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Touch to Transfer

A novel way to transfer data

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***Abstract*— Nowadays, the electronic devices we use have become much more compact compared to the earlier ones. Today we have ingenuous wireless devices such as Wi-Fi, Bluetooth, NFC, and Infrared etc. Although this devices provided excellent transfer speeds there's always a risk of interception of the signal and also we require drivers to utilize this technology. Also almost all of these wireless devices are completely dependent on the functioning of antennas which can potentially reduce its portability. Here a novel way to transfer data through the human body is presented. It is based on concept of Human Area Networks (HAN) in which the human body is used as a means of transferring data. This technology can be utilized by the means of a handshake or even a pat on the back.**

***Index Terms*—Human Area Network (HAN), Wireless Protection Access (WPA), Universal Serial Bus (USB), Personal Digital Assistant (PDA), Intra Body Communication (IBC)**

I. INTRODUCTION

Currently, the field of Wireless Technology is undergoing unprecedented growth. We have many exciting new technologies such as Wi-Fi, Bluetooth, and Infrared etc. This technology can transfer data at very good speeds. But all this technologies have their drawback such as limited line of sight, excessive power consumption, possibility of signal interception during transmission, low throughput etc. In order to overcome these drawbacks the emerging concept of intra-body communication can be used.

According to a plethora of scientists the human body is a very good conductor of electricity. Our project Touch to Transfer uses the concept of intra-body communication in order to transmit data through the human body. The transmission of data is commenced as soon as we touch the touchpad on both ends. It utilizes the human body as a safe, secure and efficient means of transferring data from one device to another.

In this project we pass data through the human body in the form of voltage of 5V through the human body which is considered as a safe for human body. We will have consoles with USB ports on sending as well as receiving side. The transmission of data will only be completed after we touch the transceiver on both sides and the circuit is completed. Any android device can be connected to the USB ports on both sides.

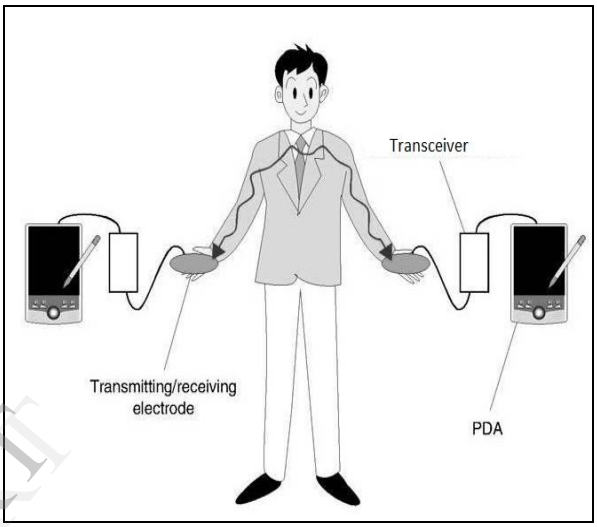

Fig 1. Data Transfer between two PDAs

The fig. 1 provides a brief demonstration about the working of Touch to Transfer. As we can see there are transceivers on both sides for transmission of data, which are connected to the PDA through the USB port.

We aim to develop Touch to Transfer which is based on concept of HAN. Like LAN, MAN, WAN technologies, HAN is also for data transmission. The existing study done on HAN states that data can successfully be transmitted through human body.

The existing methodology consists of wired and wireless communication. Wired communication consists of transmitting data between two by the means of wires. These wires can be of any type i.e. it may be a simple twisted pair copper wire, a co-axial cable or it may also use the more efficient but also more expensive fiber-optic wires. Although wired connection can be quite fast it is not very flexible and is also vulnerable to physical threats such as damaged wires etc. Wireless communication is a more advanced means of transferring data. In wireless communication, data transfer is achieved without the means of any kind of wires. This makes wireless communication much more flexible compared to the wired one but the issue with security still exists. Although wireless communications are not vulnerable to physical attacks they are still quite vulnerable to signal interceptions.

Apart from these, methodologies using IBC also exist. One such technology is called the RedTacton. In this, data is transmitted inducing fluctuations in the minute electric field on human body surface [1] [2]. Receiver section consists of a photonic electric field sensor which combines an electro-optic crystal and laser light to read the data. Electro-optic crystal has a property to change its own optical property with respect to the changes in a weak electric field. The crystal senses changes in the weak electric field on the surface of the body caused by the transmitter. Laser detects those changes in the optical properties of an electro-optic crystal, converts the result to an electrical signal in an optical receiver circuit as shown in the figure2.

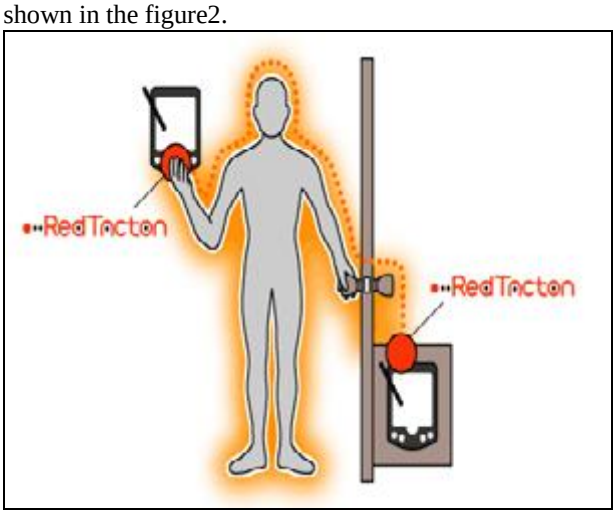

Fig 2. Intra-body communication using Electric Fields

The above figure illustrates the working of the existing method of Intra Body Communication which is termed as RedTacton. As shown in the figure in this method the data is passed with the help of electric field on the surface of the human skin.

Also this methodology is entirely dependent on the availability of crystals which can be quite an expensive deal.

The paper also presents Drawbacks of existing system in section II, comparisons with existing system in section III, out proposed methodology in section IV, some applications in section V and conclusion in section VI.

II. DRAWBACKS OF EXISTING SYSTEM

As mentioned earlier the existing methodologies mostly consist of wired and wireless communications.

Wired communication is very efficient and reliable. It is also relatively cost-effective, as the price of cabling – even at the lengths needed to cover an average office – is pretty cheap. But these technologies, such as the twisted pair copper wire, co-axial cable, fiber-optic cable, etc. come with their fair share of drawbacks. The biggest and the most important drawback of wired communication is the lack of portability. Since these technologies use wires for data transfer they cannot be used on the go. We may need sockets and all other kinds of infrastructure for utilizing this method of communication. Also, Wired-technology products, such as desktop computers, take up more space than equivalent wireless options. Wires, cables and multiple components require more desktop space than their wireless counterparts. Office-furniture decisions and employee-space allocation must account for the added space needs of wired computer and technology products.

This brings us to wireless communication. The main feature of this communication is that no wires are used. This means that the problem with flexibility which is encountered in wired communication is virtually non-existent in wireless communication. But still it has its own set of shortcomings. Wireless networking uses radios to transmit networking signals. Just as with terrestrial or satellite radio, wireless networks have a limited number of channels and, if every channel is full, connections will slow down or fail to work. Also intercepting a wireless signal is simpler compared to a wired signal, since hacking into a wired network requires the hacker to splice into the wire but in case of wireless technology like Wi-Fi since the signals are propagated through the air itself the hackers just need a tool like a Wi-Fi receiver in order to hack into the network.

So to summarize, although the existing technologies are quite fast and efficient they have some serious drawbacks. The most important drawback of existing communication technologies is the lack of absolute security. Although wireless technologies are not too easy to hack into, since the signals propagate through air they can be intercepted by hackers. For example, Wi-Fi uses Wireless Protection Access (WPA) or Wireless Protection Access 2 (WPA2) security protocols in order to ensure that the data doesn't go into the hands of any unauthorized person. Although these security protocols provide adequate security, they are still not impenetrable. The case with Bluetooth is quite similar.

As mentioned in the Introduction, a method of Intra Body Communication termed as RedTacton also exists. Since it uses IBC, unlike other wired and wireless networks it is fully secured. The data only passes through the human body, hence it is impossible to intercept. RedTacton works by using the electric fields present on the surface of human skin for the transfer of data. The main drawback of using this method is the cost. This method relies on the principle that the optical properties of the electro-optic crystal varies according to the changes in the weak electric field. It detects the changes in the optical properties of an electro optic crystal using a laser beam and converts the result into an electrical signal in a detector circuit.[3] Hence the working of this method is totally dependent on the availability of certain kind of electro-optic crystals which can be quite expensive.

III. COMPARISON

	Bluetooth	Wi-Fi	Touch to transfer
Cost	Low	High	Low
Installation	Complex	Complex	Simple
Speed	Low	High	Medium
Accuracy	Low	Low	High
Security	It is less secure	Security issues are already being debated.	It is most secure.
Reliability	Low	Low	High
Hardware requirement	Bluetooth adaptor on all the devices connecting with each other	Wireless adaptors on all the devices of the network, a wireless router and/or wireless access points	Amplifiers, Microcontrollers, Touchpads, etc.
Range	5-30 meters	10-20 meters	Human Body
Power Consumption	Low	High	Low

IV. PROPOSED METHODOLOGY

As was mentioned before the human body is a good conductor of electricity. By using the project we can capitalize on this fact. In normal conditions the human body offers a resistance of about 10,000 ohms, but it can be even greater if the person is dehydrated. For the safety of the body the current should be limited to 5mA to 9mA. Also the maximum voltage that the human body can safely take is 5V.

In our proposed methodology, as shown in fig. 3. We will use touchpads on the transceivers on both the sides i.e. a sender and a receiver. Since they are transceivers, the device can provide efficient full-duplex communication. Both transceivers will be connected to the respective android devices by through a USB port. The transceivers will be connected to the respective micro-controllers.

When we touch the touchpads on both sides the circuit is completed and the data is transferred. The data can be a text file, audio, video etc. The data in the form of string is converted into digital voltage signals with the help of micro-controllers. When the data is converted to voltage it is given to touchpad through output port of the micro-controllers. After passing through the human body the data arrives to the receiver side's touchpad. The micro-controller at the receiving side gets the data through the touchpad and hence the data transfer is complete.

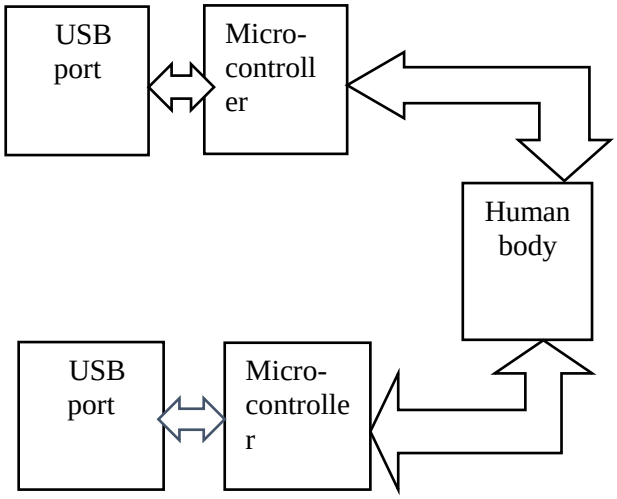

Fig 3. Block Diagram for Touch to Transfer

V. APPLICATIONS

Some applications of Touch to Transfer include:-

Alarm

An alarm can be placed on a medicine bottles in any hospital. As soon as the patient touches the wrong medicine bottle an alarm will trigger on the terminal he is carrying. This will make it impossible for the patient to consume any medicine which is not meant for him.

Fig 4. Alarm on Medicine

Touch Advertising

When a consumer stands in front of an advertising panel and information matching his or her attributes is automatically displayed. By touching or standing in front of items, consumers can get more in-depth information.

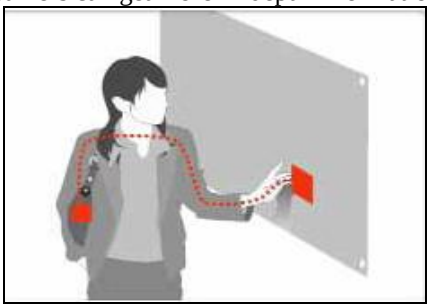

Fig 5. Touch Advertising

Touch a printer to print

By applying Touch to Transfer technology to printing it is possible to print by just touching the printer with one hand and touching the PC or any device where document resides with the other hand in order to give the print command.

Wireless Headset

The Touch to Transfer technology can be used to carry data such as songs or videos through the human body itself. Hence by using it we can design a wireless headset.

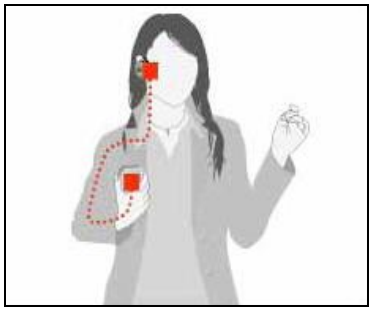

Fig 6. Wireless Headset

Vital Signs Monitor

Touch to transfer can be used to create a unique Vital Sign Monitor which is a more accurate compared to the existing monitors which use radio waves which are much more vulnerable to interferences.

Authentication

This is one of the most important applications of Intra Body Communication. It can be used for creating totally accurate authentication systems. For example it can be used to create a ticket authenticator in which the user has transmitter electrode placed in his pocket whereas the receiver electrode is embedded in the ground.

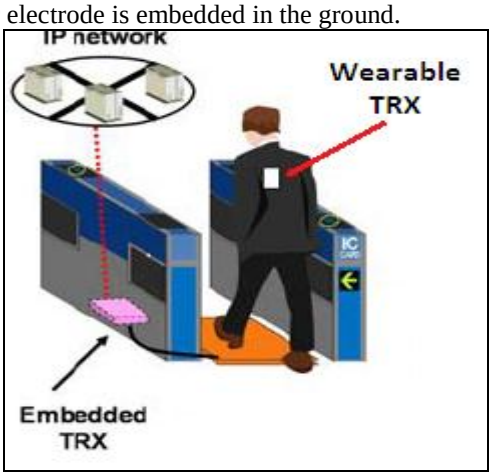

Fig 7. Authentication

VI. CONCLUSION

Compared to some of the other recent communication technologies our proposed system touch to transfer is comparatively better in the sense of cost and security. We examined various ways of communication such as wired and wireless but finally came to the conclusion that both of these have their share of drawbacks. While wired communication is quite secure and reliable with minimum data loss it's not very flexible and portable. Wireless communication overcomes the flexibility issue but it is quite vulnerable to signal interceptions. We also the working of the proposed system and its advantages over the existing system. Finally we explored some of the most promising and unique applications of Touch to Transfer.

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