ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 8.4
IJAR 2019; 5(5): 307-309
www.allresearchjournal.com
Received: 19-03-2019
Accepted: 21-04-2019

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Study on the inductive coupling technique used in wireless charging

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DOI: https://doi.org/10.22271/allresearch.2019.v5.i5d.9336

Abstract
In this study, a novel concept for protecting mobile phones is implemented, including an anti-theft alarm, and the recharging of mobile phones is accomplished through the use of inductive coupling. In order to transmit energy between two objects, an electromagnetic field is required, which is accomplished through the use of the induction principle. A mobile phone may be charged wirelessly using this paper, and this technology can be applied to many different situations, such as protecting the phone against loss or theft. If somebody attempts to steal the mobile phone while it is still powered on, an automatic 60 Db siren will be activated. The system is connected to a control switch, which must be turned on in order for the user to be able to charge his or her mobile phone by placing it on the inductive plates. Once the charging process is complete, do not remove the mobile phone from its charging dock without first turning it off. Otherwise, an automatic siren will sound.

Keywords: KEIL, Software, Siren, Buzzer

1. Introduction
Now that Wi-Fi has gained widespread acceptance, there has been increased interest in wireless communication, as well as a growing interest in eliminating the "last cords" (cables that connect computers to the internet). The study and development of wireless power technology has progressed to the point that it has become the most widely used technology in the world. Consider the following scenario: you are seated on a sofa, reading the newspaper, and placing your mobile phone on a table. The phone begins charging on its own, without the use of connectors or wires. At any time, you can just take your cell phone out of your pocket and charge it anywhere you need to - whether it's in your house, office, library, or neighborhood coffee shop. It is tough to transport with the assistance of wired chargers. We may easily forget about USB cables, adapters when travelling, and other such items when they come into play. Wireless charging technology, which makes use of inductive coupling, is being employed for a variety of applications in today's modern technology (e.g. pacemakers, MP3 players, toothbrushes, iPod, digital cameras, laptops, etc.). In order to transmit energy between two objects, an electromagnetic field is required, which is accomplished through the use of the induction principle.
This paper is used to wirelessly charge a mobile phone, and this technology can be employed in a variety of situations, such as protecting the phone from loss or theft, among others. The driving force behind this is as follows: As technology has progressed, wireless communication has emerged as one of the most active areas of research and development in today's technological landscape. Wi-Fi technology is used in a broad variety of applications, including MP3 players, cellular telephones, and mobile phones. The wireless communication business is extremely competitive around the world, and the reported number of cellular telephone subscriptions globally has now overtaken the reported number of fixed telephony subscriptions for the first time. The number of autonomous electronic devices, which are not limited to mobile phones, is increasing at an alarming rate (e.g. pacemakers, MP3 players, tooth-brushes, iPod, digital cameras, laptops, etc.) Wireless Power Transfer (WPT) is a means of sending electric power from point A to point B through vacuum or air without the use of wires that is both effective and efficient. To compile, the KEIL software is utilized,

and this software makes use of the C programming language, which is used to write and compile the machine language code. It is necessary to convert the code and dump it into the microcontroller in order for the subsequent process to be as simple as possible. During this step, the machine source code is transformed into hex code.

Tresna Dewi and colleagues addressed the design and implementation of 12 V lamps, a cell-phone charger, and a DC fan using a transmitter (source) that powers many receivers at the same time (loads). A. Gamini Sharma and colleagues present a novel concept for wirelessly charging cell phones on a wide scale using microwaves, which they developed in collaboration with other researchers. Microwaves are the radio waves that are utilised to communicate through two mobile phones. L. Olvitz and colleagues presented how a wireless power transfer system is designed to deliver wireless power transmission to a mobile phone using Bluetooth.

Wireless power transfer is discussed, and a practical wireless charger device is constructed to demonstrate the concept. A revolutionary concept of wireless charger networking is proposed by Xiao Lu and colleagues, which allows chargers to be connected in order to facilitate information collecting and control. Achmad Munir and colleagues developed a way for creating a wireless power charging system for mobile devices that relied on magnetic resonance coupling to accomplish their goal. When an alternating current signal is generated and needs to be transferred, a transmitter circuit is used to transfer the power of the alternating current signal wirelessly transmitting and receiving radiators are used to convert the alternating current signal to direct current voltage, and a receiver circuit is used to convert the direct current voltage to alternating current for charging the mobile device.

Through the use of a wireless power transfer system with several receivers, Khadijat Hassan and colleagues proposed a technique for changing the batteries in mobile phones. The system circuit is comprised of a transmitter and two receivers coupled in series. To better understand its behaviour, a mathematical analysis of the circuit is carried out with the help of the proposed concept, and the circuit is simulated with variations in coupling coefficient and load. Wenzheng Xu and colleagues demonstrated that when a mobile charger is used to wirelessly charge sensors in a rechargeable sensor, the travel distance of the electronic gadget mobile charger is decreased and the total of sensors lifetime is maximized, according to their findings. According to Nathan S. Jeong and colleagues, a technique in which a metal-wrapped mobile device is enabled using a loosely coupled resonant system in order to produce an effective wireless charging has been proposed. For the sake of simplification, a metal phone case has been employed, and three coils have been developed and dispersed on this metal phone case, each of which has been adjusted for resonance at 6.78MHz.

Theoretical background of the study

Using the electromagnetic (EM) field generated by coils, wireless power transfer has become the most popular technology in the world since the early twentieth century. This technology is being used in many electronic applications and allows wireless power transfer between physical objects by utilizing the electromagnetic (EM) field generated by coils. Due to the transmission of alternating current to the induction coil, a magnetic flux is generated around the coils. Embedded technology is now being employed by numerous industries for steady and accurate control, and it is becoming increasingly popular. At the heart of the system is a microcontroller (the AT89S52), which allows for more dynamic and faster operation of the system. The system displays the charging of a mobile phone with the use of a Liquid crystal display (16x2), which is made possible by the use of an LCD. The AT89S52 microcontroller is the central component of the system, and it is responsible for controlling all of the functions of the system. A mobile phone may be charged wirelessly using this paper, and this technology can be applied to many different situations, such as protecting the phone against loss or theft. If anyone attempts to steal it without turning off the switch, a siren with a decibel level of 60 will be activated immediately. The AT89S52 Microcontroller is a programmable device with a digital input and output. A microcontroller is a single chip that contains a large number of peripherals, including random access memory, read only memory, input/output ports, a CPU, an Analog to Digital Converter, and a timer. For many applications where cost and space are important considerations, microcontrollers with on-chip Read Only Memory, Random Access Memory, and a large number of input/output ports are the most suitable solution. Electrical energy can be transferred between sources and loads without the use of conventional media such as cables. This is accomplished through the use of electromagnetic induction, which is referred to as wireless electrical transfer or contactless energy transfer. Inductive coupling is now playing a significant role in the achievement of wireless power transfer at power levels ranging from few microwatts to several kilowatts, according to recent research. Efficiency decreases rapidly as the distance between the transmitter and receiver coils increases, and as the power delivery increases, so does the operational range of the reception coils, which is specified by the efficiency reduction.

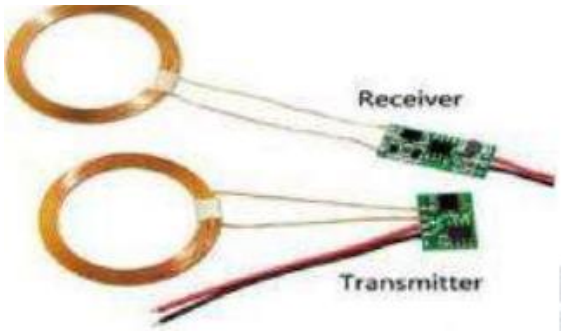

Fig 1: Induction coils

Implementation of Hardware

When alternating current (AC) is transmitted to it, an electromagnetic field is formed, and energy is transferred between two induction coils, the induction coils are said to use an electromagnetic field. Induction charging, transistor driver circuit, relays, LED and LDR selection are some of the components of the system. It also includes a transformer, a rectifier and a filter as well as a voltage regulator, an AT89S52 microcontroller, and induction charging.

Figure 2 depicts a block diagram of the system as a whole. When the circuit's input is connected to a controlled power supply, the circuit is said to be operational. It is necessary to utilize a step-down transformer in order to reduce the voltage to the appropriate amount. For example, a 230V AC input is provided from the mains supply, and a 12V supply

is obtained through the use of a step-down transformer and supplied to a rectifier.

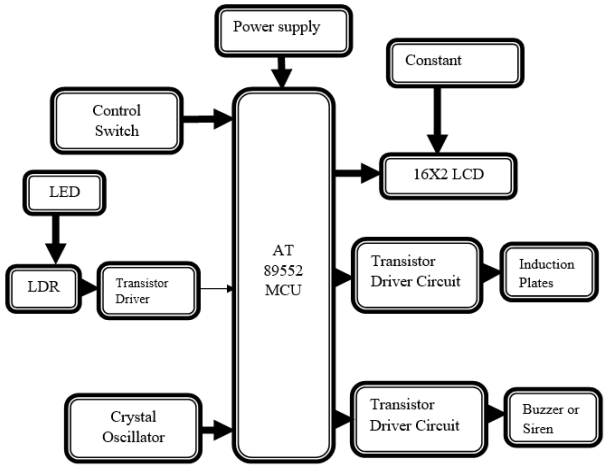

Fig 2: system block

A direct current voltage (DC voltage) is obtained from the rectifier. Now, the produced dc voltage output of the rectifier may contain some alternating current components. In order to eliminate the alternating current components and achieve the pure dc voltage, the rectifier's output is passed through a filter to make the voltage smooth. After that, a voltage regulator is attached to the filter in order to obtain pure constant dc voltage. Figure 3 depicts the overall power supply for a block diagram. In order to increase or decrease the voltage, transformers are utilised. Typically, DC voltages are required by the vast majority of electrical devices and equipment. The 230V alternating current supply is used as the input voltage, and a step-down transformer is used to reduce the 230V alternating current to the needed voltage. A step-down transformer is connected in order to reduce the voltage to the desired level for the application.

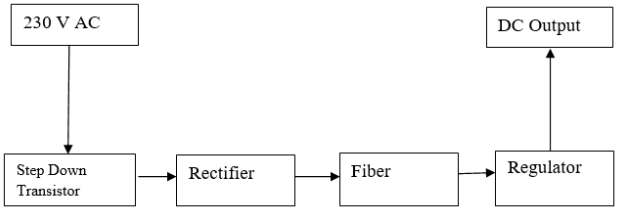

Fig 3: power supply block

Rectifier

The output of the transformer is fed into the rectifier for processing. It transforms alternating current to direct current. The rectifier can be either a half-wave or a full-wave rectifier, depending on the application. Full wave rectifier maintains good stability conditions, and full wave rectification is employed to achieve a satisfactory result.

Filter

A capacitive filter is used to smooth the D.C voltage output of the Bridge rectifier in order to remove ripples from the output of the bridge rectifier. Until it maintains constant output voltage and load, the voltage and load at the output of this filter will not change, and the voltage at the output of this filter will not change. Because of this, a regulator is used at the output stage.

Regulator

A voltage regulator is now employed in order to obtain a steady direct current voltage source. This project necessitates the use of a 5V and a 12V DC power supply. The voltage regulators 7805 and 7812 are responsible for generating the voltage levels. The regulators in this process are made up of a positive supply, which is represented by the number 78, and two output voltage levels, which are represented by the numbers 05 and 12 respectively.

Selection of LEDs and LDRs

LDRs, or Light Dependent Resistors, are extremely useful in a variety of applications, particularly in light/dark sensor circuits. In order to prevent the light from the leds from falling on the LDR, we have placed a box on top of the LDR where we will keep our mobile phone. As soon as someone attempts to remove the box, the Buzzer is activated because the light from the LED falls directly on the LDR, and the transistor, which is monitored by the microcontroller, is turned on.

Results

As a result, we were able to ignite the coil close to it by employing the induction coupling principle. The efficiency of transfer was, on the other hand, quite low, but this is primarily due to the distance between the coils. The effectiveness of the coil can be boosted further by increasing the size of the coil, but the size constraint is violated as a result. The anti-theft technology was able to precisely detect the absence of a phone while not shutting off the power supply system. This is a significant advantage for bio-medical devices, such as pacemakers, which can be recharged remotely when the battery becomes depleted.

Conclusion

Wireless technology has advanced and is now being used in a wide variety of electronic applications in today's society. Particularly given the fact that wireless communication systems are becoming more affordable, easier to implement, and smaller on a daily basis, allowing more and more devices to benefit from them. Wireless solutions have the potential to save time and be simpler to use. Aside from that, wireless conditioning monitoring reveals a variety of uses that are not even possible over a wired network.

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