Human Area Network at Defence

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Abstract—HAN, the Human Area network is a Technology that uses the outer skin of the Human Body as the path for the transmission of data safely with a high speed. This technology is an innovative method which uses the minute electric field emitted on the surface of the human body makes it different from the advanced technologies like wireless transmission and IR technologies. The concept of REDTACTON, Red Touch ACT ON makes Communication possible using anybody surfaces, such as the hands, fingers, arms, feet, face, legs or torso. Combining the human body with the various conductors and dielectrics the transmission of data can be made powerfully and securely. This state-of-the-art technology can be castoff in Defence to pass the imperative data and commands among the authorized in secret. Out of many available technologies like LAN, WAN, MAN, INTERNET, BLUE TOOTH, ZIG-BEE …etc the REDTACTON uses the human skin as communication medium. In Defence HAN can be used to pass orders to the individuals in officers level to allocate their freedom of action and to restrict individual soldiers not to use the weapon at the wrong time. During the conference of the higher ranks to assign the specific task for the individuals when others need not or should not know the rights given to others. Just through handshake the intruders or terrorists might be known and taken off. Foreign objects, persons can be revealed and get a clear fool proof soldiers. With already stored data of individuals including the thumb impressions, blood group etc., thesecurity system can be at the maximum proof.

Index Terms—Human Area Network, Defence, Sensors, REDTACTON, Security, Terrorists.

I. INTRODUCTION

Human Area Networking (HAN) is a technology that safely makes the surface of the human body into a data transmission path at speeds up to 10 Mega bps between any two points on the body [1]. Evolution of HAN came into existence as the concept of intra-body communication and was first proposed by International Business Machines Corporation in the year 1996. This communication mechanism was later evaluated and reported by numerous research groups around the world. All those reported technologies had two limitations as a) The operating range through the body was limited to a few tens of centimeters and b) The top communication speed was only 40 bit/s.

These limitations were overcome by NTT (Nippon Telegraph and Telephone Corporation) , Tokyo, Japan by using photonic electric field sensors and as a final point came up with a human area networking technology called ‘REDTACTON’. RedTacton is a new Human Area Networking technology that turns the surface of the human body as a safe, high speed network transmission path. Communication is possible using any body surfaces like the hands, fingers, arms, feet, face, legs or toes. RedTacton works through shoes and clothing as well. RedTacton uses the minute electric field emitted on the surface of the human body for data transmission. NTT developed super sensitive Photonic electric field sensor for detecting minute electric field emitted on the surface of the human body. The electro-optic sensors are the electronic detectors that convert light, or a change in light, into an electronic signal. They are used in many industrial and consumer applications.

II. REDTACTON

TACTON is Touch ACT ON meaning of which is an action triggered by touching” and RED was added as that color is the auspicious one for the Japanese philosophy representing warmth. This technology uses the surface of the human body as a safe, high speed network transmission. The study of Human Area Networking.

- RedTacton uses the minute electric field emitted on the surface of the human body. It is completely distinct from wireless and infrared.
- A transmission path is formed at a part of the human body which 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 are linked in several combinations according to the user's natural, physical movements.
- Communication is possible using any body surfaces, such as the hands, fingers, feet, face, legs, skin or torso. Red Tacton works through shoes and clothing as well.
The transmitter has a circuit that induces electric fields towards the body and a data sense circuit, which distinguishes 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 as shown in Diagram 1.

In order to avoid Packet Collisions, Receive First half-duplex Communication Scheme is implemented here to send the data only after the previously sent data is received. This RedTacton takes advantage of the long-overlooked electric field that surrounds the human body[2]. RedTacton has three main functional features:

- **Touch** - Touching, gripping, sitting, walking, stepping and other human movements can be the triggers for unlocking or locking, starting or stopping equipment, or obtaining data.
- **Broadband and Interactive** - Duplex, interactive communication is possible at a maximum speed of 10Mbit/s. Because the transmission path is on the surface of the body, transmission speed does not deteriorate in congested areas where many people are communicating at the same time.

Any media - In addition to the human body, various conductors and dielectrics can be used as transmission media. Conductors and dielectrics may also be used in combination.

A. **How does RedTacton work?**

The RedTacton transmitter induces a weak electric field on the surface of the body. The RedTacton receiver senses changes in the weak electric field on the surface of the body caused by the transmitter. RedTacton relies upon the principle that the optical properties of an electro-optic crystal can vary according to the changes of a weak electric field. RedTacton detects changes in the optical properties of an electro-optic crystal using a laser and converts the result to an electrical signal in a optical receiver circuit Multiple transceivers can be used simultaneously. This is because RedTacton uses a proprietary CSMA/CD (Carrier
Sense Multiple Access with Collision Detection (SMA) protocol that allows multiple accesses with the same medium from multiple nodes. Mechanism of communication with RedTacton.

Figure 4: RedTacton Connection diagram

Figure 5: Applications of HAN contd

Figure 6: Assembled HAN Kit

Table 1: Comparison between various transmission modes

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In Human Area Networking 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 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. System Safety NO current flows into human body from RedTacton devices.

RedTacton uses the Electric field that occurs naturally on the surface of the human body for Communication. Transmitter and receiver electrodes are covered with an Insulating films. RedTacton is in conformity to the port; Radiofrequency-exposure Protection” standard (RCR STD-38) port; issued by the Association of Radio Industries and Businesses (ARIB).

B. Features of RedTacton

RedTacton has three main functional features. Touching, gripping, sitting, walking, stepping and other human movements can be the triggers for unlocking or locking, starting or stopping equipment, or obtaining data. Human Area Networking Technology Duplex, interactive communication is possible at a maximum speed of 10Mbps.

![Figure 7: Applications of HAN continued](image)

Because the transmission path is on the surface of the body, transmission speed does not deteriorate in congested areas where many people are communicating at the same time. In addition to the human body, various conductors and dielectrics can be used as transmission media. Conductors and dielectrics may also be used in combination. Comparison with other Human communication methods RedTacton does not require the electrode to be in direct contact with the skin.

Human Area Networking Technology With the electric amperage method, electrode must be in direct contact with the skin. Comparison with other network technologies Evaluation criteria Wireless LAN Infrared Red Tacton Transfer Speed E P E Performance deterioration during periods of congestion (Simultaneous use by many people in small spaces) Duplex data transfer (Interactive processing) Performance: E: Excellent, P: Poor.

![Figure 7: Applications of HAN continued](image)

Plans for Commercialization It seems like there was a press release event where they demoed the technology.

The first demo was a PDA medication assistant that shows instructions relevant to touched medicine bottles. The second was a museum guide PDA whose contents was fed from a floor-embedded transmitter through a user’s feet. NTT plans to develop transceivers with an emphasis on portability that are more compact and less power consumption. Through field testing, NTT will continue to investigate and improve the robustness of Human Area Networking and human body surface communication applications.

C. Human Area Networking Technology applications

Four major application fields using RedTacton are introduced
- One to One services Information recorded in the RedTacton device is sent to the touched objects
- Elimination of Human Errors Marketing Applications (context awareness)
A various sensor technologies can be used to capture physical data such as position of fingers. Otherwise a motion tracker, such as a magnetic devisor inertial tracking device, is fitted to capture the global position or rotation data of the glove. These movements are interpreted by the software accompanies the glove, so any one movement can indicate any number of things. Gestures can then be categorized into useful information, to recognize Sign Language or other symbolic functions. Expensive high-end wired gloves can also provide hap-tic feedback, which is used to sense the touch. This allows a wired glove to also be used as an output device. The motivation this is to create an intuitive glove-based pointing device for multiple applications. The hope is to create a fully-developed device in terms of intuitive functionality and practical, usable features.

![Figure 8: Block diagram of Han with hand](image)

**A. Where at defense HAN can?**

- Just to pass orders to the individuals in officers level to allocate their freedom of action
- To individual soldiers not to use the weapon at the wrong time
- During the conference of the higher ranks to assign the specific task for the individuals when others need not or should not know the rights given to others
- To identify the right person assigned in for that specific task
- Just thru handshake the intruders or terrorists might be known and taken off
- Kind of portal robot type mechanism may be used at times when just the order to be followed
- Foreign objects persons can be revealed and get a clear fool proof soldiers
- With already stored data of individuals including the thumb impressions ,blood group etc., the security system can be at the maximum proof
- At the enhancement even the soldiers at the war field would come to know about the enemy attack or intrusion with the help of satellite and radar systems

**IV. CONCLUSION**

This innovative idea can very well be used by the Nation’s Defense sectors and can be utilized so that the maximum benefit for the nation garnered for the human benefit unleashing from the terrorists act to save the nation.

RedTacton is an exciting new technology for human area networking. It is developed that a transceiver that uses the human body as a data transmission medium based on an electric-field sensor that uses an electro-optic crystal and laser light. Using this transceiver, it was succeeded in achieving 10BASE communication in accordance with IEEE 802.3 through a human body from one hand to the other hand. While the immediate objective is to implement a RedTacton system supporting two-way intra body communication at a rate of 10 Mbit/s between any two points on the body, the longer-term plans include developing a mass-market transceiver interface supporting PDAs and notebook computers while continuing efforts to reduce the size and power consumption of the transceiver to enhance its portability. NTT is committed to using its comprehensive commercialization functions to push this research out to the marketplace as quickly as possible while moving ahead With tests and trials in collaboration with
The authors wish the countries to make use of the technology and have a peaceful life by concentrating more on the development factors for their country.

REFERENCES