Solar Based Wireless Power Transmission for Electric vehicle Charging Station

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ABSTRACT: *Wireless power transfer (WPT) using magnetic resonance is the technology which could set human free from the annoying wires. In fact, the WPT adopts the same basic theory which has already been developed for at least 30 years with the term inductive power transfer. WPT technology is developing rapidly in recent years. At kilowatts power level, the transfer distance increases from several millimetres to several hundred millimetres with a grid to load efficiency above 90%. The advances make the WPT very attractive to the electric vehicle (EV) charging applications in both stationary and dynamic charging scenarios.*

For energy, environment, and many other reasons, the electrification for transportation has been carrying out for many years. In railway systems, the electric locomotives have already been well developed for many years. A train runs on a fixed track. It is easy to get electric power from a conductor rail using pantograph sliders. However, for electric vehicles (EVs), the high flexibility makes it not easy to get power in a similar way. Instead, a high power and large capacity battery pack is usually equipped as an energy storage unit to make an EV to operate for a satisfactory distance. The problem for an electric vehicle is nothing else but the electricity storage technology, which requires a battery which is the bottleneck today due to its unsatisfactory energy density, limited lifetime and high cost.

Keywords: Wireless Power transfer, Electric Vehicle, Battery

1. INTRODUCTION

Contactless Power Transfer (CPT) systems are applicable for charging electric vehicles (EVs) without any physical interconnection. These systems can be installed on roadways in order to charge the vehicles while driving. The implementation of such on-road charging systems in order to extend the driving range and decrease the EV battery size is investigated in this paper. The percentage of road that should be covered and the power transfer capability of the system are estimated. Some design considerations, such as the distribution and the length of the CPT segments

over the road, are explained. Finally, the total power demand for all the passing-by vehicles using the system is calculated and the possibility of powering the EVs directly from renewable energy sources is discussed.

This system based on Contactless Power Transfer (CPT), it is assumed that the vehicle can be powered while driving. The CPT systems can be installed on the main traffic lanes. The car will get energy supplied by the on-road CPT system and therefore a greater driving range can be achieved. Moreover, a smaller battery can be an installed to the car providing the same of even greater driving range. As a result, such systems can be a pathway to overcome the main bottlenecks of electric mobility i.e. the limited driving range and the high cost, which are both related to the technology and the specifications of today's batteries. A Contactless Power Transfer System (CPT) refers to a system where power can be transferred electro-magnetically with no physical contact. The system consists basically of an air-core transformer with two windings. The efficiency of such a transformer depends on the parameters of the primary and the secondary winding, coupling factor, as well as on the load and the operating frequency.

PROBLEM DEFINITION:

- To design for minimize use of wired charger because a transformer is replaced by a set of loosely couple coils.
- To implement system for charging of electrical vehicle is based on principal of contactless power transfer
- To design system in which we implement CPT system for charging electric vehicle. It has pick-up winding installed below the chassis and is aligned with a primary winding connected to power source.

OBJECTIVES

- To design wireless power transmission system.
- To design wireless vehicle charging, as it name suggest wireless means purposed system transfer power wirelessly.
- To maximize energy consumption.
- To design for when the coils are placed close to each other with coinciding axes, which indicates high coupling between the coils and expected to have maximum power transfer in contactless systems.

2. SYSTEM DESIGN

2.1 BLOCK DIAGRAM

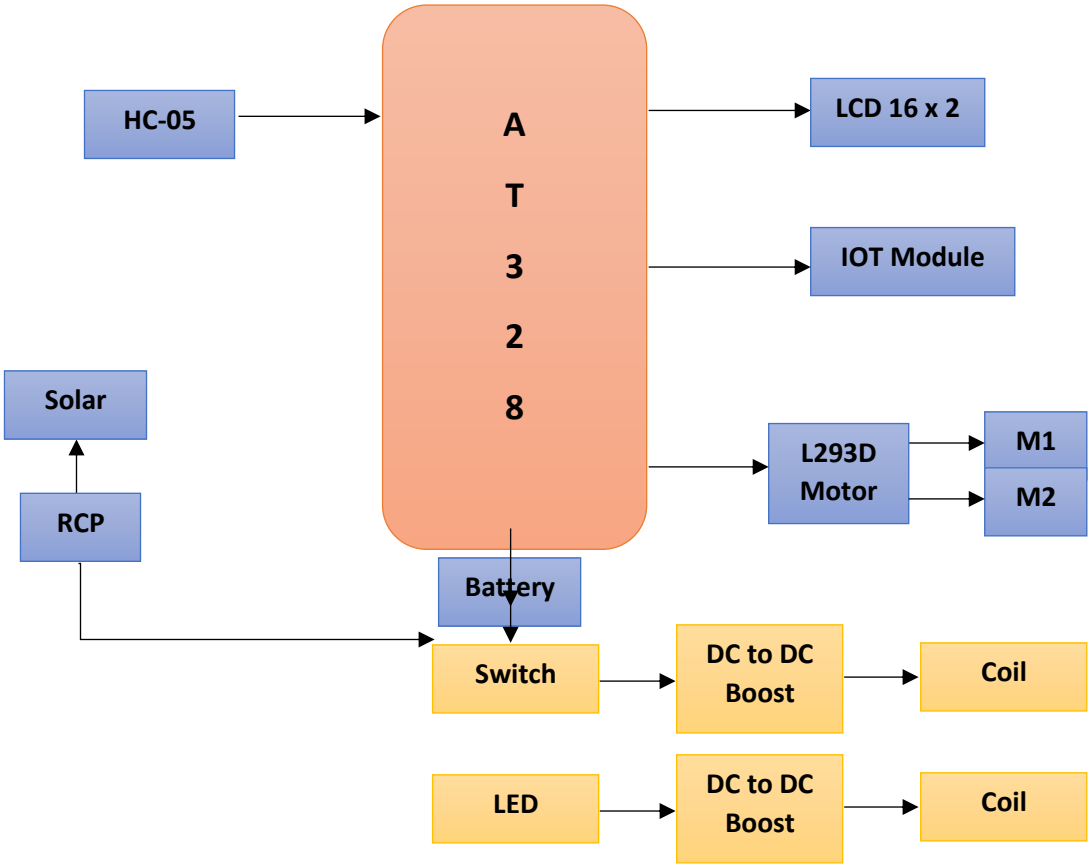

Fig. 2.1 Block Diagram

2.2 BLOCK DIAGRAM DISCRIPTION

The DC voltage can be stored in the battery bank by a charge controller. An inverter is employed to convert the DC voltage from the battery bank to 110-volt AC at 60 Hz frequency that is identical to the power from the electric outlet. This project will address the fundamental concepts of designing and developing charging systems for charging electrical vehicles.

Commands will be transmitted through Bluetooth APP and commands are read, by microcontroller.

With that Commands, the movement will happen with the help of L293D motor driver of two DC motors.

Vehicle motion will happen with two wheels & One 360 rotating wheel. (Right / Left/ forward / backward)

With the help of magnetic coil charge transmission will happen wirelessly

Those should be two magnetic coils

- Transmitter Coil
- Receiver Coil.

Whatever Battery voltage is there that will be displayed on LCD Display and also sent to IOT Thingspeak Server.

After switch on project name will be shown on LCD Display.

We will use SMPS as grid and solar panel, main power source to charge battery.

3. SIMULATION

3.1 CIRCUIT DIAGRAM

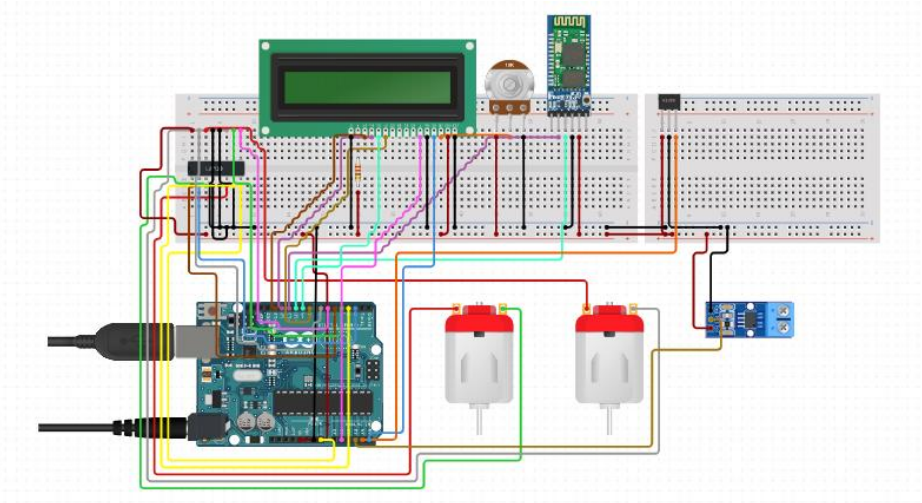

Fig 3.1 Circuit Diagram

4. OTHER SPECIFICATIONS

4.1 APPLICATIONS

- These charging stations can be installed in the parking lots of shopping centers, offices, restaurants, gyms, rest stops along highways, parks, among others, making it easy for the public to charge their vehicles and reduce range anxiety.

4.2 ADVANTAGES

- Although electric vehicles (EVs) are considered an eco-friendly option, global warming due to greenhouse gas emissions will remain an issue if conventional sources of energy are used to generate the electricity to power EVs.
- Several companies like ABB, Magenta Power, Charge Point, Leviton Manufacturing, Schneider Electric, Siemens AG and Tesla are operating in the global EV charging station market.

5. RESULTS AND DISCUSSION

The system makes use of a solar panel, battery, transformer, regulator circuitry, copper coils, AC to DC converter, IOT Module, Atmega controller and LCD display to develop the system. The system demonstrates how electric vehicles can be charged while moving on the road, eliminating the need to stop for charging. The solar panel is used

to power the battery through a charge controller. The battery is charged and stores dc power. The DC power now needs to be converted to AC for transmission. For this purpose, we here use a transformer.

The power is converted to AC using a transformer and regulated using regulator circuitry. This power is now used to power the copper coils that are used for wireless energy transmission. A copper coil is also mounted underneath the electric vehicle. When the vehicle is driven over the coil's energy is transmitted from the transmitter coil to ev coil. Please note the energy is still DC current that is induced into this coil. Now we convert this to DC again so that it can be used to charge the EV battery. We use AC to DC conversion circuitry to convert it back to DC current. Now we also measure the input voltage using an Atmega microcontroller and display this on an LCD display. Thus, the system demonstrates a solar powered wireless charging system for electric vehicles that can be integrated in the road.

6. CONCLUSION

The development of the Charging system for batteries project comprised of various disciplines like electrical, electronics, and mechanical engineering technologies. This project attempted to provide a framework for the battery charging station. The proposed charging system will be one of the initiatives taken to achieve a Green campus. It is clearly evident that the proposed battery charging system is better than the existing electrical charging system both in terms of operation and economical aspects. Researchers work on this project get a basic idea of the design and building of systems for several useful applications such as electrical vehicle system.

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