HUMAN AREA NETWORKING

(REDTACTON)

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Abstract

Human society is entering an era of ubiquitous computing, when 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 ubiquitous 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 behavior patterns enabled by RedTacton. At last we predicted how Redtacton changes lifestyle in future.

Background

At the end of 2002 the Japanese telecommunications group NTT had announced that it would develop a new data transmission technology that uses the conductive properties of the human body to exchange information between electronic devices. With RedTacton the company has now scarcely two and a half years later presented its first prototype of a Human Area Network (HAN).

The basic principle of the RedTacton concept is the creation of minute electrostatic fields that modulated by a code-giver to carry digital information are capacitively transmitted to human skin as a conductor, thence to be transmitted upon physical contact. To read out the data bits NTT makes use of a novel type of opto-electrical receiver equipped with a miniature laser whose light ray is reflected by a crystal.

At the receiving end the electrostatic fields evoked by the RedTacton sender cause the electrical field in the environment of the crystal to change, which in turn induces changes in the polarization of the reflected laser light. These changes in polarization the opto-electrical receiver interprets as data bits, which it converts into electrical signals that can be processed by a PDA, for instance.

According to NTT this technology - which can also be made to works when door handles, switches or turnstiles are touched - allows bi-directional signals to be sent at rates of up to 10 Mbit/s. The strength of the electrostatic fields evoked the company puts at but a few hundred milliwatts. Prior to the stage planned for 2006 in which the HAN technology is to be ready for the market, NTT intends to conduct a number of field tests this summer, in which it is inviting companies with an interest in the technology to participate.

Japanese company Nippon Telegraph and Telephone Corporation (NTT) claims to have developed the first viable Human Area Network (HAN) device, enabling fast data transfer between devices using the human body as a conduit.

NTT reckons this latest advance on the wireless Personal Area Network concept - dubbed RedTacton - can transmit data over the surface of the skin at up to 2Mbps. Where it differs, though, from previous offerings, is that a RedTacton-enabled device does not have to be in direct contact with the skin - only within about 20cm.

Introduction

Human society is entering an era of ubiquitous computing, where everything is networked. The practical implementation of ubiquitous services requires three levels of

connectivity: Wide Area Networks (WAN), typically via the Internet, to remotely connect all types of severs and terminals; Local Area Networks (LAN), typically via Ethernet or WiFi 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. 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."

Furthermore, humans apparently make poor aerials, something which is "good for security because even if you encrypt data it is still possible that it could be decoded, but if you can't pick it up it can't be cracked

What's 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.

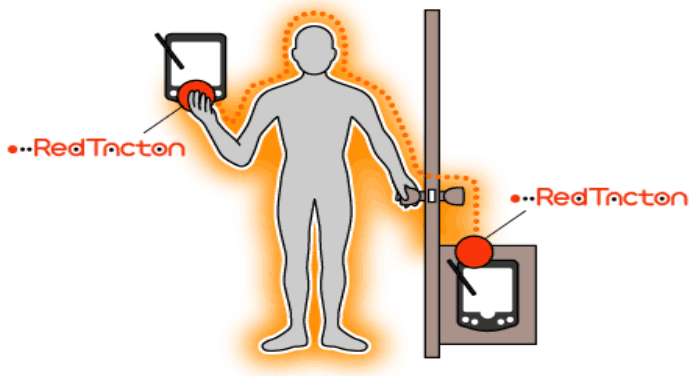
RedTacton takes a different technical approach. Instead of relying on electromagnetic waves or light waves to carry data, RedTacton uses weak electric fields on the surface of the body as a transmission medium. A RedTacton transmitter couples with extremely weak electric fields on the surface of the body. The weak electric fields pass through the body to a RedTacton receiver, where the weak electric fields affects 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.

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

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

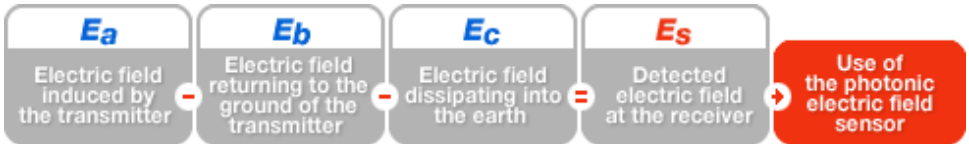
- Using RedTacton, communication starts when terminals carried by the user or embedded in devices are linked in various combinations according to the user's natural, physical movements.

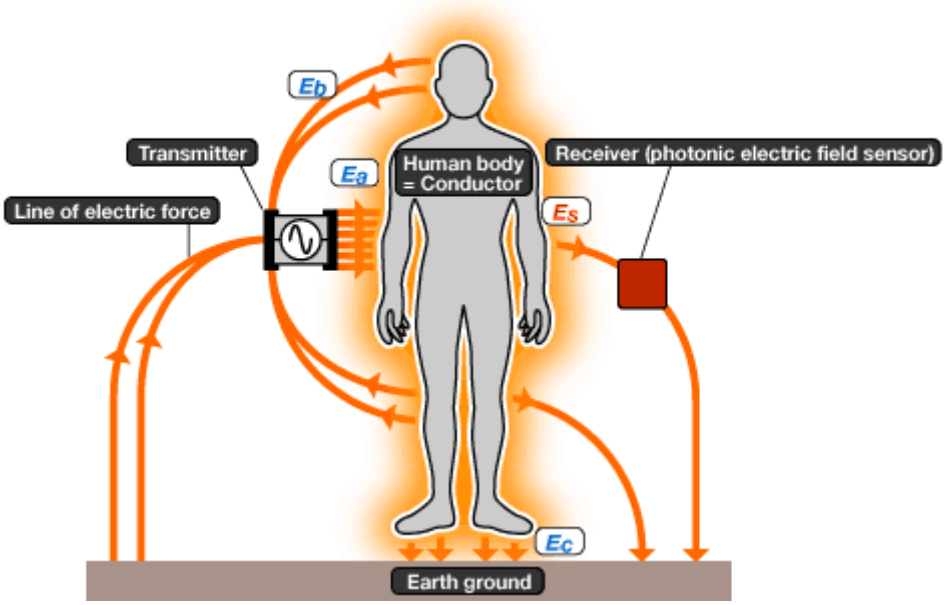
- Communication is possible using any body surfaces, such as the hands, fingers, arms, feet, face, legs or torso. RedTacton works through shoes and clothing as well.



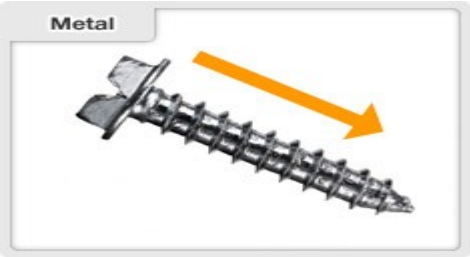
How RedTacton Works ?

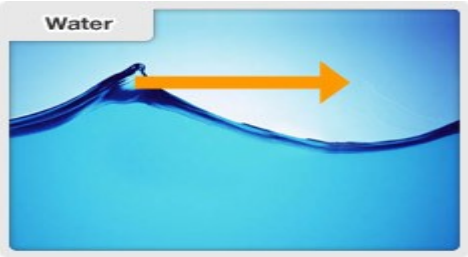
The transmitter sends data based on fluctuations in the weak electric field induced in the body. The electric field is received using super-sensitive electric field sensing technology.



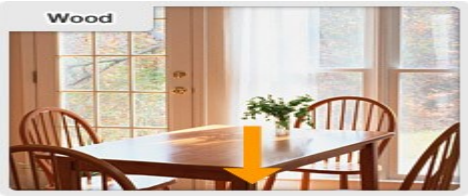


- The naturally occurring electric field induced on the surface of the human body dissipates into the earth. Therefore, this electric field is exceptionally faint and unstable.
- The super-sensitive electric field sensing technology measures the weak electric fieldsinduced by the super-efficient alternating electric field induction .





- Dielectric : Signals pass through materials



Conductor + Dielectric : Combinations of travelling along and passing through materials

Potential Applications

- 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.

- Intuitive operation of personal information devices
Communication is triggered by totally natural human actions and behavior, 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.

- 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.

- New behavior patterns
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. For example, a user could have instant access to the Internet merely by placing a laptop onto a conductive tabletop.

- 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.

Conclusion

The applications of RedTacton are enormous, medical security and data transfer are just the start. Conferencing can be enabled without the use of wiring, and walls and desks and doorknobs can be conduits for data transfer. In education the applications are endless from lesson outlines to administrative forms data could be transfered 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.