

The Future of Wireless Everything

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Abstract— This paper would revolve around the wireless future of our planet. The rate at which technology is expanding it isn't a surprise on how people have started imagining things that only sounded like magic till now. Talking of technology, the world today can easily be termed as the "GADGET WORLD", given the astonishingly high rates at which gadgets are being developed, manufactured, and ultimately exploited by the end users. This paper would be consisting of some of the new technology supporting wireless world. The technologies like Sixth sense, IOT, LiFi, GiFi, NFC, wireless power transmission, EnOcean tech etc has been developed in the recent years. If these technologies would be supported the time is very soon where you would see the world without cables and power cords.

Keywords—Sixth Sense, LiFi, NFC, GADGET WORLD.

I. INTRODUCTION

Generally, in a communication system, information is transmitted from transmitter to receiver that are placed over a limited distance. With the help of Wireless Communication, the transmitter and receiver can be placed anywhere between few meters (like a T.V. Remote Control) to few thousand kilometres (Satellite Communication). We live in a World of communication and Wireless Communication, in particular is a key part of our lives. Some of the commonly used Wireless Communication Systems in our day – to – day life are: Mobile Phones, GPS Receivers, Remote Controls, Bluetooth Audio and Wi-Fi etc.

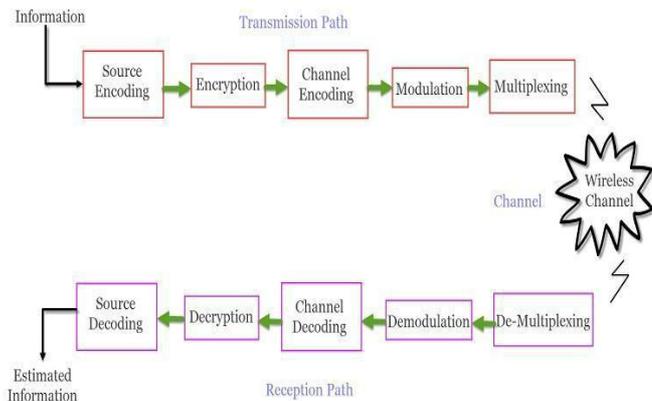


Fig.1 Block Diagram of Wireless Communication

II. NFC

A. Introduction

Near-field communication (NFC) is a set of communication protocols that enable two electronic devices, one of which is usually a portable device such as a smartphone, to establish communication by bringing them within 4 cm (1.6 in) of each other.

NFC devices are used in contactless payment systems, similar to those used in credit cards and electronic ticket smartcards and allow mobile payment to replace/supplement these systems. This is sometimes referred to as NFC/CTLS (Contactless) or CTLS NFC. NFC is used for social networking, for sharing contacts, photos, videos or files. NFC-enabled devices can act as electronic identity documents and keycards. NFC offers a low-speed connection with simple setup that can be used to bootstrap more capable wireless connections

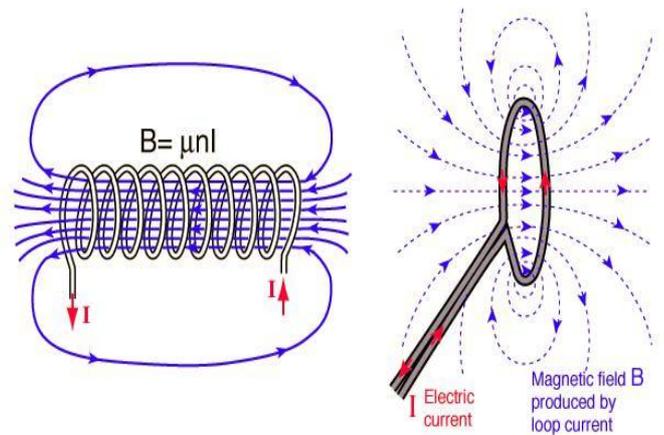


Fig.2 Working of NFC in Active Field.

NFC-enabled devices to exchange various pieces of information between each other. In this mode both devices switch between active when sending data and passive when receiving.

Read/write mode, on the other hand, is a one-way data.



B. Working

NFC works on the principle of sending information over radio waves. Near Field Communication is another standard for wireless data transitions.

The technology used in NFC is based on older RFID (Radio-frequency identification) ideas, which used electromagnetic induction in order to transmit information.

NFC technology does not command enough inductance to charge our smartphones.

A can send data at either 106, 212, or 424 kilobits per second. To determine what sort of information will be exchanged between devices, the NFC standard currently has three distinct modes of operation. Perhaps the most common use in smartphones is the peer-to-peer mode. This allows two transmission. The active device, possibly your smartphone, links up with another device in order to read information from it. NFC advert tags use this mode.

The final mode of operation is card emulation. The NFC device can function as a smart or contactless credit card and make payments or tap into public transport systems.

C. Application

NFC chips stocked inside credit cards for contactless payments are nothing new. But a slightly more recent - and admittedly more enticing - use case for NFC is with your smartphone, or even your smartwatch, as a way to digitize your entire wallet.

Samsung pay, which operates similarly, is available for Samsung phone users in the US, and expected to land in the UK soon.

Share internet passwords with your friends Most often than not, your Wi-Fi passwords will include numbers , alphabets, as well as symbols to make it more secure. However, when we want to share this password with your friends, it can be quite troublesome to spell it out verbally.

NFC WORK WITH THE BUTTONS

NFC is powered by the radio energy from the phone. The buttons decide what data (an ID) the NFC chip should communicate to the phone. As each strip can only be heard by a specific phone, they can communicate the same four IDs. The app then handles all the tricky stuff .iOS doesn't allow direct access to NFC (an intended limitation), hence only possible for Android, and likely also Windows Phone, at the moment.

III. ENOCEAN TECHNOLOGY

A. Introduction

EnOcean wireless technology uses a combination of energy harvesting and very low power wireless communications to enable virtually indefinite communications to be maintained without the need for recharging.

The EnOcean technology is used for wireless sensors, controllers and gateways.

One of the key issues with small machines is the need for ensuring that batteries are maintained charged. In traditional systems, either mains power was required, or batteries needed to be replaced, even if only infrequently. The use of EnOcean removes the need for power to be directly applied thereby reducing the cost of the system operation.

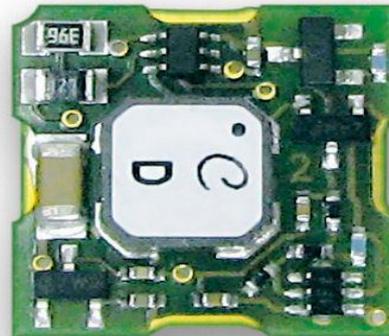


Fig.3 Ultra low power DC/DC converter for Thermoelectric

Energy Harvesting.to connect with other standards for an Internet of Things (IoT).

Flexible and maintenance-free sensor solutions Key EnOcean elements. The EnOcean standard is unique in that it encourages the use of energy harvesting to maintain the operation. Accordingly there are several different areas of interest within the overall EnOcean system.

Energy harvesting: One of the key elements of EnOcean is the ability to harvest local energy to power the remote devices. This overcomes key issues encountered by other systems. A number of energy harvesting systems are covered.

Radio Interface: The radio interface has been designed to provide optimum data transfer over the required distances using very low power levels. This makes the overall system sustainable, even with very small amounts of energy harvesting.

Data layers: The data needs to be transferred in an optimum way to ensure that the EnOcean system is able to provide robust communications.

B. Advantages

BUILDING AUTOMATION: Self-powered wireless switches, sensors and controls cut installation cost and time, and enable efficient use of energy.

SMART HOMES : EnOcean solutions increase comfort and security for smart homes.

Flexible and maintenance-free sensor solution.

Energy –efficient solution.

Cost and time savings in installation, maintenance and renovation.



PRODUCTS

PTM 210: Push button multi-channel switch module.
 PTM 330: Transmitter module.
 STM 300: Energy harvesting wireless sensor module

C. Software Automation

EnOcean is newly supported by Fhem and ago control. Fhem and ago control are GPL licensed software suites for house automation. They are used to automate some common tasks in the household like switching lamps, shutters, heating, etc., and to log events like temperature, humidity, and power consumption. Both run as servers that are controlled via web front-end, telnet, command line, or TCP/IP directly.

D. Alliance

A group of companies including EnOcean, Texas Instruments, Omnio, Sylvania, Masco, and MK Electric formed the EnOcean Alliance in April 2008 as a non-profit, mutual benefit corporation. The EnOcean Alliance aims to internationalise this technology, and is dedicated to creating interoperability between the products of OEM partners, in order to bring about the existence of a broad range of interoperable wireless monitoring and controlling products for use in and around residential, commercial and industrial buildings.

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IV. LIFI

A. Introduction

LiFi is a wireless optical networking technology that uses light-emitting diodes (LEDs) for data transmission.

LiFi is designed to use LED light bulbs similar to those currently in use in many energy-conscious homes and offices. However, LiFi bulbs are outfitted with a chip that modulates the light imperceptibly for optical data transmission. LiFi data is transmitted by the LED bulbs and received by photoreceptors.

LiFi's early developmental models were capable of 150 megabits-per-second (Mbps). Some commercial kits enabling that speed have been released. In the lab, with stronger LEDs and different technology, researchers have enabled 10 gigabits-per-second (Gbps), which is faster than 802.11ad.

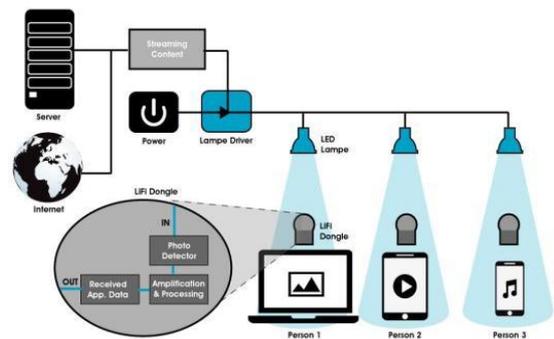
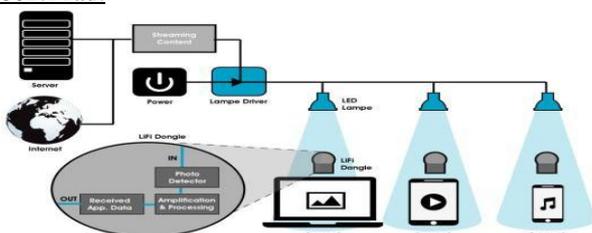


Fig.4 Block Diagram of LiFi

B. Working

The working of Li-Fi is very simple. There is a light emitter on one end i.e. an LED transmitter, and a photo detector (light sensor) on the other. The data input to the LED transmitter is encoded in to the light (technically referred to as Visible Light Communication) by varying the flickering rate at which the LEDs flicker 'on' and 'off' to generate different strings of 1s and 0s. The on off activity of the LED transmitter which seems to be invisible (The LED intensity is modulated so rapidly that human eye cannot notice, so the light of the LED appears constant to humans), enables data transmission in light form in accordance with the incoming binary codes: switching ON a LED is a logical '1', switching it OFF is a logical '0'. By varying the rate at which the LEDs flicker on and off, information can be encoded in the light to different combinations of 1s and 0s. In a typical setup, the transmitter (LED) is connected to the data network (Internet through the modem) and the receiver (photo detector/light sensor) on the receiving end receives the data as light signal and decodes the information, which is then displayed on the device connected to the receiver. The receiver (photo detector) registers a binary '1' when the transmitter (LED) is ON and a binary '0' when the transmitter (LED) is OFF. Thus flashing the LED numerous times or using an array of LEDs (perhaps of a few different colours) will eventually provide data rates in the range of hundreds of Mbps.

C. Advantages of LiFi

Efficiency: Li-Fi works on visible light technology. Since homes and offices already have LED bulbs for lighting purposes, the same source of light can be used to transmit data. Hence, it is very efficient in terms of costs as well as energy. Light must be on to transmit data, so when there is no need for light, it can be reduced to a point where it appears off to human eye, but is actually still on and working.

Availability: Wherever there is a light source, there can be Internet. Light bulbs are present everywhere – in homes,



offices, shops, malls and even planes, meaning that high-speed data transmission could be available everywhere. Security: One main advantage of Li-Fi is security. Since light cannot pass through opaque structures, Li-Fi Internet is available only to the users within a room and cannot be breached by users in other rooms or buildings.

C. D. Disadvantages of LiFi

Internet cannot be used without a light source. This could limit the locations and situations in which Li-Fi could be used. Because it uses visible light, and light cannot penetrate walls, the signal's range is limited by physical barriers.

V. SIXTH SENSE TECHNOLOGY

A. Introduction

Sixth Sense is a wearable gestural interface that enhances the physical world around us with digital information and lets us use natural hand gestures to interact with that information. Steve Mann is considered as the father of Sixth Sense technology who made a wearable computer in 1990. He implemented the Sixth Sense technology as the neck worn projector with a camera system. He was a media lab student at that time. Then his work was carried forward by Pranav Mistry, an Indian research assistant in MIT Media Lab. It is based on the concepts of augmented reality and has well implemented the perceptions of it. Sixth sense technology has integrated the real world objects with the digital world. The fabulous 6th sense technology is a blend of many exquisite technologies. The thing which makes it magnificent is the marvelous integration of all those technologies and presents it into a single portable and economical product. It associates technologies like hand gesture recognition, image capturing, processing, and manipulation, etc. It superimposes the digital world on the real world. The sixth sense technology uses different technologies like gesture recognition, image processing, etc. At present the commercial product isn't launched but the prototype is prepared.

B. Working

The sixth sense prototype is made using very common and easily available equipments like pocket projector, a mirror, mobile components, color markers and a camera. The projector projects visual images on a surface. This surface can be wall, table, book or even your hand. Thus, the entire world is available on your screen now. When user moves their hands to form different movements with colored markers on the finger tips, the camera captures these movements. Both the projector and the camera are connected to the mobile computing device in the user's pocket. Recognition is made using computer vision

technique. These markers act as visual tracking fiducials. The software program processes this video stream data and interprets the movements into gestures. The gestures are different from one another and are assigned some commands. These gestures can act as input to application which is projected by the projector. Since, the projector is aligned downwards for compactness; therefore images would be formed at the user's feet if mirror wasn't used. The mirror reflects the image formed by the projector to front. The entire hardware is fabricated in the form of a pendant.

C. Application

Sixth sense technology is developed to digitalized human behavior. In this system we have applied the technology to form a technology enabled Lecture Theatre. The system is developed to present a lecture in a different approach where everything is visible to students. It saves much time. Examples can be shown to students using images or video that is more approachable. Students can ask query from the system, and get replied instantly. The main goal of the system is to make the lecture delivery more efficient and smart, where the students can know what the future scope of concern subjects is and how it is related to their career. The visual implementation of programmatic solution for a project would be very helpful to them to understand the theoretical and practical concerns. In future the system could be extended by adding more new components in it.



Fig 5 Use of sixth sense

FIG.6 Applications of internet of things

VI. IOT (INTERNET OF THINGS)

A. A. Introduction

The Internet of things (IoT) is the inter-networking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items—embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data.

The concept gained steam for its ability to connect the unconnected – physical-first objects previously incapable of generating, transmitting and receiving data unless augmented or manipulated. Embedding sensors, control systems, and processors into these objects enables horizontal communication across a multi-node, open network of physical-first objects.

The term is also vaguely used to describe connected digital-first devices such as wearable gadgets that may be classified as Internet of Digital while offering the same functionality as its physical-first counterpart developed into a smart connected technology.

B. Working

An IoT system consists of sensors/devices which “talk” to the cloud through some kind of connectivity. Once the data gets to the cloud, software processes it and then might decide to perform an action, such as sending an alert or automatically adjusting the sensors/devices without the need for the user.

But if the user input is needed or if the user simply wants to check in on the system, a user interface allows them to do so. Any adjustments or actions that the user makes are then sent in the opposite direction through the system: from the user interface, to the cloud, and back to the sensors/devices to make some kind of change.

C. Applications

Wearables, Smarthome, Smart City, Industrial, internetConnectedcar, Healthcare, Smart retail, IoT in Agriculture

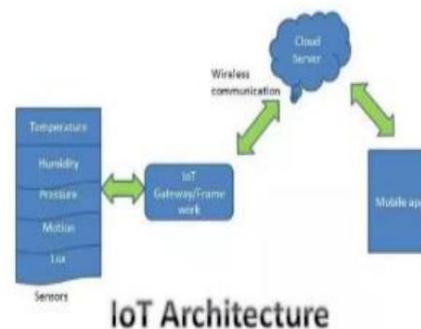
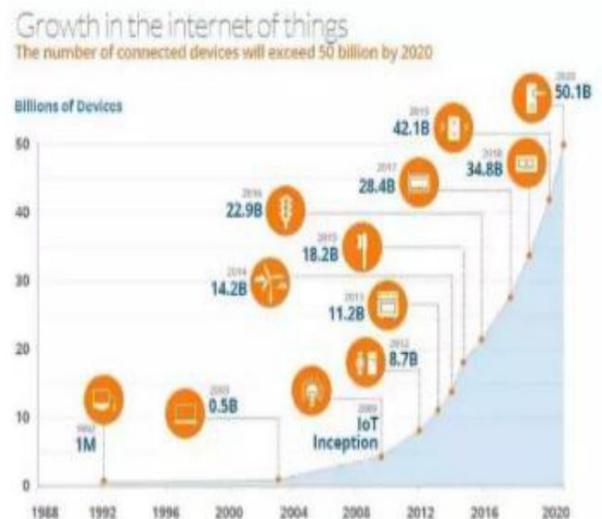
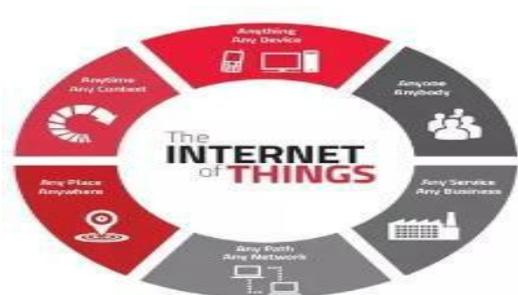


FIG8. IOT Architecture

VII. WIRELESS POWER TRANSMISSION-

A. A. Introduction

In this technology a space-based satellite is used to collect huge amounts of solar power, which is then converted into microwaves, transmitting electric power wirelessly to a pinpoint target using microwaves, to a Receiving rectenna (antenna) on the ground, and converted into DC energy for electrical use.



B. Rectenna

The concept and development of the rectenna arose in response to the need for a device that could be attached to a high altitude atmospheric platform and absorb and rectify microwave power from a microwave beam pointed at the vehicle.

C. Working

The receiving antenna (rectenna) converts the microwaves into DC power by taking the microwave in through the regular receiving antenna, then passing the signal through a Rectifying Diode, which then usually passes through a Low Pass Filter, which then ultimately passes into a DC to DC step up / step down “buck converter” — to scale up the power or scale down the power for using regular household electric powered items. Whatever signal the antenna picks up is originally in “AC” inside the antenna, thus a “rectifying diode” is needed to obtain useable steady voltage... rectifying the radio wave into DC voltage.

VIII. CONCLUSION

As What can be concluded from reviews of the current definition of ‘wireless’ and the ongoing developments, it seems there’s quite some time for the wireless technology to surface and compete with the already available options. The wireless future isn’t immediate and the transition will take its own pace, taking baby steps, one at a time.

IX. REFERENCES

- [1] Wireless World: Social and Interactional Aspects of the Mobile Age. By Nicola Green, Barry Brown.
- [2] Wireless networking technology, Book by Steve Rackley
- [3] <https://link.springer.com/article/10.1023/A:1013782614004>
- [4] <https://www.postscapes.com/internet-of-things-technologies/>
- [5] <https://www.thetrustcompass.com/top-trends-in-wireless-technology/>

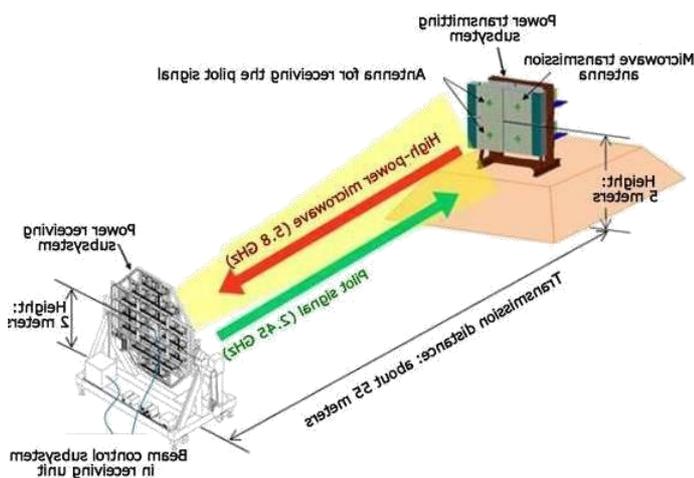


Fig 9. Wireless Power Transmission

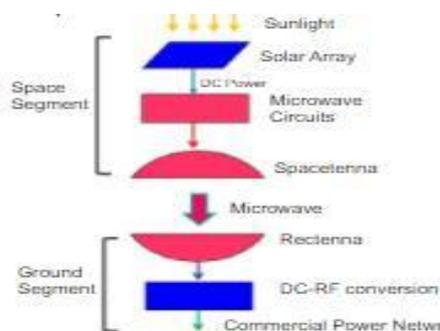


Fig 10. Flow chart of Energy Conversion System