International Journal of Technical Research and Applications e-ISSN: 2320-8163,
www.ijtra.com Special Issue 39 (KCCEMSR) (March 2016), PP. 63-67

HUMAN INTERFACING NETWORK USING RED TACTON TECHNOLOGY

Akshay Shinde[1],Ajit Gole[2],Akshay Jadhav[3]
Mrs. Trupti Harhare
Department of Electronics Engineering, LTCOE, Mumbai University, India
[1]shindeakshay007@gmail.com
[2]ajitg4494@gmail.com
[3]akshay.jadhav956@gmail.com

Abstract— **Today people can communicate anytime, any-where, and with anyone over a cellular phone network Moreover, the Internet lets people download immense quantities of data from remotely located servers to their home computers.. NTT lab from Japan is currently testing & developing this revolutionary technology. Essentially, these two technologies enable communications between terminals located at a distance from each other. Focusing on the naturalness, inevitability and sense of security conveyed by touching in everyday life, this paper describes human area networking technology that enables communication by touching, which we call RedTacton. Technically, it is completely distinct from wireless and infrared. Installation of RedTacton is simple and easy when compared to other wireless networks. RedTacton transceivers can be treated as standard network devices,so software running over Ethernet or other TCP/IP protocol- based networks will run unmodified.**

Index terms- **Redtacton, Human ,Technology,NTT.**

I. INTRODUCTION

Red Tacton is a new Human Area Networking technology that uses the surface of the human body as a safe, high speed network transmission path. It is completely distinct from wireless and infrared technologies as it uses the minute electric field emitted on the surface of the human body. A transmission path is formed at the moment a part of the human body comes in contact with a Red Tacton transceiver. Communication is possible using any body surfaces, such as the hands, fingers, arms, feet, face, legs or torso. Red Tacton works through shoes and clothing as well. When the physical contact gets separated, the communication is ended [1].

Using Red Tacton enabled devices; music from a digital audio player in your pocket would pass through your clothing and shoot over your body to headphones in your ears. And since data can pass from one body to another, you could also exchange electronic business cards by shaking hands. The word Red emphasis a warm and cordial communication and the word tacton(Touch-Act On) indicates an action triggered by touching. Japanese Company Nippon Telegraph and Telephone Corporation developed this new technology and named it Red Tacton.[2]

II. LITERATURE SURVEY

A. . History:

BAN (Body Area Network) technology is still an emerging technology, and as such it has a very short history. BAN technology emerges as the natural by-product of existing sensor network technology and biomedical engineering [2]. Professor Guang-Zhong Yang was the first person to formally define the phrase "Body Sensor Network" (BSN) with publication of his book in 2006. BSN technology represents the lower bound of power and bandwidth from the BAN use case scenarios. However, BAN technology is quite flexible BAN technology is still an emerging technology, and as such it has a very short history. However, BAN technology is quite flexible and there are many potential uses for BAN technology in addition to BSNs. Some of the more common use cases for BAN technology are:

- Body Sensor Networks (BSN)
- Sports and Fitness Monitoring
- Wireless Audio
- Mobile Device Integration

Each of these use cases have unique requirements in terms of bandwidth, latency, power usage, and signal distance. IEEE 802.15 is the working group for Wireless Personal Area Networks (WPAN). The WPAN working group realized the need for a standard for use with devices inside and around close proximity to the human body. IEEE 802.15 established Task Group #6 to develop the standards for BAN. The BAN task group has drafted a (private) standard that encompasses a large range of possible devices. In this way, the task group has given application and device developers the decision of how to balance data rate and power.

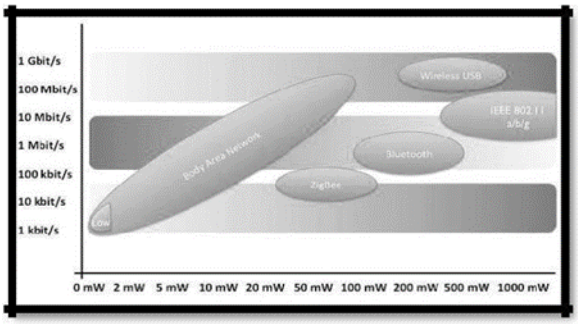

Fig.1 BAN in the power vs. data rate spectrum. [2]

As you can see the range of BAN devices can vary greatly in terms of bandwidth and power consumption. The BAN draft requirements, displayed below, add a common set of requirements as to ensure that all devices conform to a similar set of behaviors yet still encompass a wide variety of devices as previously mentioned.

B. Comparison with the existing implementations:

Protocol	Range (m)	Data (M Byte)	Speed (Mbps)	Iterations with multiple user	Duplex Data
Red Tacton	10-15	10	10	Good	Poor
Bluetooth	Max 100	0.5-1	256-1	Average	Poor
Zigbee	30	0.5-0.8	256-512	Average	Poor
UWB	50-60	0.4-0.5	1	Poor	Better
Infra Red	5-8	0.3-0.5	128-256	Poor	Poor
Wlan	6-7km	Unlimited	Unlimited	Excellent	Excellent

Fig.2 Comparison with the existing implementations.

C. Capacitive Touch screen Technology

A capacitive screen in most commercial tablets and smart phones consists of an array of conducting electrodes behind a transparent, insulating glass layer which detects a touch by measuring the additional capacitance of a human body in the circuit [6]. Figure shows a schematic of one possible realization of such a system when a user touches the screen, her finger acts as the second electrode in a capacitor with the screen as the dielectric. The touch screen electrodes are driven by an AC signal (Vsig) which sends a current through the screen capacitance Cs passing through the body capacitance CB, and then back into the tablet through the case capacitance Cc. This change in voltage measured at one or more screen electrodes is then passed to the screen controller for processing. Because all of the relevant capacitance values are small (hundreds of pico farads) environmental noise makes direct measurement of this current impractical. Instead, the charge integration circuitry in Figure is used to measure the excess capacitance associated with a finger touch. In this case, a digital signal, Vsig, is synchronized with a pair of switches and a charge integrator. Switch S3 is first closed to discharge capacitor Ci and then opened. Next, switch S1 is closed and S2 opened while Vsig is high. This charges the series combination of the CB, Cc, and Cs. Then S1 is opened and S2closed, transferring this charge to Ci. The voltage on Ci is directly proportional to the ratio between Ci and the series combination of CB ,Cc, and Cs post fixed number of cycles. This voltage is then used to detect touch and, through the matrix addressing on a multi touch display, which is not directly applicable to today's mobile devices due to its additional hardware requirement.[7]

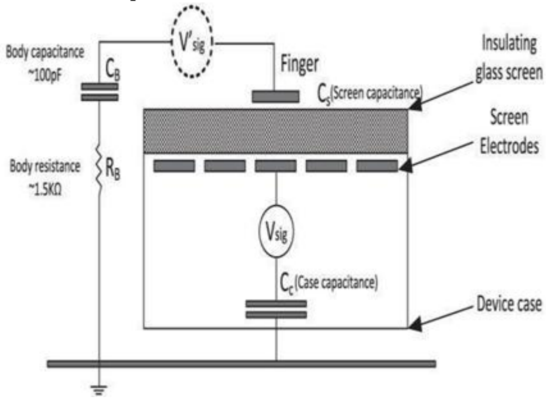

Figure 3.schematic of a basic capacitive touchscreen

The research and development made by various scientist in the field of BAN technology is given below:

Intra Body Communication, MIT, 1995

The first study with respect to BCC has been performed by Zimmerman in 1995 in and. In his work, however, BCC is referred to as intra-body communication (IBC). In his study, the capacitive coupling approach is employed and the communication system consists of a TX and RX which are battery powered devices. The TX and RX are also electrically isolated from each Other, so they do not share a common electrical ground. Both TX and RX are connected to a pair of vertically structured electrodes. The electrode size is in the order of centimetres. Data is transmitted by modulating electric fields and by capacitive coupling very small currents to the body. The body conducts the tiny signal to the RX which demodulates the signal. The environment provides the return path. [8]

Shinagawa et al., NTT laboratories, 2003-2004

A near-field-sensing transceiver for BCC has been developed by the authors of [9] and [10]. In their study, they used capacitive coupling for the data transmission. An optical electric field sensor that exploits the electro-optic effect and laser light has been used for the receiving part of this transceiver. Since the sensor can measure electric fields independent of ground contact and has an extremely high input impedance, it is able to detect small unstable electric fields from the human body more accurately than the electrical sensors employed in previous studies. The experiments have been performed employing a phantom body model. In the experiments the TX and RX electrodes are capacitively coupled to the phantom model. Their demonstration shows that this set up can support TCP/IP (10BASE) half-duplex communication at 10 Mbps. They also experimentally verified that the intra-body communication and inter-body communication can be performed employing the designed transceiver. In the intra-body communication setup, the test person touches the electrodes of two transceivers by the right and left hands to confirm that the two transceivers can communicate through the human body. In the inter-body , two test persons shake shake hands while each touches the transceiver electrode with the free hand. The result confirms that the two transceivers communicate via the bodies of the test persons.

Hachisuka et al. [11]

In a study by the author, the characteristics of the BCC have been investigated for high frequencies from 1 MHz to 10 GHz. They claim that the human body acts as a waveguide for these frequencies. In this work, two different electrode structures, the vertical and horizontal, have been introduced as four-terminal circuit model and two-terminal circuit model, respectively, to investigate the optimum electrode structure for BCC. Extensive measurements have been performed employing electrodes with different materials. Different body locations and different arm positions, such as arm held up, arm held horizontally and arm held down, have also been examined. As measurement system, they developed a battery-powered TX and RX. The electrodes in the TX and RX sides are structured horizontally. The output signal is measured by connecting an oscilloscope to the RX side. The results obtained from the measurements indicate that the vertical structure is superior to the horizontal structure in the MHz frequency range. Considering various arm positions, the arm held down had the lowest gain, which they claim to be a result of transmission direction inversion at the shoulder and interference on the surface and inside the body.

It is also shown that the transmission characteristics are independent of the distance between the ground and the body. The electrode impedance is largely independent of the electrode materials, so stable communication can be achieved using different kinds of electrodes. The maximum frequency has been found to be between 10 to 50MHz, as signals are gradually attenuated for frequencies above 100 MHz and exponentially above 1 GHz. Digital data transmission at 9600bps using FSK at a carrier frequency of 10.7 MHz was reported.

III. PROPOSED METHODOLOGY

The basic block diagram for the proposed model is as shown below

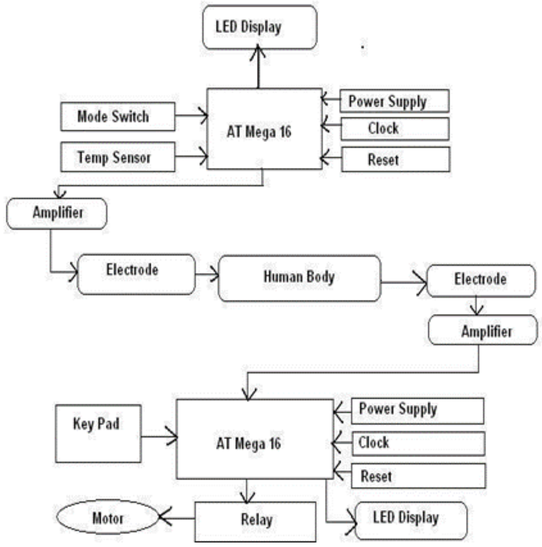

Figure 3. Basic block diagram of BAN

The above block diagram consists of two sections that are transmitter and receiver. Both consist of an aluminium electrode attached to it. The input to transmitter is given through four way switches provided at the transmitting side. This input is given to the ATMEGA16 microcontroller. For running the microcontroller three things are required that is power, clock & reset which is given to it. The two LCD screens are fixed to microcontroller for showing the input and output results at transmitter and receiver side respectively.

The transmitting signal is induced in the human body through the transmitting electrode. The receiver receives this weak signal through receiving electrode attached to human body. Since the signals received is weak signal hence it is amplified by and amplifier and is given to receiver. The necessary output will be generated at the receiving end as per the input mode selected at the transmitting side.

IV. SOFTWARE SIMULATION

A. Embedded C

We are using Embedded C programming for the software implementation of our project. It is small and reasonably simpler to learn, program and debug. Embedded C code is more reliable and scalable, more portable between different platforms. It has advantage of processor-independence and is not specific to any particular microprocessor/microcontroller or any system.

This makes it convenient for a user to develop a program that can run on the most of the systems. It supports access to I/O and provides ease of management of large embedded projects. There are variety of different compilers on the market, manufactured by different companies, that uses the Embedded C. One of the popular one is Kiel compiler. Because of this, Embedded C is also known as Kiel C.

B. Bascom AVR Compiler

BASCOM-AVR is the original Windows Basic Compiler for the AVR family. It is designed to run on W95/W98/NT/W2000/XP and Vista.

V. CONCLUSION

This paper proposed the development of short range wireless network in which we are using human body as a medium for data transfer.Red Tacton is an exciting new technology for human area networking. We have developed a transceiver that uses a human body as a data transmission medium based on electric field sensor that uses an electro-optic crystal and laser light. Using this transceiver, we succeeded in achieving communication through a human body from one hand to other hand. While our main objective is to implement a Red Tacton system supporting two-way intra body communication at a rate of 10Mbit/s between any two points on the body, our longer term plans include developing a mass market transceiver interface supporting PDA's and notebook computers while continuing efforts to reduce the size and power consumption of the transceiver to enhance its portability.

A. Advantages

i) Red Tacton does not require the electrode to be in direct contact with the skin.

ii.) High-speed communication is possible between any two arbitrary points on the body.

iii.) Body-based networking is more secure than other broadcast systems, such as Bluetooth which have high range of about 10m.

iv.) Network congestion due to fall in transmission speed in multiuser environments is avoided.

v.) Superior than Infrared technology
vi.) Superior than Wi-Fi.

B. . Disadvantages

i.) It has no compelling applications that aren't already available.
ii.) It is very costly

C. Future Scope:

Body Area Network technology is expected to dominate Bluetooth technology in the future. Body Area Network technology could put the use of cables to an end. The problem faced by the Body Area Network technology is the cost of development. This technology brings a new dimension of communication which effectively links the user to anyone he wants to communicate. Since it provides high speed communication, it can provide seamless service wherever, whenever and whoever uses it. We conclude that, when we compare Body Area Network with other technology present today it can give a better performance over others. And we can say that to connect the network with in short distances Body Area Network is best. In this technology there is no problem of hackers as our body is itself a media.

VI. CHALLENGES

Security: Considerable effort would be required to make WBAN transmission secure and accurate. It would have to be made sure that the patient ''secure'' data is only derived from each patient's dedicated WBAN system and is not mixed up with other patient's data. Further, the data generated from WBAN should have secure and limited access. The IEEE 802.15.16 standard, which is latest standard for WBAN, tried to provide security in WBAN. However, it has several security problems.[3]

System devices: The sensors used in WBAN would have to be low on complexity, small in form factor, light in weight, power efficient, easy to use and reconfigurable.

Data Management: As BANs generate large volumes of data, the need to manage and maintain these datasets is of utmost importance.[4]

Consistent performance: The performance of the WBAN should be consistent. Sensor measurements should be accurate and calibrated even when the WBAN is switched off and switched on again. [5]

Cost: Today's consumers expect low cost health monitoring solutions which provide high functionality.

VII. ACKNOWLEDGEMENTS

Special thanks to our Guide "Prof. Trupti Harhare" for assisting us to complete our paper on "Human Interfacing Network using Red Tacton".

She is our faculty whose expertise and talents in circuit designing and troubleshooting and logical regression helped us effectively.

We would also like to thank our HOD "Dr.Sheeba P.S." for providing us facility and labs which helped us constantly in increasing our technical knowledge.

Now, we would also like to thank lab assistant for helping us to find valuable matter for making this paper, last but not the least and special thanks to all staff of Electronics Department, Batch members & friends for their technical support and constant motivation, without which this work would not have been successful.

REFERENCES

[1] Wikipedia. (February 2009). Red Tacton [Online]. Available: http://en.wikipedia.org/wiki/RedTacton

[2] Professor Guang-Zhong Yang "Body Sensor Networks-Research challenges and applications"

Institute of Biomedical Engineering Imperial College London http://www.bsn-web.org

[3]On Vulnerabilities of the Security Association in the IEEE 802.15.6 Standard.Proceedings of the 1st Workshop on Wearable Security and Privacy (Wearable'15) 2015.

[4] http://dl.acm.org/citation.cfm?id=2378021

[5.] Lai, D., Begg, R.K. and Palaniswami, M. eds, Healthcare Sensor Networks: Challenges towards practical implementation, ISBN 978-1-4398-2181-7.

[6] AN1298 - Capacitive Touch Using Only an ADC (CVD)SA602 Data Sheet page no. 8 to 9.

[7] CristianPop, Introduction To Bodycom Technology, Microchip Technology Inc, March 2013, page no 5 to 6.

[8]T.G.Zimmerman, "Personal Area Networks: Near-field intrabody communication," IBM systems journal,
Vol. 35, Nos. 3&4, pp.609-617,1996.

[9] M. Shinagawa, M. Fukumoto,K. and H. Kyuragi, "A near-field-sensing transceiver for intra-body communication based on the electro-optic effect," in Proceedings of the 20th IEEE Instrumentation and Measurement Technology Conference 2003., vol. 1.

[10] M. Fukumoto, M. Shinagawa, K. Ochiai, and H. Kyuragi, "A near-field-sensing transceiver for intrabody communication based on the electrooptic effect," in IEEE Transactions on Instrumentation and Measurement, vol. 53, December 2004, pp. 1533–1538.

[11] Keisuke Hachisuka, Teruhito Takeda, Hiroshi Hosaka "Development and Performance Analysis Of An Intra Body communication Device". The University of Tokyo, Honda R&D Co., Ltd. and Tokyo University of Science.