Non Complex Physical Energy Transmission

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ABSTRACT

The primary motive of this paper is to present design of wireless power transmission. Electrical energy can be transmitted via two ways, one is wired and the other one is wireless. Wired electric transmission is complicated in design and causes power loss in the form of heat, easy way to overcome this disadvantage by using wireless transmission. This paper explains how the electrical energy is transferred from a source to the load, without any wired conductive physical connection. In this proposed work two coils are used one is primary and another is secondary, Electromagnetic Induction coupling principle is used which creates the magnetic field. The tesla coil can be used as a transmitter. Tesla coil induces high density flux, high frequency, high voltage and low alternating current. In addition to this we like to include a Control Switch which receives power from secondary coil. This can be implemented in Electronic devices like Phone, Laptop, etc.

Keywords:
Wireless Power Transmission (WPT),Electromagnetic Mutual Induction Coupling, High Frequency Switching

INTRODUCTION:

Wireless Power Transfer technology helps in eliminating power cords reduces the risk of electric shock and makes power transfer more practical than wired chargers. It is believed that Wireless Power Transfer (WPT) makes it possible to transfer power through an air gap, without the need for current-carrying conductors[1]. It can provide power from an AC source to compatible batteries or devices without any physical connectors or wires. It can recharge batteries of mobile phones & tablets, drones, cars, even transportation equipment[2].The concept of transferring power without wires, however, has been around since the late 1890s. Nikola Tesla achieved it by lighting electric bulbs wirelessly at his Colorado Springs Lab using electro dynamic induction[3]. Depending on the power and distance, energy can be effectively transferred via an electro magnetic field, such as radio waves, microwaves. A Control Switch is additionally added to this device(receiver) to control the power flow. In a typical high-power inductive wireless power transfer (WPT) system, AC signal, which drives the coupled resonant inductors (couplers), is produced by a half- or full-bridge inverter[4].

Brief History

- Nikola Tesla – Experimented in 1899 Imagined a global wireless power distribution system
- William Brown Established microwave to electricity conversion
- Invention of the Solar PanelvFirst NASA solar powered satellite 1958

- Oil Crisis NASA program
- Marine Soijacic and his team – Experimented in 2007ν 60-watt light bulb from a power source 7 feet away¬ without wires. Currently looking for Witricity in the range of 100¬ watts.

NEED FOR WIRELESS POWER TRANSFER:

Wireless power transmission is employed in cases where continuous energy transfer is needed, but interconnecting wires are inconvenient, hazardous, or impossible. Number of household points receives electricity at the same frequency using transmitting coil as long as they all are at the resonance. Thus this setup could recharge all the devices in a room at once. An WPT system, based on this method would eliminate the need for an inefficient, costly, and capital intensive grid of cables, towers, and substations. System would reduce the cost of electrical energy used by the consumer. It will get rid of the landscape of wires, cables, and the transmitting towers. More efficient energy distribution systems and sources are needed by both developed and under developed nations. To transmit wireless power to any distance without limit. It makes no difference what the distance is. The power failure due to short circuit and fault on cables would never exist in the transmission. Power theft would be not possible at all.

METHODOLOGY:

This paper aims at creating a system that can transmit power wirelessly. This is done by connecting a input to an inductive coupling system that uses magnetic fields to transfer the energy through air gap. The coupling system involves a transmitting coil L1 transmitting energy to a receiving coil L2. This is done by sending high frequency + AC signal through the L1 coil, and creating a magnetic field B, the L2 coil then creates an energy signal using the magnetic field. The coupling for which the circuit is shown in the figure below:

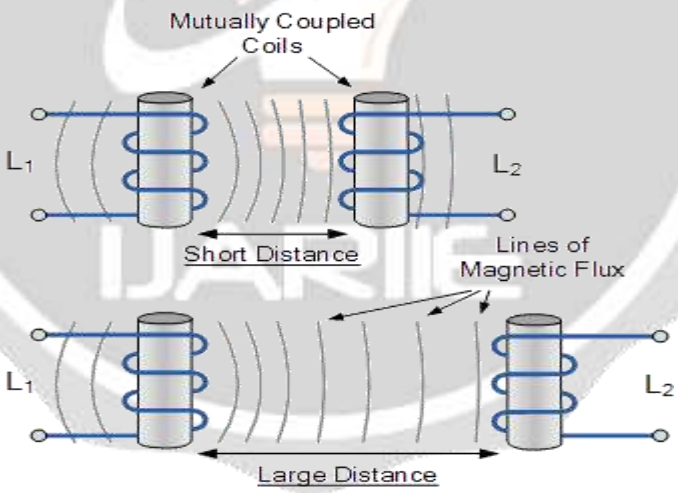
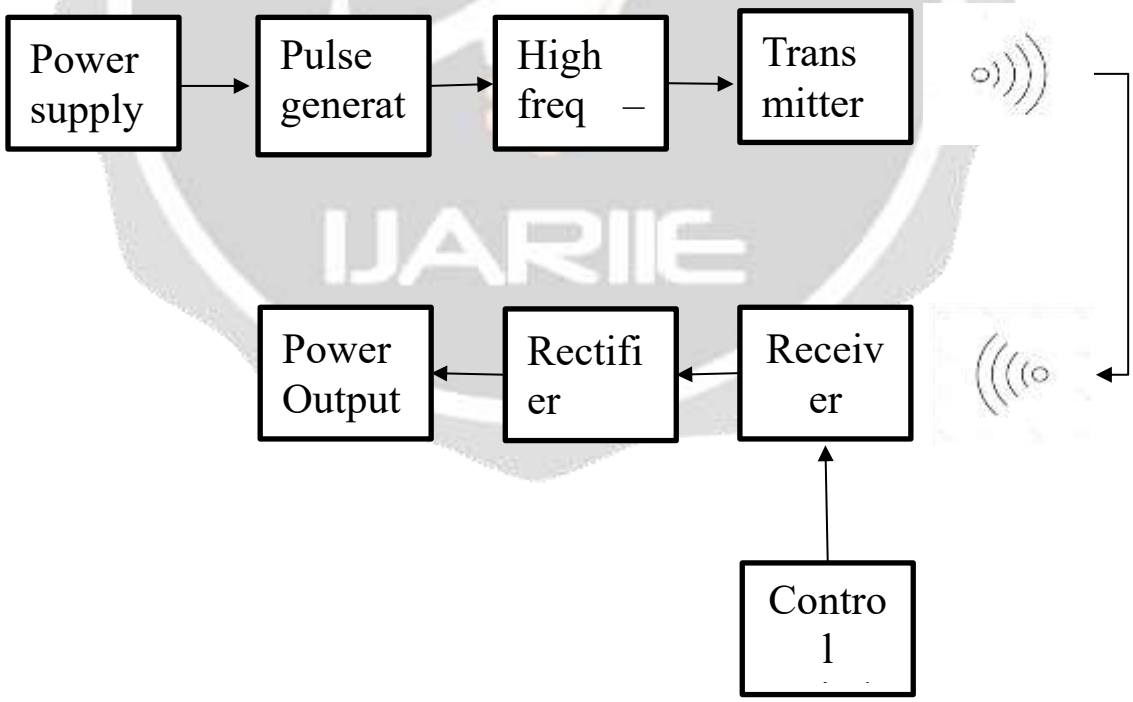


Figure 1: Inductive Coupling system

Figure 2: Inductive Coupling coil.

The system's overall efficiency is based on the size ratio D2/D1of the two coils and the distance between the two coils (Z). As the ratio D2/D1 decreases, the efficiency of the system will decrease. As the distance between the two coils increases, the efficiency of the system also decreases. A power source supplies the primary coil, D1, with a high frequency AC, this causes a magnetic field to be generated in the primary coil. The magnetic field generated the L1 coil, induces a high frequency AC voltage in the L2 coil according to Faraday's Law of induction. The output voltage from the L2 coil is rectified by using the Bridge rectifier and used to power a load (charging of mobile). The power transmission is done through mutual inductance(Ex : Transformer)

OUR PROPOSED METHOD:



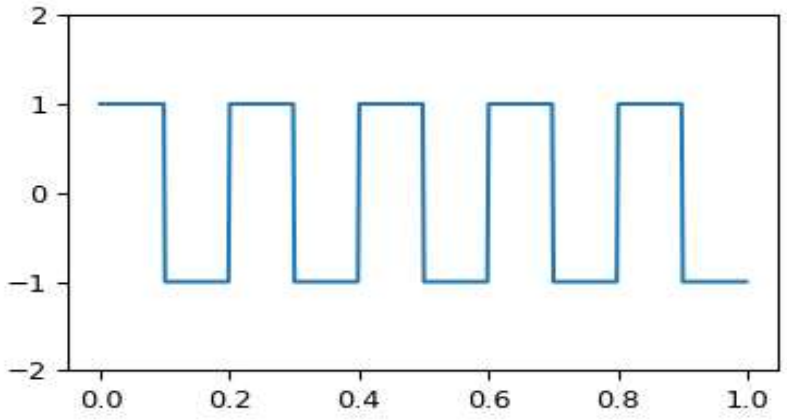
- In our proposed system Shape and orientation of both transmitter and receiver coil is modified.
- Electromagnetic Induction coupling principle is used. Electromagnetic coupling is evolved between transmitter and receiver coil.
- Shape of the coil is modified to obtain field in 360 °.
- In addition to this we like to include a Control Switch, which is used to control the output voltage to the device. This can be implemented in Electronic devices like Phone, Laptop etc.

APPLICATIONS

Different applications regarding WPT are eliminating traditional battery charging systems . It allow us to charge a mobile phone or laptop without using a power cord that is , it can charge the battery wirelessly .It can be implemented even in home like laptop and phone charge continuously and wirelessly. Charging can be controlled by a switch an the receiver. more complex applications include charging of EVs (electric vehicles) batteries. As Electrical vehicle become will rule the future . Reduced risk factor like Short Circuit WPT reduces the cost when compared to the wired system

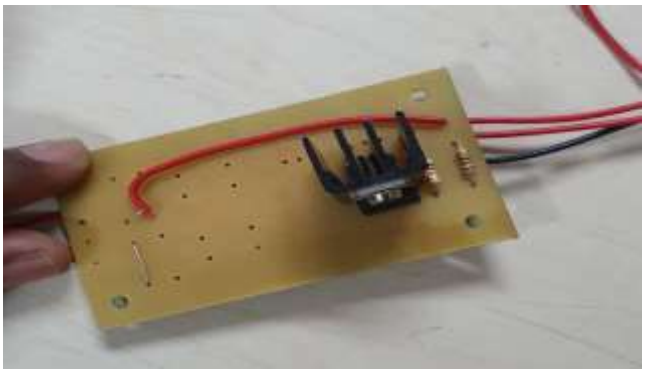
COMPONENTS :
PULSE GENERATOR:

It receives 5V input from power supply and produces the output frequency of about 200HZ-2KHZ.
The pulse generators can be used to generate pulses which can stimulate logic circuit and use to create Sine pulse In order to be able to provide the right kinds of pulses a considerable degree of adjustment is required for the pulses in terms of length, delay, repetition rate and the like. In this to produce a variety of waveforms, the pulse width can be variedby the pulse generator.



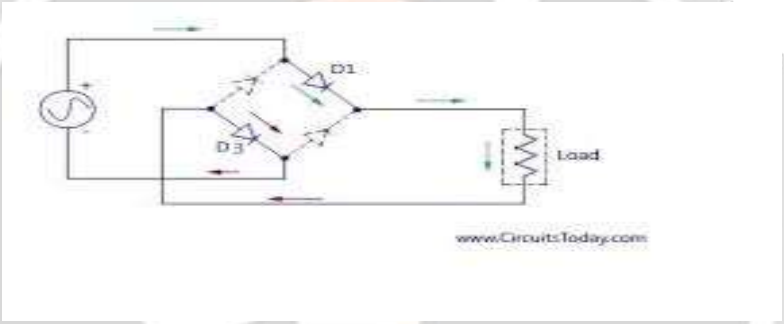
HIGH FREQUENCY SWITCHING CIRCUIT:

The output of the pulse generator is given as input to this frequency-switching circuit. This device gives output in the range of approximation 1.5 MHZ. This purpose of this circuit is to control the voltage and current flow between the source and drain. It works almost as a switch



RECTIFIER AND REGULATOR:

A rectifier converts AC to DC, which flows in only one direction. We are using Bridge rectifier for better efficiency. Additionally a capacitor is used to filter the rectifier output.



A Regulator constantly produces 5V output. The output from regulator is applied to the load. We used transistor and regulator diode(5.2V) to produce constant output of 5V to charge the mobile phones.

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CONCLUSION:

The power transmission efficiency are important. Regardless of the degree of alignment between the coils efficiency could be maintained relatively stable. In WPT, it reduces the complexity in wires where wires delivers less efficiency by dissipating the power in the form of heat. Thus Non complex physical energy transmission reduces the risk of danger compared to wired connections.

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