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Wireless Power Transmission System

Mr. Anurag A. Sutar[1], Dipti K. Swami[2], Tejas N. Bindale[3], Mruna M. Kharatmal[4]
[1, 2, 3, 4]Department of Electrical Engg.Sanjay Bhokare group of Institute, Miraj

Abstract: Wireless power transfer is a new technology of the world. Transfer electrical power without any physical contact (conductors and wires, any electrical equipment without use) between the source and the load. Wireless power transfer technology can potentially reduce or eliminate the need for wires and batteries. Wireless transmission is useful to power electrical devices where interconnecting wires are inconvenient, hazardous, or are not possible. The metal which are used to make electric wire will extinct in future .Electric power is transferred at a frequency of about 100 kHz in a medium distance range to light on a 3 watt lamp making use of resonance.
Keywords: Wireless power transfer, inductive coupling, A4WP, microwave power transmission

I. INTRODUCTION

This technology provides efficient, fast, and low maintenance cost as compared to previous technologies.It also allows portable electronics to charge themselves without ever being plugged in ubiquitous power wire. On the other hand, power loss of this technology is very less as compared to wired electricity transmission. The main function of wireless power transfer is to allow electrical devices to be continuously charged and lose the constraint of a power cord. There are three main systems used for WPT such as microwaves, resonance, and solar cells. Microwaves would be used to send electromagnetic radiation from a power source to a receiver in an electrical device. The founder of AC electricity, Nikola Tesla, was first to conduct experiments dealing with WPT. His idea came from the notion that earth itself is a conductor that can carry a charge throughout the entire surface. While Tesla's experiments were not creating electricity, but just transferring it, his ideas can be applied to solve our energy crisis. Each application has its respective drawbacks but also has the potential to aid this planet in its dying need for an alternative to creating power. Today, portable technology is a part of everyday life. But from portability emerges another challenge is energy. Almost all portable devices are battery powered, meaning that eventually, they all must be recharged using the wired chargers currently being used. Now instead of plugging in a cell phone, PDA, digital camera, voice recorder, mp3 player or laptop to recharge it, it could receive its power wirelessly Although wireless power transfer is feasible and helps in human daily lives, but this technology suffers from several drawbacks namely requires a network of hundreds of satellites and interferences with other electronic devices. There are two techniques in wireless power transfer, which are near-field technique and far-field technique.

II. SCOPE AND RELEVANCE

A. Inductive Coupling Inductive or Magnetic coupling works on the principle of electromagnetism. When a wire is proximity to a magnetic field, it generates a magnetic field in that wire. Transferring energy between wires through magnetic fields is inductive coupling. If a portion of the magnetic flux established by one circuit interlinks with the second circuit, then two circuits are coupled magnetically and the energy may be transferred from one circuit to the another circuit. This energy transfer is performed by the transfer of the magnetic field which is common to the both circuits. In electrical engineering, two conductors are referred to as mutual-inductively coupled or magnetically coupled when they are configured such that change in current flow through one wire induces a voltage across the end of the other wire through electromagnetic induction. The amount of inductive coupling between two conductors is measured by their mutual inductance. Inductive Coupling with Four Component Fluxes Power transfer efficiency of inductive coupling can be increased by increasing the number of turns in the coil, the strength of the current, the area of cross-section of the coil and the strength of the radial magnetic field. Magnetic fields decay quickly, making inductive coupling effective at a very short range.

B. Inductive Charging Inductive charging uses the electromagnetic field to transfer energy between two objects. A charging station sends energy through inductive coupling to an electrical device, which stores the energy in the batteries. Because there is a small gap between the two coils, inductive charging is one kind of short- distance wireless energy transfer. Induction chargers typically use an induction coil to create an alternating electromagnetic field from within a charging base station, and a second induction coil in the portable device takes power from the electromagnetic field and converts it back into electrical current to charge the battery. The two induction coils in proximity combine to form an electrical transformer. Greater distances can be achieved when the inductive charging system uses resonant inductive coupling.

III.LITERATURE REVIEW

A. Tesla's Experiment

Tesla demonstrating wireless power transmission in a lecture at Columbia College, New York, in 1891.The two metal sheets are connected to his Tesla coil oscillator, which applies a high frequency oscillating voltage. The oscillating electric fields between the sheets ionizes the low pressure gas in the two long Geissler tubes he is holding, causing them to glow by fluorescence, similar to neon lights. Experiment in resonant inductive transfer by Tesla at Colorado Springs 1899.The coil is in resonance with Tesla's magnifying transmitter nearby, powering the light bulb at bottom. Inventor Nikola Tesla performed the first experiments in wireless power transmission in wireless power transmission at the turn of the 20th century, and may have done more to popularize the idea than any other individual. In the period 1891 to 1904 he experimented with transmitting power by inductive and capacitive coupling using spark-excited radio frequency resonant transformer, now Called Tesla coils, which generated high AC voltages.With these he was able to transmit power for short distances without wires. In demonstrations before the American Institute of Electrical Engineers and the 1893 Columbian Exposition in Chicago he lit light bulbs from across a stage.He found he could increase the distance by using a receiving LC circuit tuned to resonance with the transmitter's LC circuit, using resonant inductive coupling. At his Colorado springs laboratory during 1899-1900,by using voltages of the order of 10 megavolts generated by an enormous coil. he was able to light three incandescent lamps at a distance of a about one hundred feet. The resonant inductive coupling which Tesla pioneered is now a familiar technology used throughout electronics and is currently being widely applied to short-range wireless power systems[1]

W.C.Brown, the pioneer in wireless power transmission technology, has designed, developed a unit and demonstrated to show how power can be transferred through free space by microwave.In the transmission side,the microwave power source generates microwave power and the output power is controlled by electronic control circuits. The waveguide ferrite circulator which protects microwave source from reflected power is connected with the microwave power source through the coax-waveguide adaptor. The tuner matches the impedance between the transmitting antenna and the microwave sourceattenuated signals will be then separated based on the direction of signal propagation by Directional Couplers by Directional Coupler. The transmitting antenna radiates the power uniformly through free space to the rectenna. In the receiving side, a rectenna receives the transmitted power and converts the microwave power into DC power.[2] Witricity is building a near field wireless charging apparatus for consumer devices with the help of the Haier group, a chinese electronics manufacturer. Witricity demonstrated this technology by wireless powering a 32 inch television at a distance of six feet. Delphi Automotives is working with Witricity to develop a wireless charging system for electric cars. The groundbreaking technology will enable to automotive manufacturer to integrate wireless charging into the design of hybrid & electric vehicles. There is another standard protocol for charging mobile phone initiated by the Wireless Power Consortium [3].

William C. Brown contributed much to the modern development of microwave power transmission which dominates research and development of wireless transmission today. In 1960s Brown invented the rectenna which directly converts microwave into dc current.[3][1]

· · · · B. L. Cannon, J. F. Hoburg, D. D. Stancil, et al., "Magnetic Resonant Coupling As a Potential · In contains a demonstration of power transfer from a single resonant source coil to multiple resonant receivers, focusing upon the resonant frequency splitting issues that arise in multiple receiver applications. The resonant coupling system is modeled with either single or multiple receivers using a relatively simple circuit. The model takes into account mutual coupling between all coils, and does not make approximations usually associated with the coupled mode approach. The analysis made with the model shows that high Q resonant coupling is key to the efficiency of the system, through an implementation where the primary coil is inductively coupled to the power source and the receiving coils are inductively coupled to the loads. The developed work can help to understand the resonant coupling mechanism and to extend it to multiple mobile receivers. Authors point out that the main challenge is to adjust the lumped capacitances at the terminals of the receivers as they move with respect to the source coil and with respect to one another.[4] \

The author Z. N. Low, R. A. Chinga, R. Tseng, et al., designed and fabricated an efficient and compact wireless power transfer system achieving low-power loss using the switched-mode class-E transmitter of high-efficiency via planar inductive coupling using air coils. This wireless power transfer system was able to achieve a desirable power-delivery response across a wide range of load resistances without any control mechanism. The authors studied two types of air cooling systems to increase the efficiency and the power delivery of the wireless power transfer system. The proposed system is capable of 295 W of power delivery at 75.7% efficiency with forced air cooling and of 69 W of power delivery at 74.2% efficiency with air natural convection cooling. This is the highest power and efficiency of a loosely coupled planar wireless power-transfer system reported to date (2009). The system can be used to provide power wirelessly to various electronic portable devices, industrial appliances, and many other interesting applications.

This technology can be applied to rugged electronics to enable the creation of hermetically sealed units and to eliminate the problem of charging port contamination and corrosion. In environments where sparking and arching hazards exist, this technology can be applied to eliminate an electronic device's external metallic contacts[5]

Describes the design considerations for high energy inductive link. An inductive link is a dc-dc converter built around a coupled transformer, after rectification, the voltage regulator ensures a constant output voltage. This paper discusses the major differences between low power and high power inductive links. An inductive link capable of transferring 20 W of power over a distance of 1 cm with an efficiency of 80% is presented. Both the external and the remote coil have diameters of 6 cm and a thickness of 2 mm. This core link drive will be integrated into biomedical, industrial and automotive applications[6]

T. Imura, Y. Hori, "Maximizing Air Gap and Efficiency of Magnetic Resonant Coupling for In the relationship between maximum efficiency air gap using equivalent circuits is analyzed and equations for the conditions required to achieve maximum efficiency for a given air gap are proposed. The results of these equations match well with the results of electromagnetic field analysis and experiments. The relationship between frequency and the efficiency of wireless power transfer is studied using electromagnetic field analysis by varying the length of the air gap. The method of moments is used in the electromagnetic field analysis[7]

The creation of WPT dates back to the 19th century, when Tesla invented the Tesla coil. Several studies have been directed in this area in recent years, but transfer distance and transfer efficiency of WPT methods continue to pose a challenge. Although experiments were conducted by many researchers and extensive efforts for near-field WPT (i.e., inductive coupling and magnetic resonant coupling techniques) were presented, a number of practical challenges can be identified, such as orientation and interference. The first challenge is the alignment or orientation between the source and destination coils. The maximum transfer distance can be achieved if and only if the coaxial alignment is ensured between the coils. Other orientation settings, such as 45° rotation or coplanar relative to the coaxial alignment, minimize the coupling factor between the receiving and transmitting coils; therefore, the transfer distance and efficiency are reduced. Second, when these technologies are expanded to charge several devices, mutual coupling between different receiving coils and other entities may cause interference; then, watchful tuning is required [8]

IV. OBJECTIVES OF PROPOSED WORK

The main objectives of proposed system are as follows:

A. To provide inducive coupling coils
B. To use sensor A4WP, microwave power transmissio fusion concept using power transfer.
C. To design and use efficient algorithm for achieving without any equipment use the power transfer one to another device.
D. To implement the wireless power transmission system.

V. METHODOLOGY

This project will use the principle of magnetic inductive coupling to transfer electricity between two separate coils.

At the first step Materials. Overall, this experiment does not require too many materials, many of which can be easily acquired we collect the needed materials for each type of work satisfactorily.

Then Building the Two Coils electromagnetic field analysis by using the copper wire coil .primary coil is sending electricity from coil through and secondary coil is received coil

The transistor is the brain of this operation. Its purpose it to connect and disconnect the power at a rapid pace, thus creating a changing magnetic field in the inducer coil. This changing magnetic field is what induces an electric current in the receiver coil; which powers the LED

To properly connect the transistor, need to attach the correct coil leads to the correct transistor terminals (emitter, base, and receiver). The transistor will be soldered on.

The LED will be soldered to the two leads of the receiver coil. This allows the LED to be powered easily when the receiver coil is moved around the magnetic field. Each LED terminal will be connected to one lead of the receiver coil. The positive and negative of the led do not matter, as the current in the receiver is changing.

Once everything has been assembled and the power connected, hover the receiver coil over the inducer coil and watch the LED light up; without wires!!! I recommend experimenting with different positions and distances, as it is lots of fun. You can even place items between the coils, and the LED will still be powered. Also try flipping the receiver coil over if the LED is not very bright, as the magnetic flux of the receiver coil flows in one direction. The platform (black rectangle under the coils) is not necessary, but it allows you to move the whole project around more easily. It is simply the inducer coil glued to a note card wrapped in electrical tape.

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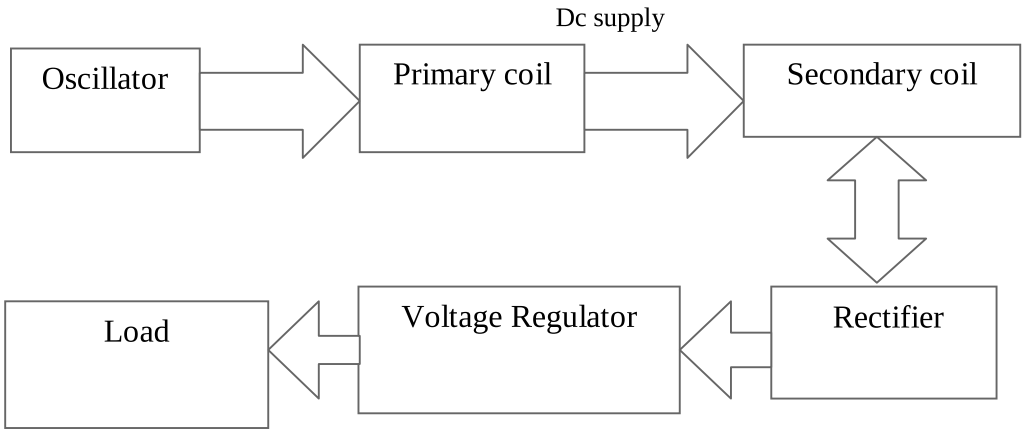
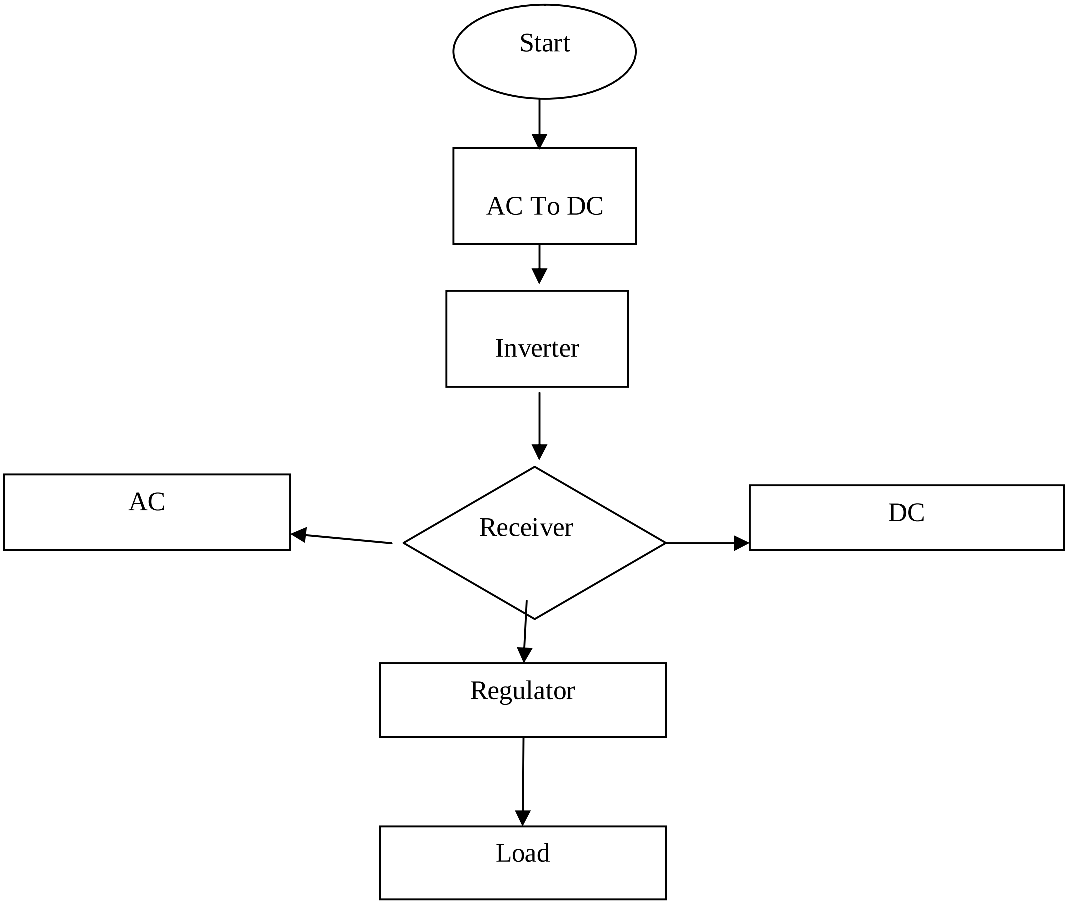
A. Flow Chart for WPTS



Flowcharts are used for used in designing and documentation of process and programmes. For indications first step start with the help of input controls also workng the all portable electronics devices starts running. If power transfer in container is empty then LED indicator is glowed. Else power supply compliting the path.

B. Flow chart of working of WPTS



This is flowchart of working of wireless transmission system.at initial stage to starts running with help of input.

VI. DESIGN STEPS

1) *Step 1:* Designing of block diagram of the system & selection of components.
2) *Step 2:* Interfacing of magnetic coils
3) *Step 3:* Interfacing the Reciever Coil and sending coil at separate two coil installed
4) *Step 4:* Connecting load as a mobile phone ,charger and indicator (LED)
5) *Step 5:* Designing system for wirless power transmission system parameters measurement and linking of parameters with actions of wireless transmission
6) *Step 6:* System Implementation

a) Completion of the hardware part.
b) Working basic programs
c) Testing of an overall system working.

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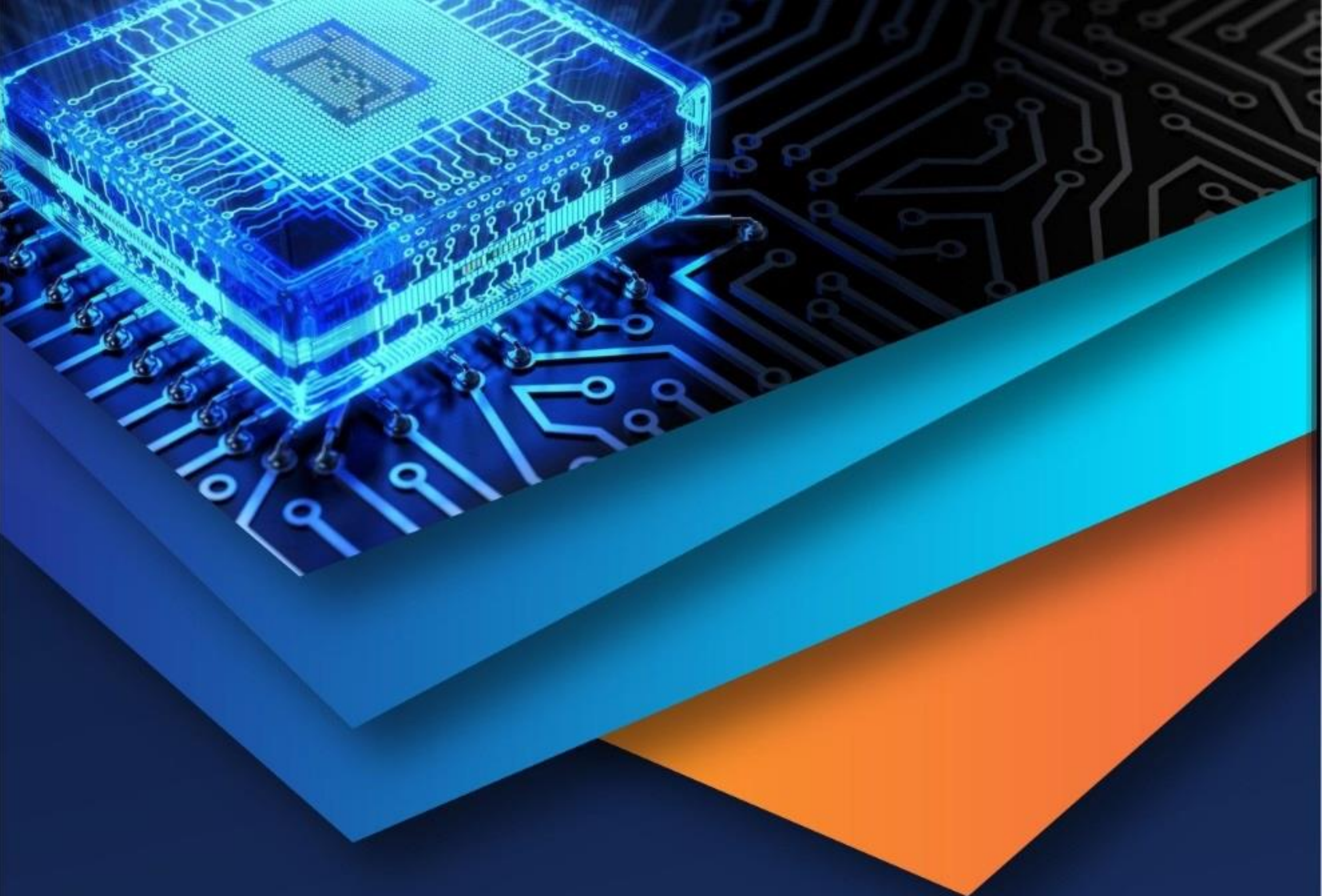

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