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Review Paper on Wireless Energy Transfer in Electric Vehicles

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Abstract: ***The speed and capacity of magnetic field simulation and recent advances in power electronics have led to significant growth in the field of wireless power transfer.***
Electric vehicles are being investigated as possible alternatives to internal combustion engine vehicles in the future transport sector, especially for his CO2 reduction and alternative energy objectives. However, the vehicle's heavy weight, large capacity and limited range mean that many important issues need to be addressed. This paper presents a new dynamic wireless on-road charging system for electric vehicles.

I. INTRODUCTION

Growing concern about reducing pollution causing emissions from automobiles has led to the adoption of vehicles powered by comparatively cleaner sources of energy, such as batteries, fuel cells, and so on, in place of vehicles powered by internal combustion engines (ICE). In comparison to ICE vehicles, electric vehicles (EVs) are a developing technology and is promoted as well as supported by the government to its advantages, and much research is being conducted by academia and industry to improve the overall performance of these vehicles.

EV charging technologies are classified as conductive or wireless, fixed or dynamic, slow or fast. This project is a concept to charge electric vehicles wirelessly.

The wireless power transfer technology is desired by EV owners since it can eliminate the problems that come along with charging and makes the process simpler. Using a dynamic WPT system, the EV could be powered while being driven and making the vehicle continue running without stopping, also helping the owners to save on charging time. Sometimes, people forget to plug-in their vehicles for charging and later find themselves running out of battery.

The risk involved with handling the charging cables is eliminated, keeping the owners safe from accidents such as electric shocks which may be fatal.

WPT paves way for making the batteries' size smaller to a reasonable extent, hence reducing the manufacturing cost of EV, and making them available at cheaper prices for owners.

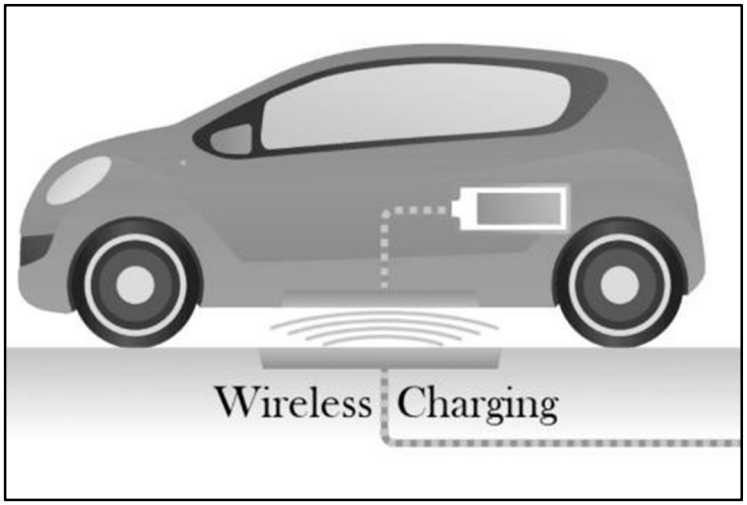


Fig 1: Wireless Charging of Electric Vehicle

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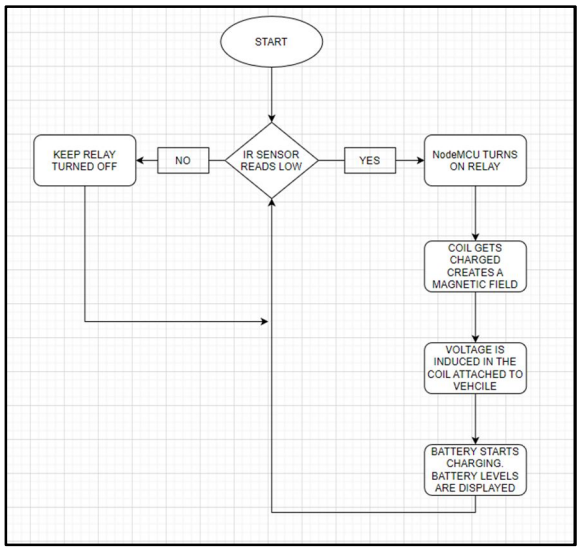


Fig2: Flowchart of WPT in EV.

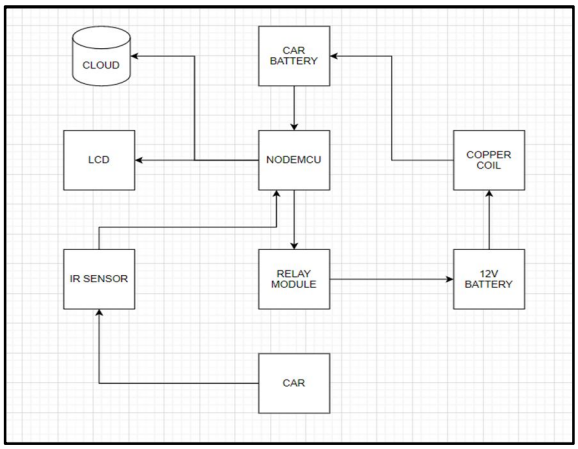


Fig3: Block Diagram of WPT in EV

II. RELATED WORKS

Nassim Iqteit et.al. [1] This research paper deals with the basic overview of the present and future scenarios of EVs. After discussing the scenarios, various concerns regarding battery types and charging methodologies are discussed as well.

A.M. Ahmed et.al. [2] This research paper briefs the measure of amount of received power compared to the transmitted and measure the efficiency by percentage in several intervals.

Sujit Kumar et.al. [3] This research paper shows, A dynamic wireless charging system is developed, and an experiment is performed to assess system output with the improved charging system.

Chandrasekharan Nataraj et.al. [4] In his paper a basic analysis of inductive coils and its parameter calculations are presented.

Sayed Mahmud et.al. [5] This research paper investigates the working principles and applications of linear power supply in ac to dc converters.

K. O. Rauff et.al. [6] This research paper concludes the concept of mutual induction which arises from Faraday's law of electromagnetic induction.

T. C. Beh et. al. [7] In this paper, possibility of tuning the resonant frequency of an antenna pair at a specific distance to 13.56 MHz using an impedance matching (IM) network was investigated to ensure maximum power transfer efficiency.

Imran Okasili et. al. [8] This paper focuses on inductive power transfer, this article categorizes, describes, and carefully compares distinct compensation schemes, converter topologies, and control methods as well as coil structures for wireless power transfer systems.

III. PROPOSED DESIGN

The project consists of IR sensors, 12V Relay-Modules, copper coils having particular number of rotations and a certain diameter. These are integrated together using NodeMCU. Coils are supplied 12V converted from 220V mains using a step-down transformer. Just as the car comes above the coil, the IR sensor is triggered, sends the signal to microcontroller to turn on the relay connected to respective coil. The coil then gets the 12V supplied AC as input and generates an emf in the coil attached underneath the car. Thus, current in that coil is induced, the generated current is converted to DC using a bridge rectifier and is then supplied to the battery via wires. The battery levels can be sent over cloud and can be displayed in a mobile application or on a website.

IV. CONCLUSION

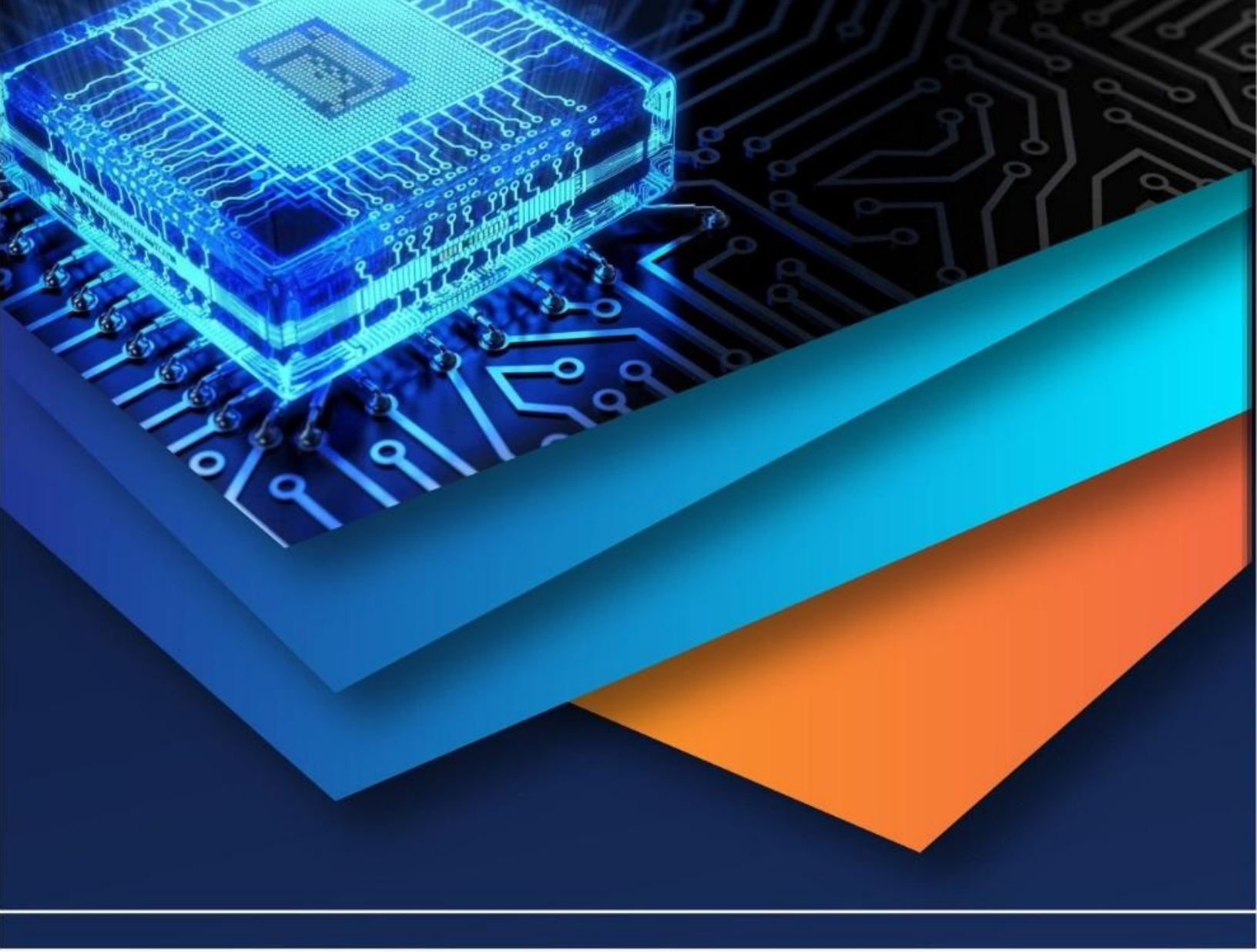
Car Manufacturers are putting a lot of efforts in expanding the landscape and market of Electric Vehicles as both technology and consumer interests are evolving. Consumers have started to trust the future of Electric Vehicles as we have seen an exponential rise in the adoption of EV in the last few years, which in turn brings a dire need to find resolutions to all the charging troublesome, so that Electric Vehicles remain a desirable option for consumers. Implementation of Wireless Power Transfer has proven to be beneficial as: -

1) The risk involved with handling the charging cables is eliminated, keeping the owners safe from tripping hazards.
2) Battery size of EV can be reduced, eventually reducing purchasing cost for consumers.
3) Users will no longer have to take a halt to charge their vehicles, allowing them to complete their journey in desired time.

The vehicle's heavy weight, large capacity, exorbitant purchasing cost, maintenance cost, tripping hazards that accompany charging and limited range are of some the important issues that have been addressed in this paper.

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