Wireless Power Transmission for Mobile and Wheel Chair Charging of Physically Challenged People

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Abstract--- In this project wireless power transfer is used for providing power supply to various loads using a mobile wheel chair. This chair is operated using RF technology. This project integrates two wireless technologies: wireless power transfer and RF technology. The working principle behind wireless power transmission is electromagnetic induction. Wireless power or wireless energy transmission is the transmission of electrical energy from a power source to an electrical load without man-made conductors. Wireless transmission is useful in cases where interconnecting wires are inconvenient, hazardous, or impossible.

Index terms--- Wireless Power Transfer; Magnetic Resonance Coupling; Nuclear Waste Management; Multi Barrier System;

I. INTRODUCTION

The working principle behind wireless power transmission is electromagnetic induction. Wireless power or wireless energy transmission is the transmission of electrical energy from a power source to an electrical load without man-made conductors. Wireless transmission is useful in cases where interconnecting wires are inconvenient, hazardous, or impossible. With electro dynamic induction, electric current flowing through a primary coil creates a magnetic field that acts on a secondary coil producing a current within it. Coupling must be tight in order to achieve high efficiency. [3]

This action of an electrical transformer is the simplest form of wireless power transmission. The primary and secondary circuits of a transformer are not directly connected. Energy transfer takes place through a process known as mutual induction. Principal functions are stepping the primary voltage either up or down and electrical isolation. Mobile phone and electric toothbrush battery chargers, and electrical power distribution transformers are examples of how this principle is used. Induction cookers use this method. The receiver must be directly adjacent to the transmitter or induction unit in order to efficiently couple with it. In this paper, we will report some recent progress on wireless power transfer (WPT) based on resonant coupling.

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Two major technologies will be discussed: the use of meta materials and array of coupled resonators. With a slab of meta material, the near-field coupling between two resonant coils can be enhanced; the power transfer efficiency between coils is boosted by the meta material. The principle of enhanced coupling with meta material will be discussed; the design of meta material slabs for near-field wireless power transfer will be shown; recent experimental results on wireless power transfer efficiency improvement with meta material will also be presented. By using an array of resonators, the range of efficient power transfer can be greatly extended. More importantly, this new technology can provide wireless power to both static and mobile devices dynamically. The principle of this technology will be explained; analytical and numerical models will be used to evaluate the performance of a WPT system with an array of resonators; recent experimental developments will also be presented.

ELECTROMAGNETIC FORCE:

An electric current flowing through a conductor, such as a wire, carries electrical energy. When an electric current passes through a circuit there is an electric field in the dielectric surrounding the conductor; magnetic field lines around the conductor and lines of electric force radially about the conductor.

PRINCIPLE OF EMI

"When a conductor is exposed to a changing magnetic field, an electric current will flow in the conductor." [1] We need a power source and a transmitting antenna, and also a receiving antenna to which we can connect the thing to be powered (the electrical load, or just the load). The power source will deliver a high power signal to the antenna. This will create an electrostatic field around the antenna that changes as the signal to it changes. This will create electromagnetic waves that will travel out from the antenna and through the air. The receiving antenna will be in the path of these waves, and the waves will pass by it and "sweep" it with their moving electromagnetic fields. This will induce a signal in the receiving antenna proportional to the energy that the antenna captures. This signal will cause current flow that will power the load.

II.EXISTING SYSTEM

In the existing system, wheelchair is controlled manually and hence the person needs somebody to help them in moving from one place to another. Also automatic movement is not possible.

III.PROPOSED WORK OF THIS SYSTEM

In the proposed system, an automatic battery chargeable wireless wheelchair control is introduced using wireless power transfer technology and android technology. [1] The system consists of a battery operated wheel chair for disabled persons and the movements of the wheelchair is controlled by giving commands from an android smart phone in which an application is developed for the purpose. Commands like forward, reverse, left, right, start and stop are given to the wheel chair using wireless power transfer. These commands are sent to the chair through a blue tooth transceiver module in the chair. A microcontroller is used to control the movements of the wheel chair using relays and motor. The wheel chair module consists of a wireless power receiver coil. Also, the android mobile has a wireless power receiver coil in it. Both these coils, when brought near the wireless power transmitter coil, the battery get charged automatically. They don't have to plug in the charger.

IV.POWER SUPPLY

DESCRIPTION

The KA78XX/KA78XXA series of three-terminal positive regulator are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a wide range of applications. Each type employs internal current limiting, thermal shut down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents. The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

WORKING PRINCIPLE

TRANSFORMER

The potential transformer will step down the power supply voltage (0-230V) to (0-6V) level. Then the secondary of the potential transformer will be connected to the precision rectifier, which is constructed with the help of op–amp. The advantages of using precision rectifier are it will give peak voltage output as DC, rest of the circuits will give only RMS output.

V.BRIDGE RECTIFIER

When four diodes are connected as shown in figure, the circuit is called as bridge rectifier. The input to the circuit is applied to the diagonally opposite corners of the network, and the output is taken from the remaining two corners.

Let us assume that the transformer is working properly and there is a positive potential, at point A and a negative potential at point B. the positive potential at point A will forward bias D3 and reverse bias D4.

The negative potential at point B will forward bias D1 and reverse D2. At this time D3 and D1 are forward biased and will allow current flow to pass through them; D4 and D2 are reverse biased and will block current flow.

The path for current flow is from point B through D1, up through RL, through D3, through the secondary of the transformer back to point B. this path is indicated by the solid arrows. Waveforms (1)

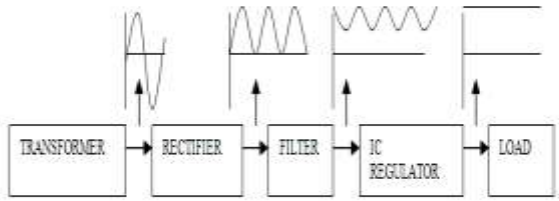

Fig. 1 Block Diagram of Power Supply

and (2) can be observed across D1 and D3. secondary of the transformer reverse, forward biasing D2 and D4 and reverse biasing D1 and D3. Current flow will now be from point A through D4, up through RL, through D2, through the secondary of T1, and back to point A. This path is indicated by the broken arrows. Waveforms (3) and (4) can be observed across D2 and D4. The current flow through RL is always in the same direction. In flowing through RL this current develops a voltage corresponding to that shown waveform (5). Since current flows through the load (RL) during both half cycles of the applied voltage, this bridge rectifier is a full-wave rectifier.One advantage of a bridge rectifier over a conventional full-wave rectifier is that with a given transformer the bridge rectifier produces a voltage output that is nearly twice that of the conventional full-wave circuit.This may be shown by assigning values to some of the components shown in views A and B. assume that the same transformer is used in both circuits. The peak voltage developed between points X and y is 1000 volts in both circuits.

In the conventional full-wave circuit shown—in view A, the peak voltage from the center tap to either X or Y is 500 volts. Since only one diode can conduct at any instant, the maximum voltage that can be rectified at any instant is 500 volts.

The maximum voltage that appears across the load resistor is nearly-but never exceeds-500 v0lts, as result of the small voltage drop across the diode. In the bridge rectifier shown in view B, the maximum voltage that can be rectified is the full secondary voltage, which is 1000 volts. Therefore, the peak output voltage across the load resistor is nearly 1000 volts. With both circuits using the same transformer, the bridge rectifier circuit produces a higher output voltage than the conventional full-wave rectifier circuit.

IC VOLTAGE REGULATORS

Voltage regulators comprise a class of widely used ICs. Regulator IC units contain the circuitry for reference source, comparator amplifier, control device, and overload protection all in a single IC. IC units provide regulation of either a fixed positive voltage, a fixed negative voltage, or an adjustable set voltage. The regulators can be selected for operation with load currents from hundreds of milli amperes to tens of amperes, corresponding to power ratings from milli watts to tens of watts.

A fixed three-terminal voltage regulator has an unregulated dc input voltage, Vi, applied to one input terminal, a regulated dc output voltage, Vo, from a second terminal, with the third terminal connected to ground.

The series 78 regulators provide fixed positive regulated voltages from 5 to 24 volts. Similarly, the series 79 regulators provide fixed negative regulated voltages from 5 to 24 volts.

- For ICs, microcontroller, LCD - 5 V
- For alarm circuit, op-amp, relay circuits - 12 V

VI.BLUETOOTH DEVICE

Bluetooth is a frequency hopping wireless communications technology. As shown below in the scrolling spectrogram display, the Bluetooth device (the red/yellow energy squares) hops across the full 2.4 GHz Wi-Fi frequency band. This is easily seen in the scrolling spectrogram display, but more difficult to see in spectrum analyzer displays (top chart) which show only frequency and amplitude information but limited time-domain information.

RADIO FREQUENCY CHARACTERISTICS

Frequency Range: 2402-2480 MHz
Transmit Power: 2.2dBm
Modulation: GFSK, FHSS
Number of Communication Channels Supported: 79
Width of Communication Channel: 1 MHz
Features: Pulsed, low-power

VII.RELAY

A relay is an electromechanical switch, which perform ON and OFF operations without any human interaction. General representation of double contact relay is shown in Fig. 2 below

Generally, the relay consists a inductor coil, a spring (not shown in the figure), Swing terminal, and two high power contacts named as normally closed (NC) and normally opened (NO). Relay uses an Electromagnet to move swing terminal between two contacts (NO and NC). When there is no power applied to the inductor coil (Relay is OFF), the spring holds the swing terminal is attached to NC contact.

Whenever required power is applied to the inductor coil, the current flowing through the coil generates a magnetic field which is helpful to move the swing terminal and attached it to the normally open (NO) contact. Again when power is OFF, the spring restores the swing terminal position to NC.

THE ELECTROMECHANICAL RELAY

The term Relay generally refers to a device that provides an electrical connection between two or more points in response to the application of a control signal. The most common and widely used type of electrical relay is the electromechanical relay or EMR.

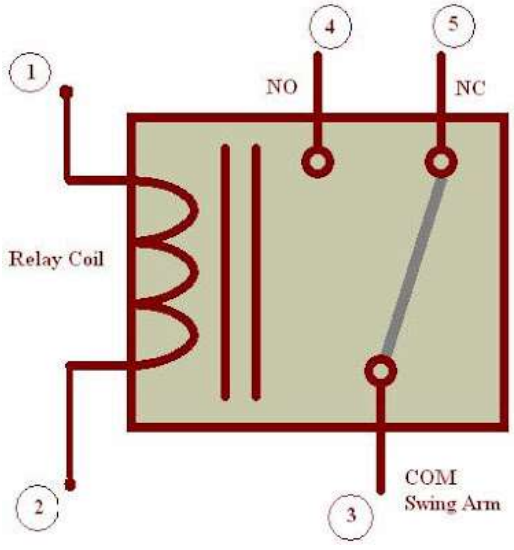

Fig. 2 Double Contact Relay

The most fundamental control of any equipment is the ability to turn it "ON" and "OFF". The easiest way to do this is using switches to interrupt the electrical supply. Although switches can be used to control something, they have their disadvantages. The biggest one is that they have to be manually (physically) turned "ON" or "OFF". Also, they are relatively large, slow and only switch small electrical currents.

VIII.ELECTRICAL MOTORS

Electrical Motors are continuous actuators that convert electrical energy into mechanical energy in the form of a continuous angular rotation that can be used to rotate pumps, fans, compressors, wheels, etc. As well as rotary motors, linear motors are also available. There are basically three types of conventional electrical motor available: AC type Motors, DC type Motors and Stepper Motors.AC Motors are generally used in high power single or multi-phase industrial applications were a constant rotational torque and speed is required to control large loads.DC Motors and Stepper Motors which are used in many electronics, positional control, microprocessor, PIC and robotic circuits.

THE DC MOTOR

The DC Motor or Direct Current Motor to give it its full title, is the most commonly used actuator for producing continuous movement and whose speed of rotation can easily be controlled, making them ideal for use in applications were speed control, servo type control, and/or positioning is required. A DC motor consists of two parts, a "Stator" which is the stationary part and a "Rotor" which is the rotating part. The result is that there are basically three types of DC Motor available. Brushed Motor - This type of motor produces a magnetic field in a wound rotor (the part that rotates) by passing an electrical current through a commutator and carbon brush assembly, hence the term "Brushed". The stators (the stationary part) magnetic field is produced by using either a wound stator field winding or by permanent magnets. Generally brushed DC motors are cheap, small and easily controlled.

Brushless Motor - This type of motor produce a magnetic field in the rotor by using permanent magnets attached to it and commutation is achieved electronically. They are generally smaller but more expensive than conventional brushed type DC motors because they use "Hall effect" switches in the stator to produce the required stator field rotational sequence but they have better torque/speed characteristics, are more efficient and have a longer operating life than equivalent brushed types. Servo Motor - This type of motor is basically a brushed DC motor with some form of positional feedback control connected to the rotor shaft. They are connected to and controlled by a PWM type controller and are mainly used in positional control systems and radio controlled models. Normal DC motors have almost linear characteristics with their speed of rotation being determined by the applied DC voltage and their output torque being determined by the current flowing through the motor windings. The speed of rotation of any DC motor can be varied from a few revolutions per minute (rpm) to many thousands of revolutions per minute making them suitable for electronic, automotive or robotic applications. By connecting them to gearboxes or gear-trains their output speed can be decreased while at the same time increasing the torque output of the motor at a high speed.

IX.CONCLUSION

The working principle behind wireless power transmission is electromagnetic induction. The future extension of my project will makes to increase the distance of transmitting Power in wireless medium. There too reducing power Loss While transmitting the power in wireless medium. There too increase the power transmitting speed in wireless medium.

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