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A PATH FOR HORIZING YOUR INNOVATIVE WORK

REDTACTON: THE NEW ERA OF HUMAN NETWORKING

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Abstract- Human society is entering an era of computing, where networks are seamlessly interconnected and information is always accessible at our fingertips. In the world of computers, networking is the practice of linking two or more computing devices together for the purpose of sharing data. RedTacton enables the first practical Human Area Network between body- centered electronic devices and PCs or other network devices embedded in the environment via a new generation of user interface based on totally natural human actions such as touching, holding, sitting, walking, or stepping on a particular spot. By making Human Area Networks feasible, RedTacton will enable services based on human centered interactions and therefore more intimate and easier for people to use. RedTacton can be used for intuitive operation of computer-based systems in daily life, temporary one-to-one private networks based on personal handshaking, device personalization, security, and a host of other applications based on new behaviour patterns enabled by RedTacton.

Keywords: Human Area Network, NTT, touch-act-on



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INTRODUCTION

Human society is entering an era of computing, where everything is networked. The practical implementation of services requires three levels of connectivity: Wide Area Networks (WAN), typically via the Internet, to remotely connect all types of servers and terminals; Local Area Networks (LAN), typically via Ethernet or Wi-Fi connectivity among all the information and communication appliances in offices and homes; and Human Area Networks (HAN) for connectivity to personal information, media and communication appliances within the much smaller sphere of ordinary daily activities—the last one meter. RedTacton is a break-through technology that, for the first time, enables reliable high-speed HAN.



Fig.1. Human Area Networking

In the past, Bluetooth, infrared communications (IrDA), radio frequency ID systems (RFID), and other technologies have been proposed to solve the "last meter" connectivity problem. However, they each have various fundamental technical limitations that constrain their usage, such as the precipitous fall-off in transmission speed in multi-user environments producing network congestion. "With Bluetooth, it is difficult to rein in the signal and restrict it to the device you are trying to connect to. You usually want to communicate with one particular thing, but in a busy place there could be hundreds of Bluetooth devices within range."

2. WHAT IS REDTACTON? RedTacton is a new Human Area Networking technology that uses the surface of the human body as a safe, high speed network transmission path.

RedTacton takes a different technical approach. Instead of relying on electromagnetic waves or light waves to carry data, RedTacton uses weak electric fields on the surface of the body as a transmission medium. A RedTacton transmitter couples with extremely weak electric fields on the surface of the body. The weak electric fields pass through the body to a RedTacton receiver, where the weak electric fields affect the optical properties of an electro-optic crystal. The extent to which the optical properties are changed is detected by laser light which is then converted to an electrical signal by a detector circuit.

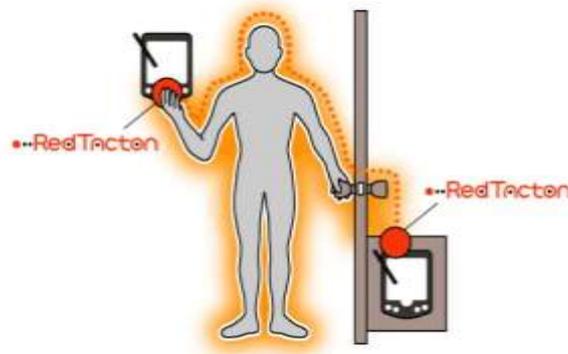


Fig.2. Approach of RedTacton for communication

2.1 RedTacton uses minute electric field emitted on the surface of the human body. Technically, it is completely distinct from wireless and infrared.

2.2 A transmission path is formed at the moment a part of the human body comes in contact with a RedTacton transceiver. Physical separation ends the contact and thus ends the communication.

2.3 Using RedTacton, communication starts when terminals carried by the user or embedded in devices are linked in various combinations according to the user's natural, physical movements.

2.4 Communication is possible using any body surfaces, such as the hands, fingers, arms, feet, face, legs or torso. RedTacton works through shoes and clothing as well.

3. FEATURES OF REDTACTON

3.1 The RedTacton equipment can be triggered by touch. Touching, gripping, walking, Stepping can trigger the device.

3.2 Duplex communication can take place at a maximum speed of 10Mbps. Since Human body surface is involved, the speed of transmission does not deteriorate in congested areas.

3.3 An additional feature of RedTacton allows the use of other media (Conductors and Dielectrics) instead of Human Body.

4. REDTACTON TRANSCIEVER The RedTacton transmitter comprises of a transmitter circuit that induces electric field towards the body and a data sense circuit which differentiates transmitting and receiving modes by detecting both transmission and reception data and outputs control signals corresponding to the two modes to enable two-way communication.

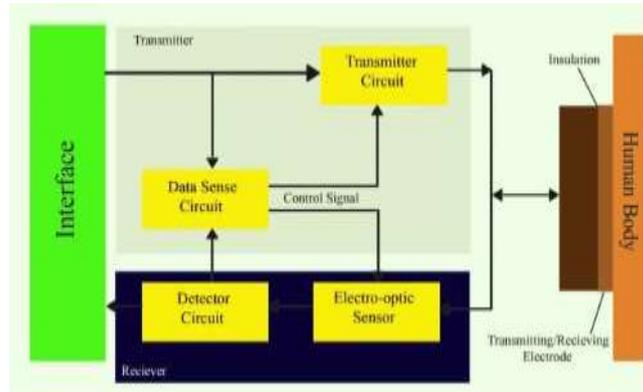


Fig.3. Block diagram of RedTacton of Transceiver [1]

The receiver comprises of an electro-optic sensor and a detector circuit that amplifies the minute incoming signal from the electro-optic sensor and converts it to electrical signal. It implements receive-first half-duplex communication which sends only after checking, so that no data is received to avoid packet collisions. RedTacton takes advantage of the long overlooked electric field that surrounds the human body.



Fig. 4 RedTacton and Transceiver

5. WORKING OF REDTACTON

RedTacton incorporates a different technical approach for communication. It uses weak electric fields on the surface of the body for transmission instead of depending on electromagnetic waves and light waves.

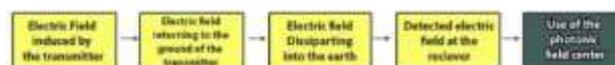


Fig.5. Flowchart representing working of RedTacton

5.1 The transmitter sends data based on the fluctuations in the weak electric field induced in the body.

5.2 The electric field is received using super-sensitive electric field sensing technology.

5.3 RedTacton uses the principle that the optical properties of an electro-optic crystal changes according to the changes in weak electric field.

5.4 The changes in the optical properties of an electro-optic crystal are detected using a laser and the result is converted to an electrical signal in optical receiver circuit.

5.5 It can simultaneously use multiple transceivers because RedTacton uses a proprietary CSMA/CD (CarrierSense Multiple Access with Collision Detection) protocol that allows multiple accesses with the same medium from multiple nodes.

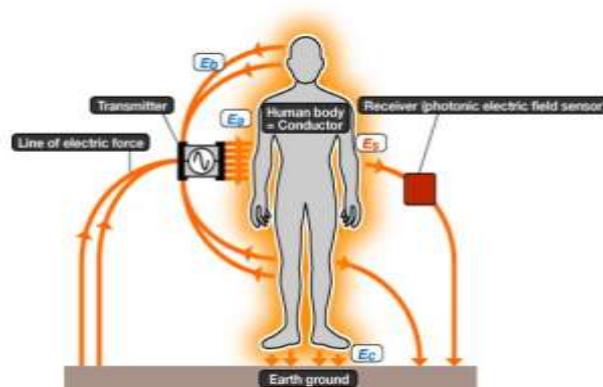


Fig.6. Communication with RedTacton [1]

The naturally occurring electric field induced on the surface of the human body dissipates into the earth. Therefore, this electric field is exceptionally faint and unstable. The super-sensitive electric field sensing technology measures the weak electric fields induced by the super-efficient alternating electric field induction. The photonic electric field sensor developed by NTT enables weak electric fields to be measured by detecting changes in the optical properties of an electro-optic crystal with a laser beam.

6. HUMAN SAFETY

Since RedTacton uses human body as a medium for communication of data, human safety is of utmost importance. The transmission and receiving electrodes are completely covered with insulating film so that the human body is safe. This makes it possible for current to flow into a person's body from a transceiver. At the time of communication, displacement current is generated by the electrons in the body because the body is subjected to minute electrical fields. However such displacement currents are very common everyday occurrences to which we are all subjected.

RedTacton fits to the "Radio Frequency- Exposure Protection Standard (RCR STD-38) issued by the Association of Radio Industries and Business (ARIB). The levels produced by RedTacton are way below the safety limit specified by this standard.

7. APPLICATIONS

7.1 One-to-one services

With the ability to send attribute data from personal information devices worn on the body to computers embedded in the environment, one-to-one services could be implemented that are tailored to the individual needs of the user.

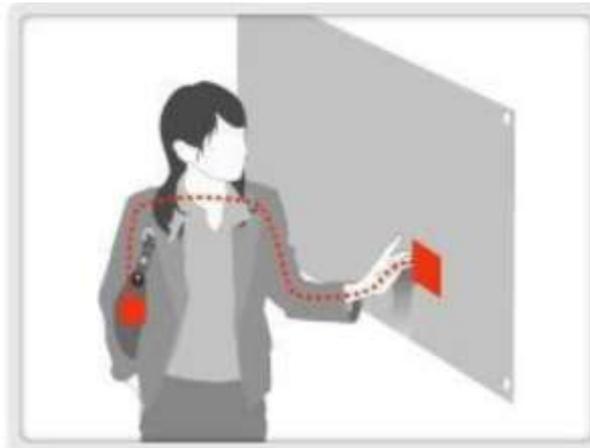


Fig.7. Marketing Applications [2]

According to the fig. Above when a consumer stands in front of an advertising panel, advertising and information matching his or her attributes is automatically displayed. By touching or standing in front of items they are interested in, consumers can get more in- depth information. Inside a shop, shoppers can view related information on their mobile terminals immediately after touching a product.

7.2 Intuition operation of personal information devices

Communication is triggered by totally natural human actions and behaviour, so there is no need to insert smart cards, connect cables, tune frequencies, or any of the other inconveniences usually associated with today's electronic devices. E.g. Printout where you want just by touching the desired printer with one hand and a PC or digital camera with the other hand to make the link.



Fig.8. Intuitive operations [2]

7.3 Device personalization

Setup, registration and configuration information for an individual user can all be uploaded to a device the instant the device is touched, eliminating the need for the device to be registered or configured in advance. For e.g. In a car the seat position and steering wheel height adjust to match the driver just by sitting in the car. The driver's home is set as the destination in the car navigation system.



Fig.9. Personalisation of Automobiles [2]

7.4 New behaviour pattern

Tables, walls, floors and chairs can all act as conductors and dielectrics, turning furniture and other architectural elements into a new class of transmission medium.

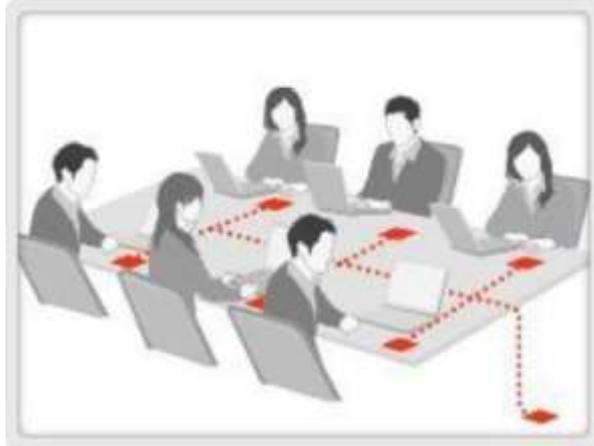


Fig.10.Conferencing systems [2]

The fig. above shows the way of network connection using tables. An electrically conductive sheet is embedded in the table. A network connection is initiated simply by placing a laptop on the table.

7.5 Security applications

RedTacton could be installed on doors, cabinets and other locations calling for secure access, such that each secure access could be initiated and authenticated with a simple touch. At the same time, all the transaction details and relevant user attributes (personal identity, security clearance, etc.) could be logged by the security system.



Fig.11. User verification Management [2]

8. COMPARISON WITH OTHER NETWORK TECHNOLOGIES

Evaluation criteria	Wireless				Infrared	Red Tacton
	Wireless LAN	Close-range wireless	Contact less IC cards	Passive wireless ID tag	Standard data communication	
Transfer speed	E	P	P	P	P	E
Performance deterioration during periods of congestion	P	P	E	E	E	E
Duplex data transfer	E	E	E	P	E	E
Data configuration at initiation of communications	E	E	P	P	E	E
Tasks required at time of each communication	E	E	P	E	P	E
Synchronization with user behavior	P	P	E	E	P	E

Fig.10. Difference between RedTacton and other Technologies

9. ADVANTAGES

- 9.1 RedTacton does not require the electrode to be in direct contact with the skin.
- 9.2 High-speed communication is possible between two arbitrary points on the body.
- 9.3 Body-based networking is more secure than broadcast systems, such as Bluetooth which have high range of about 10m.
- 9.4 Network congestion due to fall in transmission speed in multi-user environments is avoided.
- 9.5 Superior than Wi-Fi.

10. DISADVANTAGES

1. It has no convincing applications that aren't already available.
2. Too costly.

11. CONCLUSION

The applications of RedTacton are enormous, medical security and data transfer is just the start. Conferencing can be enabled without the use of wiring, and walls and desks and doorknobs can be used for data transfer. In education the applications are endless from lesson outlines to administrative forms data could be transferred quickly and easily without pedagogical intervention. This technology seems to be a glimpse into the future. At first it will be limited in use and fairly expensive, but as it becomes more widespread we could see the extinction of the key and ID card as we know them today. Imagine walking up to your house, reaching for a doorknob which automatically unlocks the door, and walking right in. No more fumbling around for keys. That's a future we'd like to live in.

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