Dynamic Wireless Electric Vehicle Charging System for Safe and Privacy

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Abstract - *One of the barriers for the adoption of electric vehicles (EVs) is the anxiety around the limited driving range. Recent proposals have explored charging EVs on the move, using dynamic wireless charging which enables power exchange between the vehicle and the grid while the vehicle is moving. Our project focuses on the intelligent routing of EVs in need of charging so that they can make most efficient use of the so-called Mobile Energy Disseminators (MEDs) which operate as mobile charging stations. We present a method for routing EVs around MEDs on the road network, which is based on constraint logic programming and optimization using a graph-based shortest path algorithm. The proposed method exploits inter-vehicle communications in order to eco-route electric vehicles. Our project argue that combining modern communications between vehicles and state of the art technologies on energy transfer, the driving range of EVs can be extended without the need for larger batteries or overtly costly infrastructure. We present extensive simulations in city conditions that show the driving range and consequently the overall travel time of electric vehicles is improved with intelligent routing in the presence of MEDs.*

***Key Words*: Electric vehicles (EVs), Mobile Energy Disseminators (MEDs), Batteries, Wireless, Eco-route**

1. INTRODUCTION

Brushless Direct Current (BLDC) motor is a Permanent Magnet (PM) motor with PMs on the rotor and three phase windings on the stator. BLDC Motor is categorized as a trapezoidal or square-wave motor since the back emf induced in the stator the associate editor coordinating the review of this manuscript and approving it for publication was Xue Zhou. Windings is of trapezoidal shape, in contrast to the Permanent Magnet Synchronous Motors (PMSMs) which has sinusoidal back emf waveform. Also, in the BLDC motor the phases are supplied with the quasi-square current while the PMSM requires sinusoidal phase currents for excitation. The back emf shape is determined by the shape of the rotor magnets and the stator winding distribution. The rotor configuration can be an inner rotor or outer rotor type. BLDC motors are widely 147542 this work is licensed under a Creative Commons Attribution 4.0 License. For more information, see http://creativecommons.org/licenses/by/4.0/ VOLUME 7, 2019 A. Usman, B. S. Rajpurohit: Comprehensive Analysis of Demagnetization Faults used in various industrial applications due to their compactness, high efficiency, high torque density and high dynamic performance. During the unfavorable environmental conditions, motors are subjected to physical and thermal stresses which results in fault. The authors of this paper have earlier in paper have classified the faults related to PM motors and further given an inference about the methods which are preferable for different types of fault conditions. Faults in BLDC motors are usually stator related faults which constrict to winding faults, while rotor related faults curtail to demagnetization or decrepit of PMs of the machine. J. Faiz et al. in paper gives the overall review of the demagnetization fault indices in PM related motors. The analytical modeling of faults is the prior requisite before proceeding on high computation and accuracy using numerical approach. S. Baldursson in describes the detailed mathematical modeling of a BLDC motor in SIMULINK. Similarly, in, the authors uses the advanced analytical techniques to model the fault in BLDC motor taking into consideration the assumptions earlier ignored during the mathematical modeling approach. In contrast, Sheikh-Ghalavand et.al, in uses the Magnetic Equivalent Circuit (MEC) based technique for modeling, which is more accurate than the analytical approach. Similar work has been done by T.J.E Miller in for modeling of fault using MMF diagrams, which again requires MEC based techniques. As already discussed by the authors in , the Numerical Methods (NMs) require high computation time but gives more accurate results than EEC and MEC based methods, these methods are therefore pervasive in industry in the field of fault diagnosis .

1.1 OBJECTIVE

The magnetic design of an IPT system for a dynamic EV charging application, to continuously deliver a power of 15 w to an EV.

1.2 ADVANTAGES

- In Battery size.
- Electric Vehicle(EV) weight.
- Increase in driving range and ease of accessibility to grids.

2. HARDWARE DESCRIPTION

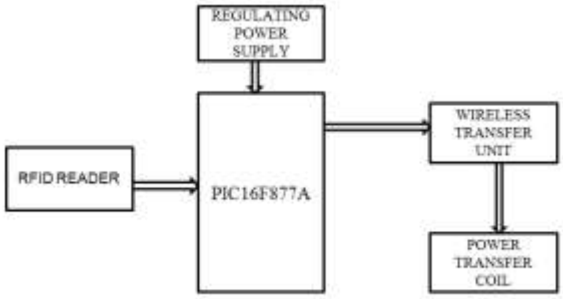

FIG 2.1 Block diagram(ROAD SIDE)

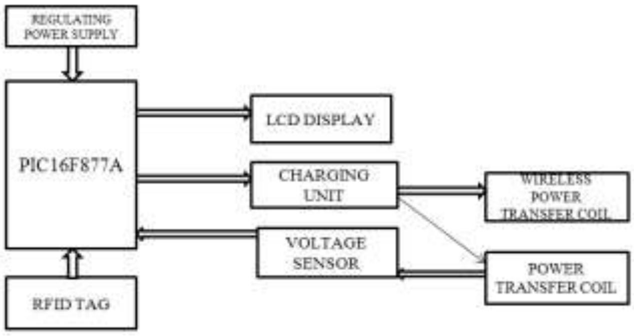

FIG 2.2 Block Diagram(VEHICLE SIDE)

2.1 RESULT

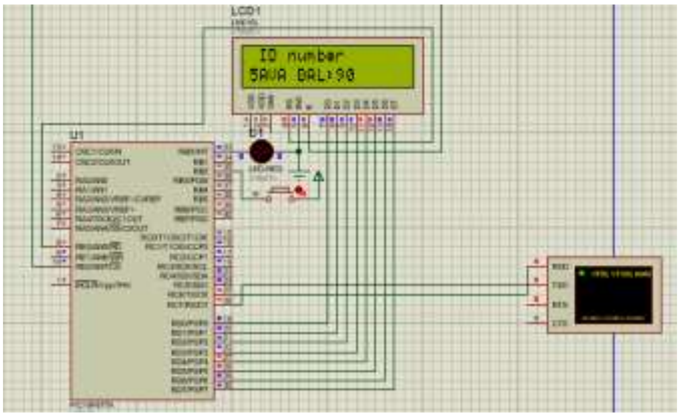

FIG 2.3 Simulation of the Project

3. CONCLUSION

We have proposed a solution for increasing the driving range of electric vehicles based on modern communications between vehicles and state of the art technologies on energy transfer. The proposed solution steers away from larger and more powerful batteries, although these would still be useful and complements what we are proposing here. It does not require changes to existing road infrastructure which are costly and often pose health hazards. In contrast to vehicle-to vehicle (V2V) charging schemes that are recently discussed in the literature, our work builds on the idea of using the city buses that follow prede_ned scheduled routes for dynamic charging in urban environments. Combining modern communications between vehicles and state of the art technologies on energy transfer, we have shown that vehicles can extend their travel range. Energy exchange between vehicles can be facilitated by a process called ``Inductive power transfer'' (IPT). This allows for an efficient and real-time energy exchange where vehicles can play an active role. Making use of inductive charging MEDs that act as mobile charging stations can improve the overall travel time of vehicles compared to using only static charging stations. Specifically, using a MED in support of a SCS the overall travel time can be improved about four times compared with the only SCS usage case. The improvement of travel time comes with a negligible cost in travel distance, but starving vehicles otherwise would have to stop for a relatively long time or make longer re-routes to and a stationary station and recharge their batteries.

4. SNAPSHOT OF THE PROJECT

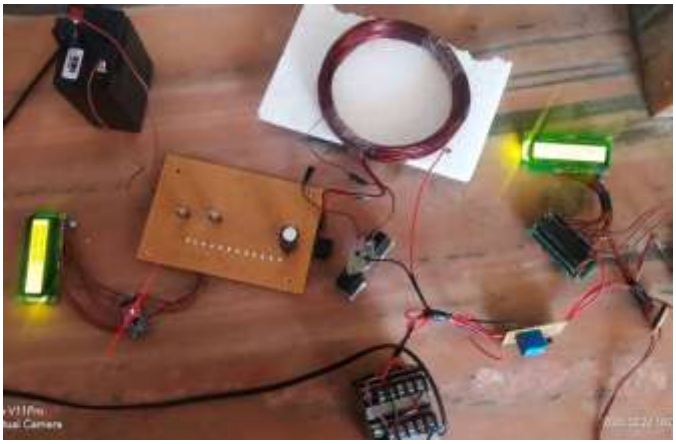

FIG 4.1 Snapshot of the Project

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