines whether the user pre-booked the battery or

want new transaction. The system successfully accepts the battery on verification of user and battery and delivers the on successful transaction.



Fig. 3. Results

4. Conclusion

The proposed system presents the battery swapping system which delivers the full charged battery to user on receiving a drain battery. The system is also able to calculate battery level and also debit the amount based battery level of received battery. The system successfully can book new battery to other stations. The system is capable of maintain smart management of batteries in stock for pre booked user.

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