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Red Tact on: New Era of Computing

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Abstract -- HAN (Human Area Network) is the new type of network that comes under the personal area network (PAN) which allows to share the information through surface of an human body easily, human society is entering a new age of computing, when networks are effortlessly interconnected and information is always accessible at our fingertips through technology RedTacton. RedTacton is a new technology which allows exchanging information through natural actions of human body, such as touching, hugging and so on. RedTacton comes under 10BASE communication in accordance with IEEE 802.3 through an human body. Here we discuss about the techniques to establish stable communication, noise reduction and firmware technology for this services, based on modules with a bidirectional communication function (Full duplex mode). Now the RedTacton achieves data transfer rate at 10Mbps in Half Duplex communication over the surface of a body.

Keyword – HAN, RedTacton, Half Duplex, Full Duplex, Firmware.

I. INTRODUCTION

RedTacton allows exchanging of information between the nodes at short-range via the natural action of a human body, such as touching, holding and so on. RedTacton is a Japanese term in that Red denotes “warmth” in Japanese culture and Tacton means “action triggered by touching”. RedTacton is technology which allows surface of a human body as a medium to transmit that data with help of minute electric field emitted on body surface. It not only uses human body as a medium it also use the various conductor and dielectric materials, also it can use both dielectrics and conductors in combination refer fig 1. But there is a limitation on length of the conductor and thickness to be propagated and installation location.

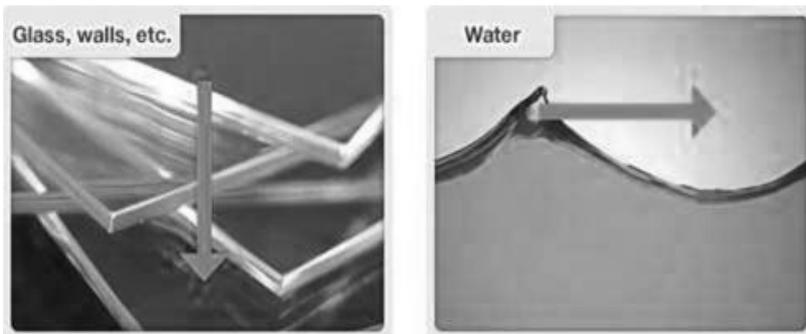


fig 1: Dielectric medium and various conductors

II. WORKING OF REDTACTON

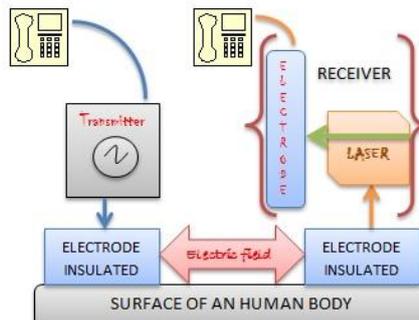


Fig2: Mechanism of RedTacton

RedTacton is a device consists of both transmitter and receiver refers fig2. The electrode induces a weak electric field on the surface of the body, it is sensed by receiver using a super-sensitive photonic electric field sensor and it is consists of electro optic crystal. The electric signal is converted into optical signal using an properties of electro optical crystal refer fig3, there is any fluctuations in the minute electric field over an surface an body the, crystal will produce Laser beam with various intensity, accordance with changes in electric field the electric signal is converted into digital signal by electrode of a receiver and then original data is converted back at receiver end. RedTacton can able to transmit data at the rate of 10Mbps. RedTacton have of both transmitter and receiver it consist of modulator and demodulator, so that it noise problem while transmitting the data.

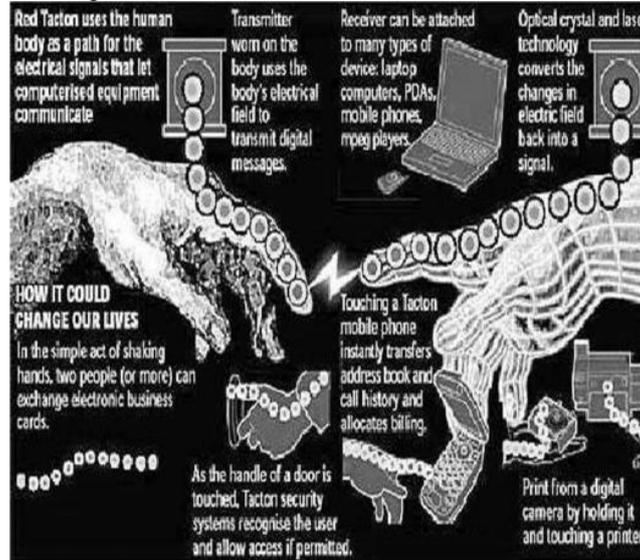


Fig3: principles of RedTacton

A. Data transmission in RedTacton

The electric-field signal generated in the human body induced by electrodes of the transmitter as E_a . This signal is returned to the transmitter via the circuit's ground as electric field signal as E_b . If the person is connected to the earth, electric-field signal E_c escapes to the earth ground. E_b and E_c are very large, so the signal that reaches the receiver is greatly reduced. The receiver able to detect very weak electrical-field signals components E_s using a high super-sensitive photonic electric field sensor refer fig4.

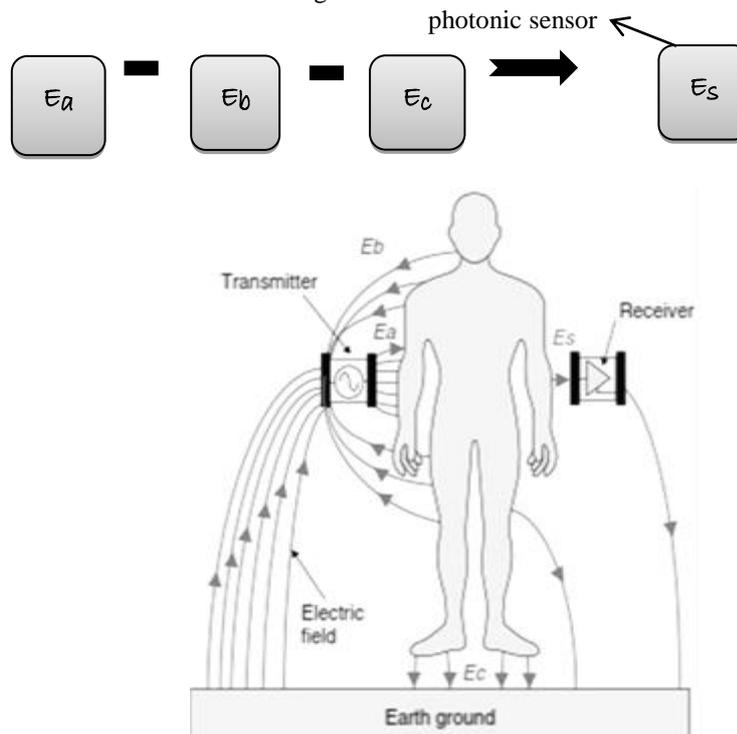


Fig4: Signal transmission mechanism

The ground electrodes are vulnerable to electromagnetic noise from the environment, noise will make a receiver to malfunction, Therefore, a mechanism to prevent that noise from causing receiver to malfunctions is required, and noise is reduced by using a floating capacitor between electrode and body surface refer fig4 .

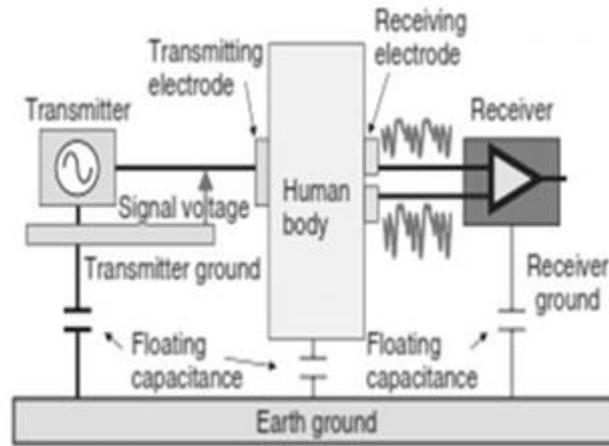


Fig4: Receiver model for electrical-field communication

III. FULL DUPLEX MODE USING LARGE SCALE INTEGRATION CIRCUIT

A Large Scale Integrated circuit (LSI) is similar to integrated circuit with same data processing ability and memory capacity. It is used in human-body near- field (RedTaction) communication to provide two-way communication (Full Duplex) , induce an electric-field signal with good efficiency, detects electric-field signal with high sensitivity, quash environmental noise and low power consumption.

To implement, analog and digital LSIs are developed to meet the requirement to achieve a stable communication over full duplex mode and reduction in noise.

1. Analog LSIs:

In this binary phase shift keying (BPSK) is used as a synchronization detection method because it provides high noise tolerance when receiver uses human body as a transmission path. Specifications of analog LSI [3] refer table1.

Table1: Analog LSI Specification

Analog LSI	Size	2.5 mm × 2.5 mm
	Carrier	6.75 or 9 MHz
	Modulation	BPSK
	Bit rate	526 Kbit/s

2. Digital LSIs

- Digital chip provide a same function as an ordinary IC.
- It has a 16-bit central processing unit (CPU) that operates at 10MHz.
- Compact mounting same as analog LSI (water-level packing).
- Digital LSI designed for low power consumption and can be used in a terminal (receiver) powered by coined battery.
- Specification of Digital LSI [3] refers table2.

Table2: Digital LSI Specification

Digital LSI	Size	5 mm × 5 mm
	CPU	16 bit , 10 MHz
	Flash memory	256 KB
	RAM	24 KB

IV. STABLE COMMUNICATION

Two key techniques for establishing stable communications efficient electric-field induction and ambient noise reduction.

To get efficient induction of a stable AC electric field, we need to control the effects of this floating capacitance. Reduction of ambient noise to develop a near-body quasi-electric field communications technology that achieves the quality required to offer communications services and operates at a minimal transmission power level refer fig4.

V. COMMUNICATION TERMINALS WITH REDTACTON MODULE

There are three kinds of communication devices or terminals (card, mobile, embedded terminals) that can have a RedTacton module.

1. *Card Terminal:*

It provides the same service as existing IC (integrated circuit), this device appears as a thin card form, it consume low power and it is powered by compact battery. It must have a file management function to maintain data for authentication and certification verification. It operates as a slave in communication role.

2. *Mobile terminal:*

It is similar to card terminal and it differs by role of communication (It operates as slave, master and peer-to-peer communication). Mobile terminal used establish the communication between the terminals and it must have a file management function and function for connecting to a supervising device. It was powered by built-in battery.

3. *Embedded terminal:*

It was powered by a mains AC, low power consumption is not an important issue and it does not need to have a file management function but it need to have a function for connecting to a supervisor. It operates only on master and peer-to-peer communication role.

Table3: Types of RedTacton communication devices

Type	Power supply	Power saving	File management	Supervising device	Communication role
Card terminal	Battery	Required	Required	Not required	Slave
Mobile terminal	Battery	Required	Required	Required	Master, slave, peer
Embedded terminal	Main AC supply	Not required	Not required	Required	Master, peer

By combining these three terminal, we can create authentication, information exchange and security service refer fig5.

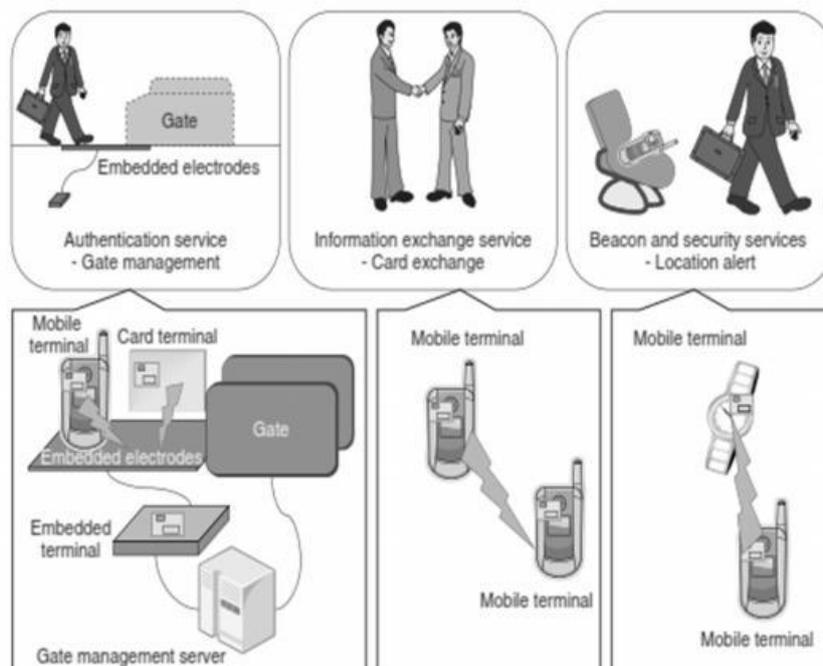


Fig5: working of terminal

VI. APPLICATION OF REDTACTON

RedTacton is applied to various fields such as medical, defence, settlement and so on... refer fig6.

1. *Medical:*

Using a special type of sensor, attributes of an medicine is collected and it able to identify the particular medicine and it gives an alarm if the medicine expires or user touches an wrong medicine.

2. *Defence:*

In defence sectors, all the weapon details are collected by a sensor it gives a full details about the weapon to user who touches the respective weapon. By the way an ordinary person can able to operate a weapon in military.

3. *Automation:*

Automatic seats adjustment in car and so on.

4. *Security:*

It provides a highly level security in various domains.



Fig6: Applications of RedTacton

VII. CONCLUSIONS

Here we achieved a main objective RedTacton system supporting two-way intra body communication at a rate of 10Mbit/s between any two points on the body and also providing a stable connection then reduction noise. Another major factor in RedTacton is to achieve full meaning to “ubiquitous”[1] (access information networks at any time and ideal of a ubiquitous society is an environment that enables information to be accessed instantly, as needed, from any object around us) if achieved it will make it possible to utilize a greater variety of sensor-captured data and combine different kinds of data to create new services. When this happens we will surely be closer to a simple, convenient, and pleasant ubiquitous society.

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