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WIRELESS ENERGY TRANSFER USING ZIGBEE

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ABSTRACT

Wireless energy transfer (WET) is new technology that can be used to charge the batteries of sensor nodes without wires. Although wireless, WET does require a charge stations to be brought to without reasonable range of a sensor node so that better energy transfer efficiency can be achieved.

On the other hand, it has been well recognized that data collection with a mobile base stations has significant advantages over a static one. Given that a mobile platform is required for WET, a natural approach is to employ the same mobile platform to carry the base stations for data collections.

The wireless charging vehicle WCV travels along a preplanned path inside that sensor network. Our goal is to minimize energy consumptions of the entire system while ensuring that each sensor node is charging in time so that it will never run out of energy, and all data collections from the sensor nodes are relayed to the mobile base stations.

***Keywords:* Wireless Energy Transfer, Zigbee, Temperature Sensors, DC Motor.**

I. INTRODUCTION

Wireless sensor networks (WSN) have been employed to collect data about physical phenomena in various applications such as habitat monitoring, and ocean monitoring, and surveillance. As an emerging technology Brought about rapid advances in modern wireless telecommunication, Internet of Things (IOT) has attracted a lot of attention and Is expected to bring benefits to numerous application areas including Industrial WSN systems, and healthcare systems manufacturing.WSN systems are well-suited for long-term industrial Environmental data acquisition for IOT representation. Sensor Interface device is essential for detecting various kinds of sensor Data of industrial WSN in IOT environments. It enables us to acquire sensor data. Thus, we can better understand the outside Environment information. However, in order to meet the requirements of long-term industrial environmental data acquisition in the IOT, the acquisition interface device can collect multiple sensor Data at the same time, so that more accurate and diverse data Information can be collected from industrial WSN.

Nowadays, there are two categories of technologies being used namely, electromagnetic (EM) radiation and magnetic resonant coupling. But they have some disadvantages such as wired technology is little bit difficult to maintain and there is no wireless technology. In the proposed system, Wireless energy transfer (WET) can be used to charge the batteries of sensor nodes without wires and efficiency is very high. Also, it is of low cost and wireless.

The proposed system consists of the following components.

1. Zigbee
2. Temperature Sensor
3. Gas Sensor
4. DC Motor
5. ULN2003 IC
6. Relay

II. WIRELESS POWER TRANSFER

Wireless energy transfer or wireless power is the transmission of electrical energy from a power source to an electrical load without interconnecting wires. Wireless transmission is useful in cases where interconnecting wires are inconvenient, hazardous, or impossible.

In wireless power transfer, a transmitter device connected to a power source, such as the mains power line, transmits power by electromagnetic fields across an intervening space to one or more receiver devices, where it is converted back to electric power and utilized.

Wireless power techniques fall into two categories, non-radiative and radiative. In near-field or non-radiative techniques, power is transferred over short distances by magnetic fields using inductive coupling between coils of wire or in a few devices by electric fields using capacitive coupling between electrodes. Applications of this type are electric toothbrush chargers, RFID tags, smartcards, and chargers for implantable medical devices like artificial cardiac pacemakers, and inductive powering or charging of electric vehicles like trains or buses. A current focus is to develop wireless systems to charge mobile and handheld computing devices such as cell phones, digital music players and portable computers without being tethered to a wall plug.

In radiative or far-field techniques, also called power beaming, power is transmitted by beams of electromagnetic radiation, like microwaves or laser beams. These techniques can transport energy longer distances but must be aimed at the receiver. Proposed applications for this type are solar power satellites, and wireless powered drone aircraft. An important issue associated with all wireless power systems is limiting the exposure of people and other living things to potentially injurious electromagnetic fields.

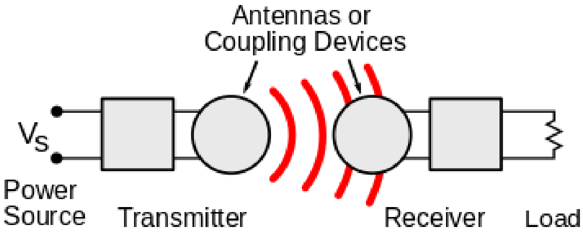

Figure-1: wireless power transfer diagram

"Wireless power transmission" is a collective term that refers to a number of different technologies for transmitting power by means of time-varying electromagnetic fields. The technologies, listed in the table below, differ in the distance over which they can transmit power efficiently, whether the transmitter must be aimed (directed) at the receiver, and in the type of electromagnetic energy they use: time varying electric fields, magnetic fields, radio waves, microwaves, or infrared or visible light waves.

In general a wireless power system consists of a "transmitter" device connected to a source of power such as mains power lines, which converts the power to a time-varying electromagnetic field, and one or more "receiver" devices which receive the power and convert it back to DC or AC electric power which is consumed by an electrical load. In the transmitter the input power is converted to an oscillating electromagnetic field by some type of "antenna" device. The word "antenna" is used loosely here; it may be a coil of wire which generates a magnetic field, a metal plate which generates an electric field, an antenna which radiates radio waves, or a laser which generates light. A similar antenna or coupling device in the receiver converts the oscillating fields to an electric current. An important parameter which determines the type of waves is the frequency f in hertz of the oscillations. The frequency determines the wavelength $\lambda = c/f$ of the waves which carry the energy across the gap, where c is the velocity of light.

Wireless power uses the same fields and waves as wireless communication devices like radio, another familiar technology which involves power transmitted without wires by electromagnetic fields, used in cell phones, radio and television broadcasting and Wi-Fi. In radio communication the goal is the transmission of information, so the amount of power reaching the receiver is unimportant as long as it is enough that the signal to noise ratio is high enough that the information can be received intelligibly. In wireless communication technologies, generally, only tiny amounts of power reach the receiver. By contrast, in wireless power, the amount of power received is the important thing, so the efficiency (fraction of transmitted power that is received) is the more significant parameter. For this reason wireless power technologies are more limited by distance than wireless communication technologies.

These are the different wireless power technologies:

Technology	Range	Directivity	Frequency	Antenna devices	Current and or possible future applications
Inductive coupling	Short	Low	Hz – MHz	Wire coils	Electric tooth brush and razor battery charging, induction stovetops and industrial heaters.
Resonant inductive coupling	Mid-	Low	MHz – GHz	Tuned wire coils, lumped element resonators	Charging portable devices (Qi), biomedical implants, electric vehicles, powering busses, trains, MAGLEV, RFID, smartcards.
Capacitive coupling	Short	Low	kHz – MHz	Electrodes	Charging portable devices, power routing in large scale integrated circuits, Smartcards.
Magnetodynamic coupling[14]	Short	N.A.	Hz	Rotating magnets	Charging electric vehicles.
Microwaves	Long	High	GHz	Parabolic dishes, phased arrays, rectennas	Solar power satellite, powering drone aircraft.
Light waves	Long	High	≥THz	Lasers, photocells, lenses	Powering drone aircraft, powering space elevator climbers.

Table-2: Wireless Power Technologies

In 1897, Nikola Tesla discovered that he could transmit up to 20 MV or more power wirelessly. This was done by sending a signal into the upper stratosphere at a frequency of 925 Hz to distances thousands of miles away from the transmitter, as stated in his "System of Transmitting Electrical Energy" patent. Wireless power transfer (WPT) receivers are devices that can wirelessly transmit power to electrical devices. This is a proof of concept technology that paves the way for charging cell phones, laptops, and many other electronic devices wirelessly. Wireless power technology is in high demand because of its convenience to consumer and industrial marketplaces. The goal of the device prototype is to eventually cost less than $100.00 and be a fully operational and completely independent of any other device.

Types of Wireless electricity:

- Inductive Coupling
- Resonant Inductive Coupling

III. SCHEMATIC DIAGRAM

Transmitting Section:

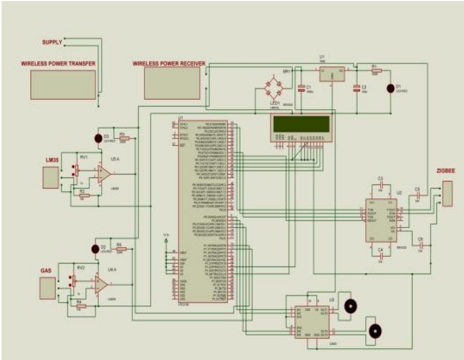

Figure-3: Transmitter Section Circuitry

Receiving Section:

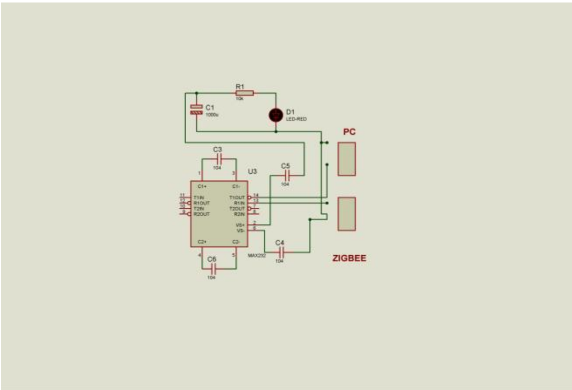

Figure-4: Receiver Section Circuitry

IV. WORKING PRINCIPLE

In this project we have two sections first one is the wireless power transmitter sections and wireless power receiver section with robot. From the wireless power transfer section, we are transmitting the power wirelessly and in the receiver side the power will be continuously received by the wireless power receiver and it will be used to charge the battery.

The voltage required by the robot is supplied by the battery. We are using two sensors one is temperature sensor and gas sensor. When the parameters of the sensors are abnormal the robot will be stop automatically. This information is continuously monitored in the PC section wirelessly by using zigbee wireless module.

V. FLOWCHART

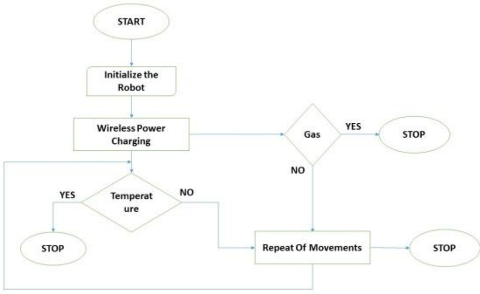

Figure-5: Flowchart showing the Working of Proposed System

VI. SIMULATION AND DESIGN

Output Screenshots:

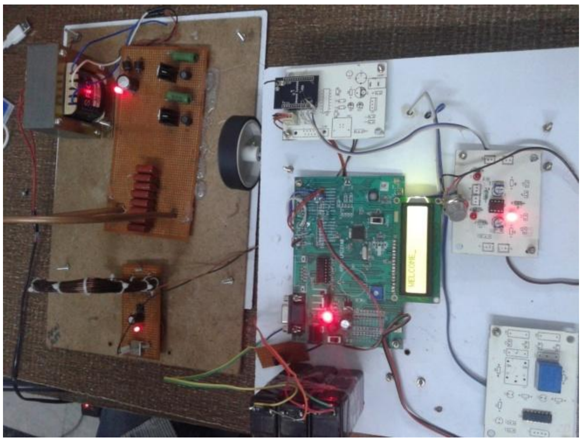

Figure-6: Kit Circuitry-1

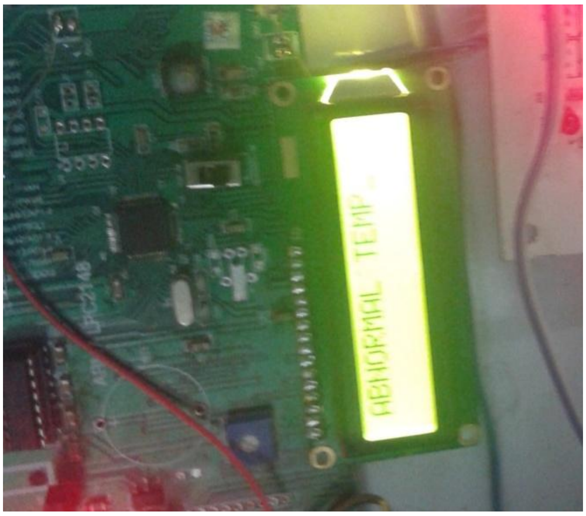

Figure-7: Kit Circuitry-2

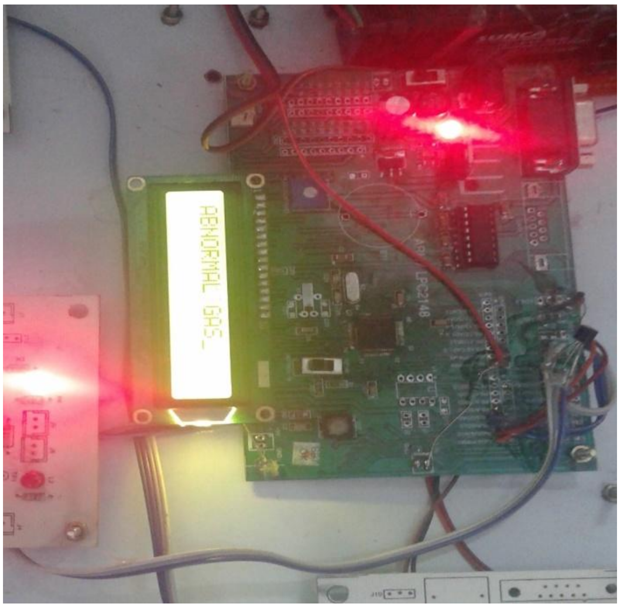

Figure-8: Kit Circuitry-3

VI. CONCLUSION

This paper explored the interesting and challenging problem of using a single mobile platform (WCV) to carry both wireless charger (for WET) and base station (for data collection) in a sensor network. The goal was to minimize energy consumption of the entire system under the constraints that (i) none of the sensor nodes runs out of energy, and (ii) all data collected by the sensor nodes are relayed to the base station in real-time. We developed a mathematical model for this problem and found that it is a highly complex problem involving time-dependent variables. Instead of studying the original problem formulation (OPT-t), we showed that it is sufficient to study a special sub-problem (OPT-s) that only involves location-dependent variables.

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