WIRELESS TRANSMISSION OF POWER USING EMBEDDED SYSTEM

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Abstract: Now a days in our daily life every where we are using embedded systems. For this embedded systems we have to provide the power supply to work. That power supply we are providing by using wires. Due to this complexity and cost of the embedded systems is increasing in order to reducing this we are going for wireless power transmission to the embedded systems. This paper gives an effective, high performance technique which can efficiently transmit the power to our embedded systems without using wires. This way of transmission does not affect the environment surroundings. This technique includes resonating inductive coupling in sustainable moderate range and transfer of power through microwaves using rectennas. With this we can avoid the confusion and danger of having long, hazardous and tangled wiring.

IndexTerms **- Resonance, Induction, Non Radiative Energ, Transfer, Rectenna.**

I. INTRODUCTION

A switch to cleaner transmission of power, as computer stores large amount of data in its memory, those using it are named a paper less society. Now is the time to make people a wireless society, and this is possible by means of wireless energy transfer methods. As time and technology advance, wireless transmission of power seems to be promising one. Unless you are particularly organized and good with tie wrap, you probably have a few dusty power cord tangles around our home. We may have even had to follow one particular cord through the seemingly impossible snarl to the outlet hoping that the plug you pull will be right one. This is one of the downfalls of electricity. While it can make people's lives easier, it can add a lot of clutter in the process. We have several techniques for moving electricity over long distance without using wires. Some exist only as theories or prototypes, but others are already in use. This paper provides the review of techniques used for wireless power transmission for embedded systems.

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II. DRAWBACK OF WIRED SYSTEM

Electrical power accounts for much of the energy consumed. Much of this power is wasted during transmission from power plant generators to the consumers. The resistance of the wire in the electrical grid distribution system causes a loss of 26% to 30% of the energy generated. There fore, the loss implies that our present system of electrical transmission is 70% to 74% efficient. We feel pretty whimsical while watching poles, towers and substations, on the roadside, which carry man-made conductors for transferring power through long distances. In our country which is hugely populated and consume high megawatts of power there arise frequent faults .

A fault arises mainly due to

a. Technical problems in a substation
b. Lightning discharges on the conductor
c. Tree falling on the lines
d. Short circuiting the phases by birds

Broadly classified as

a. Shunt fault (short circuit)
b. Series fault (open conductor)

A shunt type of fault involves a power conductor connected to ground, or short circuit between the conductors. These types of faults are characterized by increase in voltage, frequency, and fall in current in the faulted phases.

Shunt faults are classified as

a. Line to ground fault
b. Line to line fault
c. Double line to ground fault
d. Three phase fault

Series faults are classified as

a. single open conductor fault
b. two open conductors fault

These are the disadvantages while power is transmitted through conductors. In order to avoid these transferring power.

III. NEED OF WIRELESS POWER TRANSMISSION.

Wireless power transmission is employed in case where instantaneous or continuous energy transfer is needed, but wires are inconvenient, hazardous or impossible. Number of house hold embedded devices receives the power at same frequency that to of 50 Hz using single transmitting coils as long as they are at resonance. So set up can recharge all devices at a time. Unmanned planes or robots which are run by the wireless power over an area as they could fly for months at a time. A few proposals even sending power to the earth from space..

IV. EMBEDDED SYSTEM

Embedded system is a combination of both hardware and software which will be used to perform a specific task in a specific time. Examples of embedded systems are washing machine, DVD player, mobiles etc. Embedded systems contains the hardware parts as microcontroller, serial port reset circuit, timers, rtc and etc. It contains the software as operating system (OS) to controller the both hardware and other software. Embedded systems are designed to do some specific task rather than be a general purpose computer for multiple tasks. Some also has real time performance constraints that must be met, for reason such as safety and usability; others may have low or no performance requirements, allowing the system hardware to be simplified to reduce costs. Embedded systems are divided into four types depends on application. Those are

a. Stand alone embedded systems
b. Real time embedded systems
c. Network embedded systems
d. Mobile phones

V. WIRELESS POWER TRANSMISSION TECHNIQUES

Techniques used in the power transmission are classified into three types depending on the distance between transmitter and receiver those are:

a. Short range induction wireless power transmission.
b. Moderate range induction wireless power transmission.
c. Long range wireless induction power transmission.

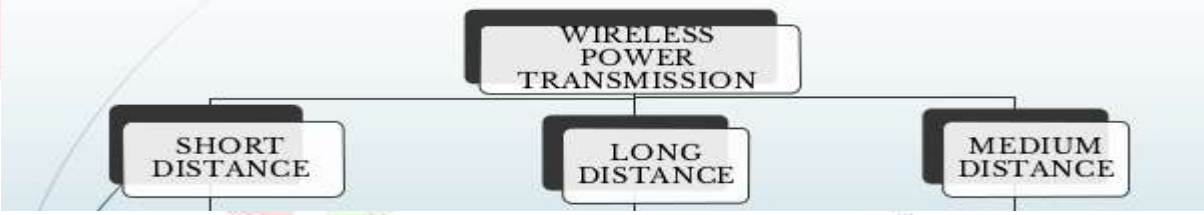

FIG.1

a. Short range wireless power transmission:

This method can reach at most a few centimeters. The action of electrical transfer is the simplest instance of wireless energy transfer. The primary and secondary circuits of a transfer are electrically isolated from each other. The transfer of energy takes place by electromagnetic coupling through a process called mutual induction. We can use the same principle to recharge our embedded devices like mobiles, digital cameras etc at a time. For example splash power recharging mat use coils to create magnetic field. Embedded devices will have in built receivers or circuits to recharge while resting on mat.These receivers contain compatible coils. Due to this compatible coils we will get the electricity by mutual induction and also we have the circuitry necessary to convert alternate current(AC) to direct current(DC).This circuitry will contain step down transformer, rectifier, filter and a regulator to convert from AC to DC. Thus the electricity will be delivered to embedded devices batteries in short range induction wireless power transmission**.**

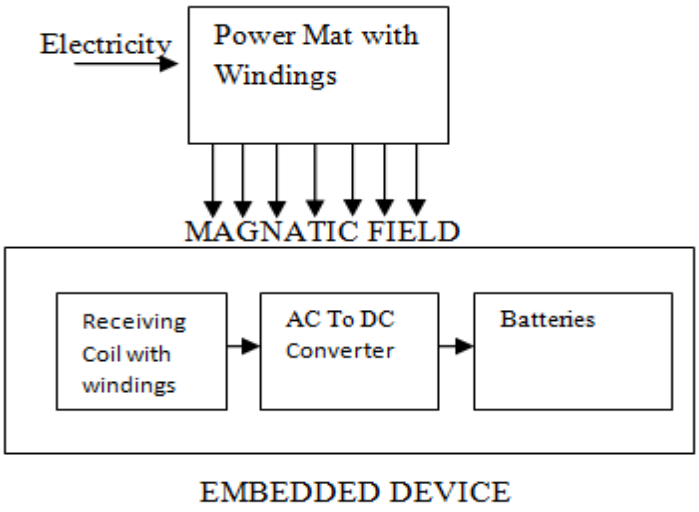

FIG.2

b.Moderate range induction wireless power transmission

This method achieves distance of few meters. An efficient way to transfer the power between coils separated by few meters is that we could extend the distance between coils by adding resonance to the equation. A good way to understand the resonance is to think of it in terms of sound. An object physical structure like the size and shape of trumpet determines the frequency at which naturally vibrates. This is it's resonate frequency. It is easy to get objects to vibrate at their resonate frequency. Induction can take place a little differently if the electromagnetic fields around the coils resonate at the same frequency. The theory uses a curved coil of wire as an inductor. Capacitive plate, which can hold charge, attaches to each end of coil. As electricity travel through the coil ten coil begins to vibrate. Its resonant frequency is a product of inductance of coil and capacitance of plates. If two resonating coils are at same frequency then only stream of energy will be transferred from transmitting coil to receiving coil.

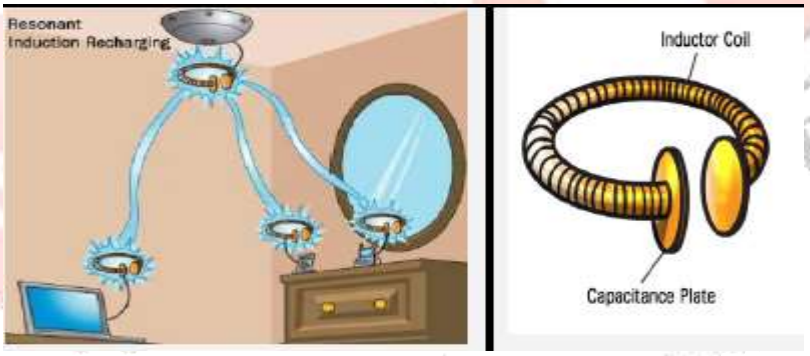

FIG.3

If two coils are at not at same frequency then nothing will be happen. This process of transferring energy is called non radiative energy transfer.

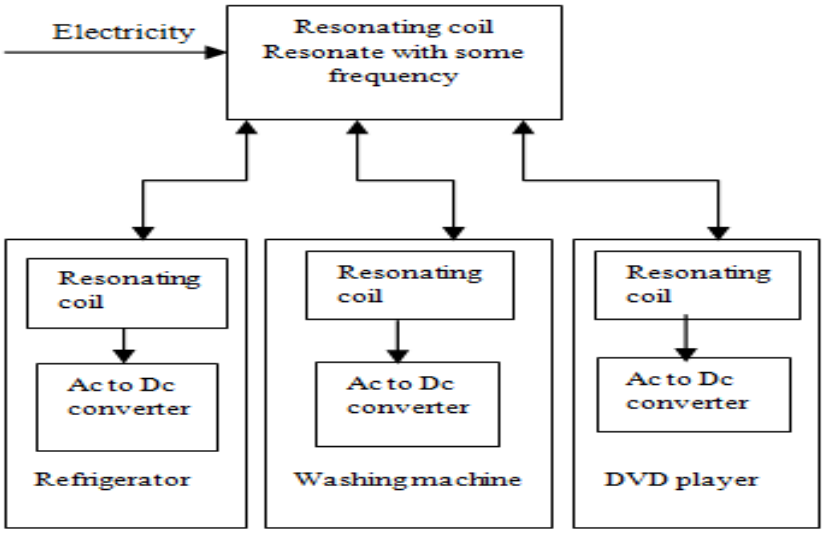

FIG.4

C. **Long range wireless power transmission**

This method achieves distance of few kilometers. In this method we are transferring the power in the form of microwaves. The conversion process of the electricity into microwaves and again microwaves into electricity can be shown in below block diagram.

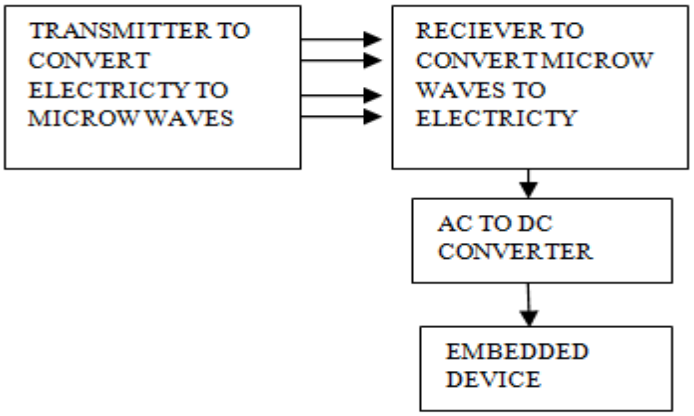

FIG.5

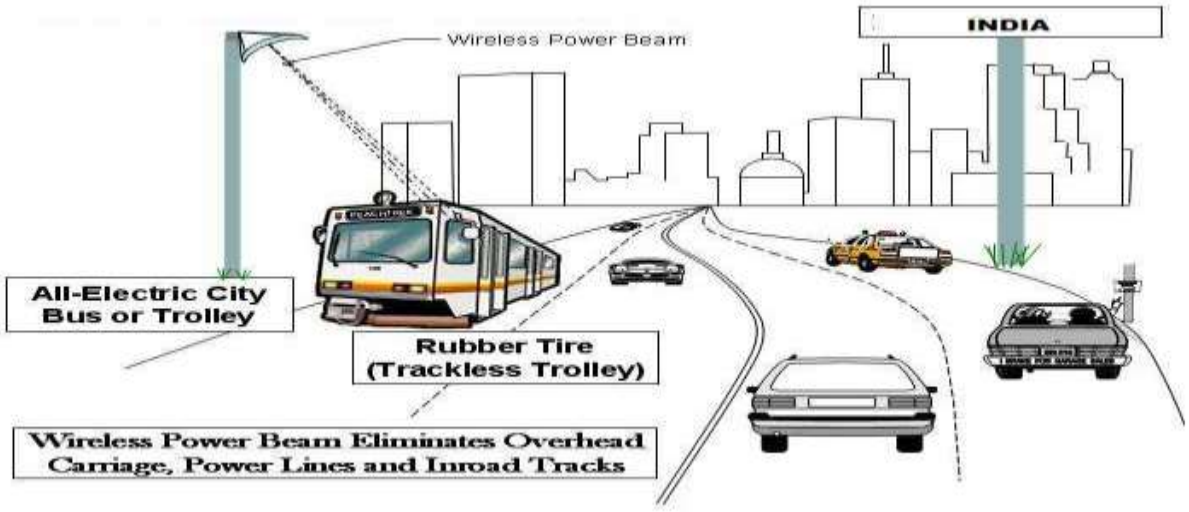

FIG.6 : shows the wireless power transmission for different embedded systems by the long

VI. **WIRELESS POWER APPLICATIONS**

The wireless system would reduce pollution and expenses resulting from the need to generate power, and to overcome and compensate for losses in the present grid. This method would eliminate the need for an inefficient, expensive, and capital intensive grid of cables, towers and substations. There are some areas in the world where there is still in need for electrical power.

Examples in the global scale are….

a. Africa is in need of power to run pumps to tap into the vast resources of water under the Sahara desert.
b. Rural areas in countries like India and China

For the above mentioned areas, if power is not delivered they will for all time be left in darkness and never compete with other nations. Wireless transmission of power would provide worldwide distribution of off-peak demand capacity. Some nations like US have the capacity to generate more power than needed. The extra power available from the power plants is transmitted to other nations using wireless system of energy transmission.

Application In Various Fields

FIG.7

a. Types of devices that can be charged wirelessly (handset, MP3, headset, DSC, etc)
b. The way devices are enabled with wireless power (adaptor, integrated receiver)
c. Standalone charger configurations (single device, multiple device, form factor, etc)
d. Embedded charger configurations (in printers and other CE products)
e. Location of charger: (home, office, travel, car, public, etc)
f. Market (consumer, office equipment, industrial, medical, etc)

VII. ADVANTAGES

a. No conductor cost.
b. The efficiency of wireless transmission of energy is in the range of 90% to 94%.
c. Rid the landscape of wires, cables and transmission towers.
d. Great flexibility in power transmission.

VIII.CONCLUSION

Power can be transmitted from one place to another place without using wires efficiently by the power transmission techniques. Cost of power transmission is also very less compared to wired transmission. Complexity also decreases by wireless power transmission.

IX. ACKNOWLEDGMENT

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REFERENCES

[1] Wireless Power Transmission for Embedded Systems, ISSN 2143-4535 Volume.03,July-2013, Pages:182-186,IJATIR
[2] Wireless Transmission of Electricity using Embedded System. ISSN No: 2454-9614, South Asian Journal of Engineering and Technology Vol.2, No.18 (2016) 78–89
[3] Wireless Power Transmission for Embedded Systems. ISSN 2319-8885 Vol.02,Issue.14, October-2013, Pages:1510-1514. IJSETR.
[4] Embedded systems by Rajkamal
[5] Wireless power transfer-principles and engineering exploration by ki young Kim
[6] Electronic Devices and circuits by A.P.Gadse&U.A.Bhakshi
[7] Hu, A. P. (2009). Wireless/Contactless power supply: Inductively coupled resonant converter solutions. Saarbrücken, Germany: VDM Verlag Dr. Müller.
[8] General Electric Co. (1915). General Electric review, Volume 18. "Wireless Transmission of Energy" By Elihu Thomson. General Electric Company, Lynn. (ed. Lecture by Professor Thomson, National Electric Light Association, New York.).
[9] Nikola Tesla, ―The Transmission of Electrical Energy Without Wires as a Means for Furthering Peace,‖ Electrical World and Engineer. Jan. 7, p. 21, 1905.
[10] Nikola Tesla, ― The true wireless‖, Electrical Experiments.