Wireless Communication with RF Based Energy Harvesting

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Abstract: The aim of this paper is to agitate a chargeable battery wirelessly and conjointly transfer the necessary data and information from source to destination in the same manner. This paper is constructed upon exploitation of an electronic circuit that converts 230 volts and 50 hertz analog supply into 12 volts. The output is fed to a tesla coil which acts as a primary winding of any air core device. At the secondary or the output side we get 12 volts. Thus, the process is finished from the input winding to the output which are separated with a substantial distance (say 3cm). Due to the property of galvanic isolation, it provides a lower risk of electric shock. Speaking of the outcome of the system referenced in this paper, the wireless transfer of energy or power is substantially achieved and a chargeable battery ignited in the process. This idea is an upcoming technology, and in future the space of energy transfer will be increased because the analysis regarding the subject will be continuous.

Index Terms: Energy harvesting, tesla coil, wireless power transfer, Zigbee.

I. INTRODUCTION

The module that is designed for wirelessly coupling energy can be used in a variety of peripherals for the common goal of wirelessly powering devices. It includes a transmitter section, a receiver and tesla coils. It's advantages like compactness and galvanic insulation gives it an edge in wireless projects. The principle used is EMF transfer to couple energy between two segments [1][2]. The winding creates an EMF from within the transmitter circuit. The coil at the output side takes power from the EMF coupled and converts it back into electrical current. The range of the obtained energy is usually 5 volts and 600 milli-Amperes. The distance between the sender and destination sections cannot be kept very large as it will hamper the low-cost advantage of this project. The maximum possible distance is in proportion with the power that a coil [6] can generate and thus the energy travelled cannot reach more than 3 centimetres. This newly generated EMF voltage can be used for agitating variety of small-scale applications ranging from a small motor towards charging a mobile battery [5].

II. EXISTING SYSTEMS

A typical analysis on user approval on powering of electric automobile wirelessly has been performed. The established model was inspired by Davis prototype of acceptance which supported a standardized layered equation. It is a swollen desegregation component of Ajzens theory of planned behavior contribute to most of the reasons manipulating the acceptance of automobile excitation area unit. Empirical findings indicate that the approval of survey members for this process is based on effective evaluations of wireless excitation. It is all about the subjective norms alleged by the utility of this procedure and environmental awareness. Even the audience who showed less degree of curiosity in the model were willing to use it inside car-sharing or industrial fleets.[1]

The practicability of contactless power transfer (CPT) is being studied comprehensively as an impending clarification for the purpose of charging electronic automobiles. Studies describe that the foremost hindrances in this process are low power productivity, price, scope and charging time. This paper offers an assessment built on prevailing works of the contactless systems for EV charging. Dissimilar situations of CPT expertise, their norm of operation and comparable trail-based analysis is performed. A dialogue on reparation tactics and their usefulness are swotted and conversed. The plan of coil arrangement for some electric cars used in the city has been referenced in general. At the end commendations and deductions are prepared based on the study and exploration of the statistics accessible in literature.[2]

The method of inductive connection is used to validate powering the car cordless device by some kind of wireless module. While conductive powering expertise has been extensively used in many electrical businesses such as mobiles, electrically powered toothbrushes, cordless electronic devices. The reason is that powering through inductors can give more consistent and supple assistances meanwhile it can also be used deprived of a powering cord for the purpose of plug-in. The study sketches the anticipated expansion of a wireless excitation module for such cars. Trial product edifice of wireless post and a cordless car driven by less power are encompassed in this project. The system is endeavoring to establish that a charge can be obtained by a car when it is on the powering area excited by induction principle after parking is done at the correct position. The venture aims to advance the knowledge of wireless charge-transferring technology and it also expects to give a missive that how efficient the charging of a cordless car without a socket is by establishing an evidence of perception for charging based on the phenomena of induction.[3]

With the electric automobile arcade budding rapidly, the evolving wireless charging expertise has engrossed further in latest years. As a crucial chunk of wirelessly powered system for automobiles, the helix structure is obligatory for upgrading the system implementation. This paper offers a synopsis of coil structures for wireless charging, which indicates their fundamental edifice, functioning ideologies, and divergent characteristics. The simple topologies comprising of circular rectangular pad (CRP), circular pad (CP), homogeneous pad (HP), double-D pad (DDP), double-D quadrature pad (DDQP), and bipolar pad (BP), are announced and debated. Also, the equivalent benefits and restrictions of each type are scrutinized and debated. In addition, few vital concerns of practical implementation glitches are paralleled in the coil topologies. At last, the social contact problems are shown.[4]

Another paper overviews novel technique for module which can wirelessly power the electronic automobile which verifies the established theory using cordless charger application of electric vehicle. In the same process which involves powering through charger and wire is inconvenient, hazardous and expensive. The existing gasoline and petrol engine driven vehicles are responsible for air, noise pollution and also for greenhouse gases. The implemented charging module by means of inductive coupling method has been presented in this paper. The driving circuit is used between the source and destination coil where Metal Oxide Semiconductor Field Effect Transistor is used for switching

operation. The transmitter coil circuit is turn ON and OFF whenever the vehicle is present and absent respectively. The system achieves 67% efficiency level while providing safety, reliability, low maintenance and long product life.[5]
An inductive wireless powering passage or track for electronic automobiles is described in this paper. The path proposed here comprises of numerous corkscrew helixes, which are placed down on a path. The explicit considerations for the blueprint of the projected lane are dogged through replication by the finite element analysis (FEA) software. A small module of the wireless powering lane is assembled and investigational outcomes indicate that, an upgraded, surmounted model vehicle, with receptor helixes supporting the bottom, can pass slickly alongside the passage without any outside charge excitation.[6]

III. METHODOLOGY:

BLOCK DIAGRAM: -

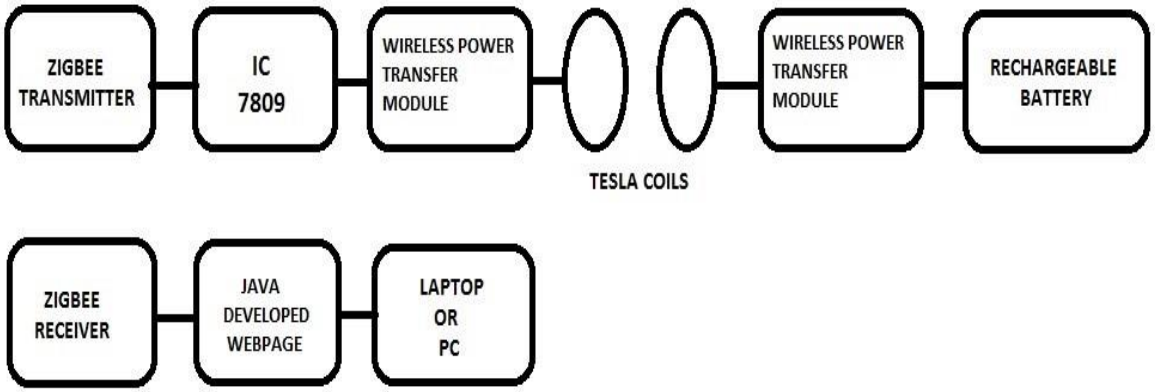

Figure 1: Block diagram of Wireless Power Transfer System

DESCRIPTION: -

A typical and standardized edifice of components is referenced here. The core or the heart of the system will be the Wireless Power Transference modules which will be placed at both the transmitter and receiver sections. These modules serve the basic purpose of WiTicity, i.e., Wireless Electricity by making the wireless transferal between source and destination possible. The Zigbee modules will permit the communication of data amid two entities and will aid in displaying definite parameters on the screen. IC 7809 is required to regulate the voltage to the desired level as it needs to be stepped down after receiving it from the supply source. Along with the wireless prototypes, two Tesla coils are necessitated to serve the purpose entirely. The intensity of energy transferred depends on the configuration of the helix structures as well as on distance between them. The ultimate application can be anything of a small-scale that can be driven on low power. This system uses a rechargeable battery which can later be utilized to power numerous devices.

BRIEF WORKING:

The proposed prototype implies an efficient and conservative method of wireless energy transferal between two modules. The concept can be briefly divided into two sections namely- the hardware part and the software part. The wireless modules and tesla coils form the foundation of the hardware fragment which contribute to the absolute functioning of the objective of the expertise. The wireless transference module as its name suggests, is accountable for coupling the power arriving from the source supply to the destination side. The two modules present at the either sides do not require any sort of connection amid them and hence can transfer the energy effectively and conservatively. These modules in association with the Tesla coils achieve the desired results. These coils are nothing but spiral helixes which control the intensity of the energy coupled from the source to the receptor. These coils need to be placed sufficiently close to one another so that the maximum energy can be transported in the process. The amount of power obtained at the secondary port depends largely on the extent of supply source and the windings present in the coil. The energy acquired at the receptor terminal can be later utilized to excite a rechargeable battery to its highest potential. The battery is supported with a numerous USB cords which can be used to drive or excite various small-scale devices.

IV. OUTPUT RESULTS

The experiment for observing success of the developed prototype was carried out and the results were more than satisfying. The acquired energy was efficient and sufficient to excite a rechargeable battery which further drives a bunch of USB cords to ignite any form of small-scale devices. In the test performed, a mobile device was charged with the received energy and the feasibility of the prototype was proved.

V. FUTURE SCOPE

With further modifications and upgradations, this expertise can be taken to another level so that the constraints of energy obtained at the output and distance can be restricted. This prototype can serve as a base for the upcoming trends in the field of wireless energy transferral. This method can assist as a stepping stone for developing a well-defined edifice for high power transmissions from one point to another.

VI. CONCLUSION

This prototype has been successfully tested and driven according to the predefined objectives and goals and it gives satisfactory results for the same. The need of a wireless technology for effortless powering and excitation of low power devices has been met. This paper scrutinized the fundamental approaches related to wireless energy transferral and set a certain proportion of considerations related to the hardware and the software structures.

VII. REFERENCES

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