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Retraction

Retraction: Human Body Communication on Portable Biometric Authentication (*J. Phys.: Conf. Ser.* **1916** 012113)

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This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

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Human Body Communication on Portable Biometric Authentication

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Abstract. Furthermore, since people's proportions of biological tissues including muscle, fat, and skeleton vary, the total dielectric constants of the human body, as well as the signal propagated through the human body, can be used as a biometric characteristic to authenticate people using Redtacton. Wearable systems can be smaller since the HBC is used for both authentication and connectivity. HBC authentication is ideal for wearable devices independent of location due to the use of a transmission signal between devices.

Keywords: HBC, Redtacton, Authentication, Wearable devices, Biometric.

1. Introduction

Biometric identification, which uses an individual physiological or behavioural trait to achieve identity identification, is widely used in the area of information security. Traditional verifications such as digital passwords, personal identity numbers, and IC cards are much easier to miss, lose, steal, repeat, or forget than biometric authentication. Redtacton employs a conversion process in which digital data is converted into a low-power digital pulse that can be transmitted efficiently via the human body. This transmission has a high speed, nearly equal to 10 mbps, and it is also safe. This technology differs from infrared and wireless in that it employs a minute electric field on the human body's surface.

Human body touch, in which the human body is used as a transmission mechanism, may be a personal authentication solution for wearable devices. Owing to the thickness differences in biological tissues in the human body, the propagation gain, which reflects the difference in transmission characteristics at various frequencies, varies as the signal is coupled into the body. As a result, the transmission benefit may be used to validate identification as a biometric attribute.

Theoretically, HBC-based biometric authentication is based on this. Since the location of a given wearable device is usually set, the biometric trait will be captured by the HBC sensor connected to the wearable device at that fixed location. Wearable devices can be smaller thanks to the use of the HBC as both an authentication and communication method. HBC has a lot of potential for wearable devices because it can transmit data at high speeds while using little power, and it also has a lot of protection and is easy to integrate into body-worn devices. The aim of this research is to look into biometric authentication for wearable devices using HBC.

2. Literature Survey

Human body communication is becoming a new research area around the world as integrated electronic and communication technology advances, and it is widely regarded as an ideal communication mode for future construction of a boy sensor network bsn. Capacitive couple HBC technology, first suggested by Zimmerman in the 1990s, uses the human body as a transmission medium to efficiently mitigate the effects of external electromagnetic noises. In UWB-WBAN, researchers from all over the world have modelled and investigated human body communication networks in point-to-point studies. A non-uniform medium mannequin was successfully used to investigate in channel of a single node.

The exponential scaling of transistors has allowed wearable devices for fitness control, medical treatment, and other applications. These units usually transmit sensor readings and other data, creating a local network known as a Body Area Network (BAN). Because of the human anatomy, these systems need a limited form factor, which restricts battery size [1] and necessitates ultra-low-power (ULP) circuits. Bluetooth, for example, consumes a significant amount of electricity (mW) in such power-constrained applications. Human body communication (HBC) guarantees ULP (tens of W) BAN communication by using the conductivity properties of the human body. As a consequence, although the systems are physically wireless, power savings equal to wire line communication [2] can be obtained. Capacitive HBC involves coupling and receiving the touch signal to the body from a single electrode with a floating ground electrode at both the transmitter and receiver. There are just a few reports on channel classification in the literature.

The initial experimental results of an in-body communication device using near infrared (NIR) light from samples of fresh porcine bio tissues are presented and discussed in this article. Over the last few decades, significant technical advances have made it possible to not only track health problems, but also to diagnose and respond rapidly to a variety of onsets. Novel health-related technology can improve one’s quality of life while also saving lives in emergency situations. Implantable electronic devices (IEDs), as well as various in-body sensors, play an increasingly important role in medical information and communications technology (ICT), with a wide range of advanced devices already available [3]. Pacemakers and defibrillators for the heart, implanted drug dosifiers, brain implants, smart drugs, and other devices are examples. Generally, these implantable medical devices are designed to perform specific tasks, such as remote onset monitoring and delivering predetermined responses to health conditions.

Humans' roles have shifted from complete manual control to passive supervision of autonomous systems that work together, such as autopilots (in aircraft, automobiles, and other modes of transportation), automated collision avoidance systems, and self-driving cars, in a variety of diverse and safety-critical domains (in air-traffic control and driving), automated production cycles (in industry and environment), and self-driving cars. As automation becomes more sophisticated, human monitoring and intervention become more difficult, especially as humans are bombarded by numerous sources of information on the same perceptual channels, such as two visual stimuli. Furthermore, when new technology is applied inappropriately (i.e., the operator is not properly trained), the operator can encounter overload, which raises the likelihood of errors [4]. Passive Brain-Computer Interface (pBCI) systems have been used in recent years to explore the possibility of quantifying the operator's current cognitive state (e.g. workload, attention) during his or her working life in real time. Such data can then be used to change/adapt the behaviour of the interface in which the user is engaging in order to eliminate, or at the very least minimise, the probability of error commission, and to increase Human Computer Interaction in general (HMI).

Over the last five decades, developments in semiconductor manufacturing have led to rapid declines in the size and expense of unit computing, as expected by Moore's law. As a result, portable implantable devices with a compact form factor have been developed for use in and around the human body. These devices form the Body Area Network, which is a network of devices (BAN). In most cases, wireless radio waves are used to communicate between BAN devices. Because of its excellent conductive electrical properties, the human body can be used as a communication medium between these devices due to their close proximity. As a result of this, Human Body Communication has developed (HBC). HBC-based circuits and networks promise to be more energy efficient than wireless networking due to the lower channel loss provided by the human body relative to wireless devices [5-8].

3. Proposed Model

A buzzer will sound if an unauthorised person tries to search his fingerprint picture. The aim of our project is to develop a security architecture using Redtacton technology [9-10]. RedTacton is a cutting-edge Human Area Networking system that transmits data across the human body's surface in a secure and high-speed manner. In terms of technology, RedTacton is a one-of-a-kind business. Every part of the body, including the hands, fingertips, limbs, feet, face, thighs, and toes, may be used to communicate. RedTacton also offers clothes and accessories. RedTacton was selected as the name for this technology because "touch-act-on" means "effect induced by touching." The surface of the human body is used as a secure, high-speed network communication route in RedTacton, a modern Human Area Networking technology. Intrabody contact, which uses the human body's minute electric field to transmit information, was first proposed by IBM and Nippon Telegraph and Telephone Corporation Figure 1.

3.1 Hardware Requirements

- Microcontroller (Arduino)
- Relay
- LCD
- Redtacton
- IOT(Esp8266)
- Keypad

3.2 Software Requirements

- Arduino Ide
- Embedded C

3.3 General Block diagram

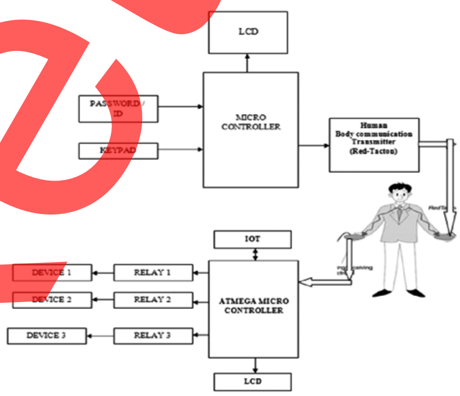

Figure 1. A block diagram of a high-security framework using RedTacton technology.

We use only one RedTacton module to enable approved users to control multiple devices using red tacton. The scanner is connected to an Arduino microcontroller, which will be used to power the system unit. The secret code must be entered into the system using a keypad, and the transmitter must transmit the secret code through the human body using RedTacton technology. Similar secret codes are used to

monitor the machines.
If an unauthorised individual attempts to scan his fingerprint image, a buzzer will sound. We used a board that came with a 16*2 character LCD display. Access granted and refused messages are shown on the LCD. LCD has 16 characters per line by two lines and LCD has 20 characters per line by two lines. When will the system be turned on and off? The LCD display is used to display messages, turn on and off the computer, and enter passwords, among other things.

A transmitter and a receiver will be present in RedTacton Technology, as in most other technology. The signals will appear to be transmitted as soon as the human body makes contact with the Red Tacton transceiver. When you delete the touch, the transmission will come to a stop. The terminals are either built-in or borne by the customer. Various variations of contact can appear based on the user's natural and physical gestures. The only body surface pieces that can be used to connect are the user's palms, fingertips, head, feet, face, thighs, and torso. The invention can also support shoes and other types of pparel. A slight electric field is produced on the surface of the human body by the transmitter in RedTacton. The RedTacton receiver's electric field sensor will be either a transistor or a photonic electric field sensor. The electric field is sensed by this electrode, and the signal is stored in the receiver. As a consequence, the data to be downloaded is the processed signal. Changes in the electric field produced in the body can affect the signals, much as they can affect digital signals. Since the electric field is mild, the receiver part uses extremely sensitive sensing equipment Figure 2,3,4,5.

4. Flowchart

Transmitter

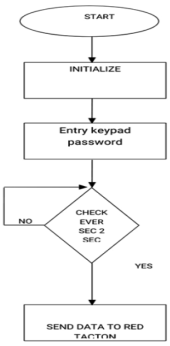

Figure 2. Flow graph for Transmitter module

Receiver

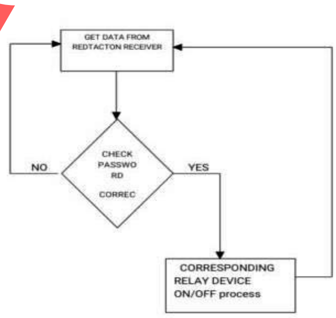

Figure 3. Flow graph for Receiver module

Transmitter

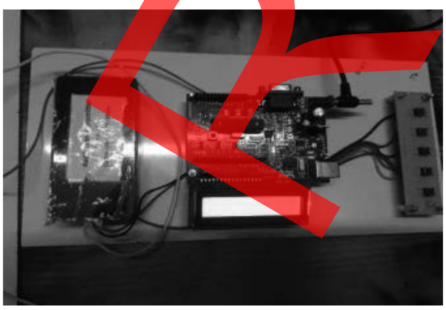

Figure 4. Redtacton Transmitter module

Receiver

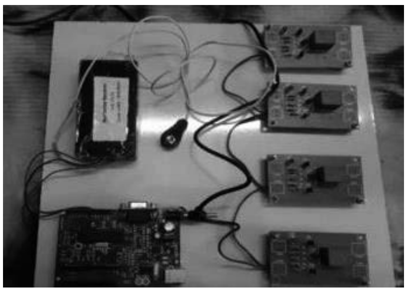

Figure 5. Redtacton Receiver module

5. Results And Discussion

Redtacton is a cutting-edge tool for the human world. We created an electric-field-based on a data transfer transceiver that makes use of the human body. The Redtacton's module and performance are shown below.

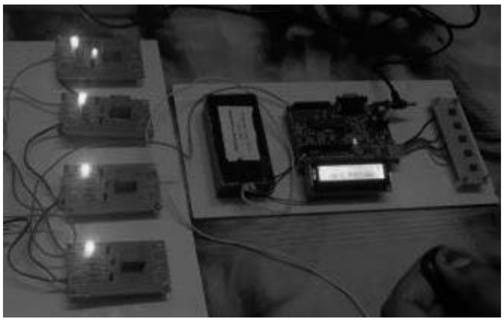

Figure 6. When key 1 pressed

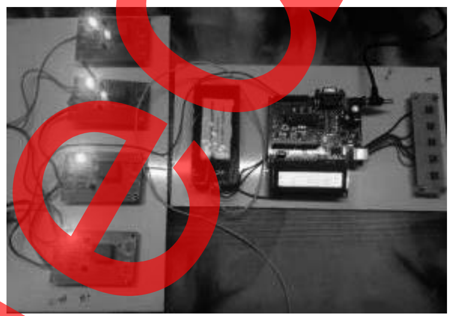

Figure 7. When key 2 pressed

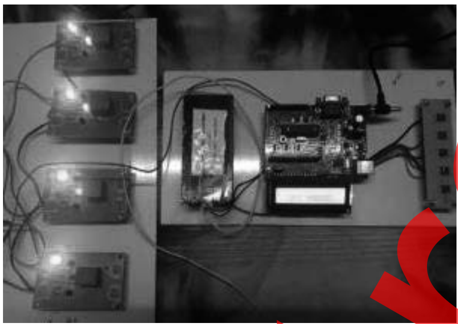

Figure 8. When key 3 pressed

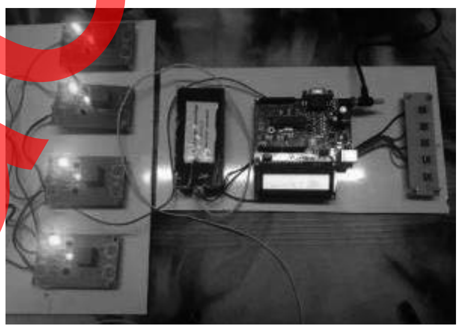

Figure 9. When key 4 pressed

Above figures. 6,7,8,9 shows that, when the key is pressed the corresponding Relay will on and off, Transmitter module LCD shows “Key1 pressed” when key 1 pressed and for the other keys also. Owing to the availability of low-cost sensor sizes and compact designs, the real implementation cost is also significantly lower than other designs. The actual implementation of the framework and the monitoring of outcomes would be the focus of future work. Adopting an over Human body will improve the system even further.

6. Conclusion

When the proposed device has been successfully implemented and tested on hardware. The effectiveness of the established operation is confirmed by experimental results. When we compare RedTacton to other technologies, we can see that it can provide better protection because there are no hackers because our bodies act as transmission medium, and it can be used more in fields where security is required, such as when there is a high rate of theft. When compared to other technologies, RedTacton outperforms them. It is preferable to link the network over short distances. Since our bodies are the transmitting medium, there are no hacker issues. RedTacton technological development is a significant accomplishment that will most likely be used in applications such as wireless headphones, medical applications, security applications, and wireless transmission by employing different acts. This may be as easy as two people with RedTacton devices shaking hands on touching devices and exchanging data like text files and business cards.

References

[1] Taewook Kang, Sungeun Kim, and Kwang-Il Oh, Evaluation of Human Body Characteristics for Electric Signal Transmission Using Calculated Body Impulse Response, IEEE Transactions on Instrumentation and Measurement (Volume: **69**, Issue: 9, Sept. 2020).

[2] Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices. IEEE Std 1528-2013 (Revision of IEEE Std 1528-2003) SEP 2020

[3] Sinan Li; Jingzhen Li; Abhishek Kandwal Study on Simulation and Experiment of Multi-node Human Body Communication 2020 3rd International Conference on Advanced Electronic Materials, Computers and Software Engineering (AEMCSE) (2020)

[4] ŽeljkaLučevVasić, and Mario Cifrek Preliminary Characterization of Capacitive Intrabody Communication Channel under Implantable-Like Conditions, IEEE International Instrumentation and Measurement Technology Conference (I2MTC), 2020. (IEEE 2020)

[5] ShitijAvlani, Mayukh Nath A, 100KHz-1GHz Termination-dependent Human Body Communication Channel Measurement using Miniaturized Wearable Devices. 2020 Design, Automation & Test in Europe Conference & Exhibition (DATE) (IEEE 2020)

[6] KatjanaKrhac; Kamran Sayrafian, A Platform for Simulating the Human-Body Communication Channel, 2019 41st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)

[7] A. Haldorai and A. Ramu, Security and channel noise management in cognitive radio networks, Computers & Electrical Engineering, vol. **87**, p. 106784, Oct. 2020. doi:10.1016/j.compeleceng.2020.106784

[8] A. Haldorai and A. Ramu, Canonical Correlation Analysis Based Hyper Basis Feedforward Neural Network Classification for Urban Sustainability, Neural Processing Letters, Aug. 2020. doi:10.1007/s11063-020-10327-3 Shovan Maity, Xinyi Jiang, Shreyas Sen, Theoretical Analysis of AM and FM Interference Robustness of Integrating DDR Receiver for Human Body Communication, IEEE Transactions on Biomedical Circuits and Systems (2019)

[9] Bo Zhao, Yong Lian, Ali M. Niknejad, Chun Huat Heng, A Low-Power Compact IEEE 802.15.6 Compatible Human Body Communication Transceiver with Digital Sigma–Delta IIR Mask Shaping, IEEE Journal of Solid-State Circuits (2019)