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MR.TACTON (MBEDDED RED TACTON)

AUTHORS: SARANYA SIVASANKARAN & SRIKKANTH GOVINDARAAJAN
4th YEAR, Dept. of ECE, Sri Venkateswara College of Engg, Affiliated to Anna University. **E-mail:** sforsaranya@gmail.com, srikbaba@gmail.com

ABSTRACT
Human area networking (HAN) is an emerging trend in the field of communication. Red tacton is a technology that uses human body as a medium for transfer of data. Red tacton uses IEEE 802.3 standard to achieve a data rate of 10Mbps. Red tacton transceivers use the body's electrical field to transmit digital messages. Optical crystal and laser technology converts the changes in electrical field back into a signal at the receiver. This method of data transfer is harmless. This method is user friendly and fast. It also has an additional advantage of being independent of the environment in which it is used in. The major disadvantage posed by this method is noise interference. This causes loss of data in other words security lapse.
We use an improved vascular pattern extraction algorithm for person verification applications. The proposed direction-based vascular pattern extraction (DBVPE) algorithm is based on the directional information of vascular patterns. The solution posed by us is towards the drawback faced by the red tacton. The best solution is the embedded solution. This method uses the near-infrared light, reflected or transmitted images of blood vessels of a hand or finger are derived and used for personal recognition. The person using the tacton has to scan his vascular pattern. For this, we use a Micro-Controller chip and vascular pattern Image processing is done by the micro-controller and if the image patterns match then data flow takes place through the human skin. If the images do not match a buzzer beeps as an alert and data transfer is denied. This gives maximum safety to the data present in the tacton.

KEYWORDS

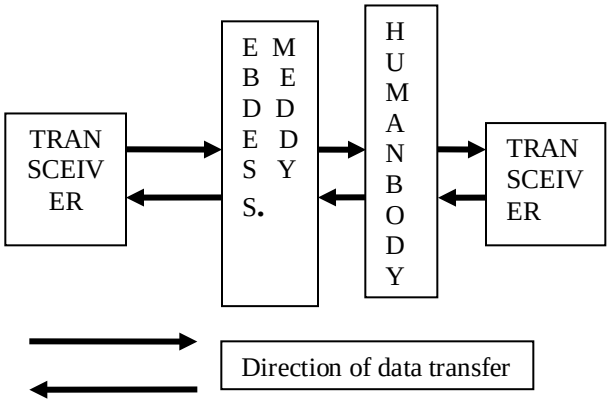
Human area networking (HAN), IEEE 802.3, Red tacton transceivers, direction-based vascular pattern extraction (DBVPE) algorithm, a Micro-Controller chip, vascular pattern.

INTRODUCTION
The major disadvantage posed by the red tacton method is noise interference. This causes loss of data in other words security lapse. The solution posed by us is towards the drawback faced by the red tacton. The best solution is the embedded solution.

THE INVENTION
We use a Micro-Controller chip and vascular pattern recognition technique. The person using the tacton has to scan his vascular pattern. Image processing is done by the micro-controller.

WORKING
The MRT (eMbedded Red Tacton) uses a Micro-controller chip and vascular recognition technique. This method uses the near-infrared light, reflected or transmitted images of blood vessels of a hand or finger are derived and used for personal recognition. The person using the tacton has to scan his vascular pattern. Image processing is done. This image processing is done by the microcontroller. The microcontroller compares the input image and the reference image available in the memory. If many images are to be stored for commercial purposes then a DSP processor is used for extending the memory. If the image patterns match then data flow takes place through the human skin. If the images do not match a buzzer beeps as an alert and data transfer is denied. This proves to be the safest and reliable transfer of data.

BLOCK DIAGRAM



ALGORITHM

1. Basic operation of typical vascular biometric identification system palm->image acquisition->feature extraction->pattern matching->Accept/Reject

Database

A) Image acquisition

- Transmittance method
- Reflection method

B) Feature extraction

- Preprocessing

->a. Vascular Pattern Marker Algorithm (VPMA);

->b. Vascular Pattern Extractor Algorithm (VPEA);

-> c. Vascular Pattern Thinning Algorithm (VPTA)

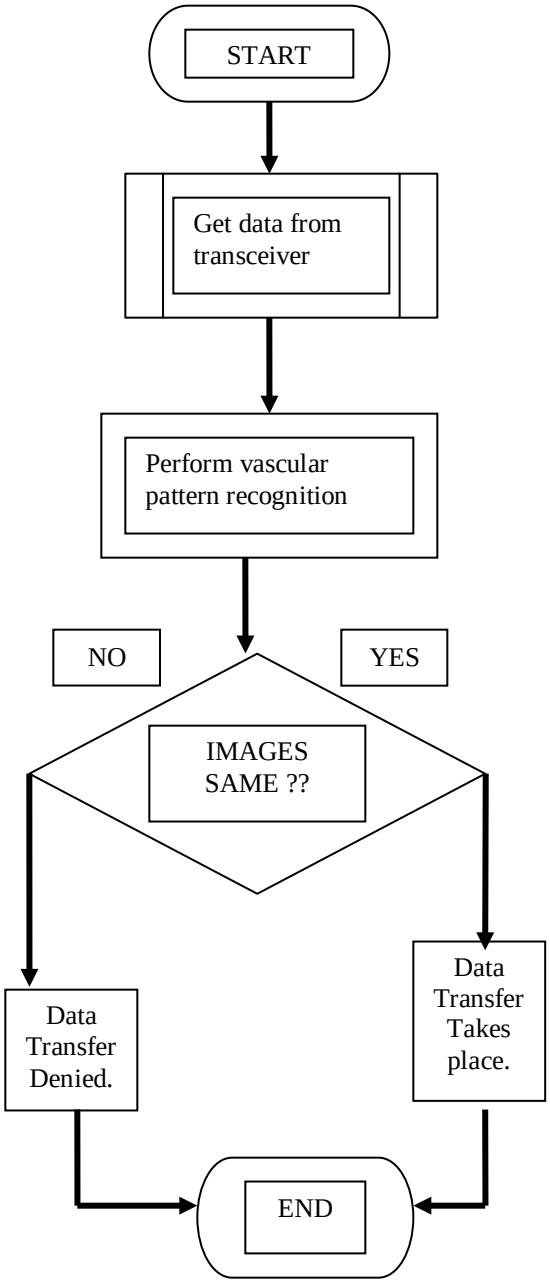
Vascular Pattern Analysis towards Pervasive Palm Vein Authentication

- A Direction-Based Vascular Pattern Extraction Algorithm for Hand Vascular Pattern Verification

c) Pattern matching

- Structural matching
- Template matching

FLOW CHART



FUZZY C MEAN ALGORITHM

1. *Initialize $U=[u_{ij}]$ matrix, $U^{(0)}$*
2. *At k-step: calculate the centers vectors $C^{(k)}=[c_j]$ with $U^{(k)}$*

$$c_j = \frac{\sum_{i=1}^{N} u_{ij}^{m} \cdot x_i}{\sum_{i=1}^{N} u_{ij}^{m}}$$

3. *Update $U^{(k)}$, $U^{(k+1)}$*

$$u_{ij} = \frac{1}{\sum_{k=1}^{c} \left(\frac{\|x_i - c_j\|}{\|x_i - c_k\|} \right)^{\frac{2}{m-1}}}$$

4. *If $|| U^{(k+1)} - U^{(k)}|| < \varepsilon$ then STOP; otherwise return to step 2.*

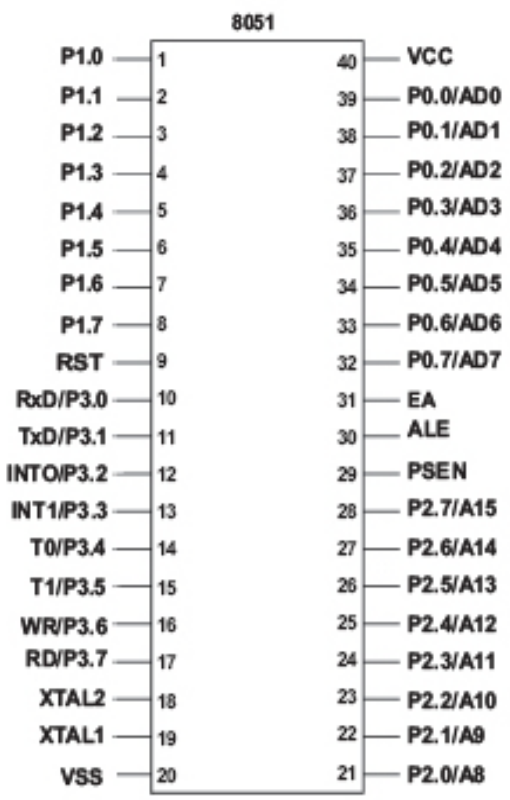
APPENDIX

1. MICROCONTROLLER CHIP:

A **microcontroller** (also microcontroller unit, MCU or µC) is a small computer on a single integrated circuit consisting of a relatively simple CPU combined with support functions such as a crystal oscillator, timers, watchdog , serial and analog I/O etc. Microcontrollers are designed for small applications.

Intel 8051

The **Intel 8051** is a Harvard architecture, single chip microcontroller (µC) which was developed by Intel in 1980 for use in embedded systems.



The DSP processor is connected to the MC chip for storing images.

2. DSP PROCESSOR:

A **digital signal processor** (**DSP**) is a specialized microprocessor designed specifically for digital signal processing, generally in real-time computing. It stores the images in its memory and when the MC chip sends signal to the DSP Processor. The input image from the MC chip is compared with the number of reference images in the DSP Processor. Based on the matching of images, corresponding signal is passed from the DSP Processor to the MC chip. Based on this result, the MC decides whether to allow or deny data transfer.

Memory architecture

- DSPs often use special memory architectures that are able to fetch multiple data and/or instructions at the same time:

1. **Harvard architecture**
2. **Modified von Neumann architecture**

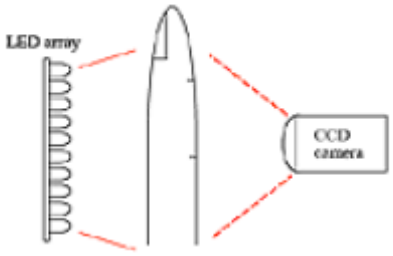
3. VASCULAR PATTERN RECOGNITION:

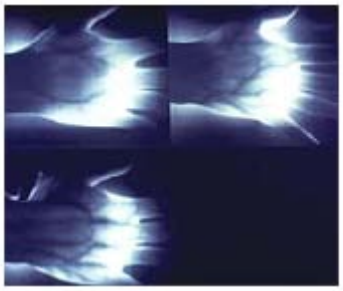
Vascular Pattern Recognition, also commonly referred to as Vein Pattern Authentication, is a fairly new biometric in terms of installed systems. Using near-infrared light, reflected or transmitted images of blood vessels of a hand or finger are derived and used for personal recognition. Researchers have determined that the vascular pattern of the human body is unique to a specific individual and
does not change as people age. Claims for the technology include that it:

- **is difficult to forge** — Vascular patterns are difficult to recreate because they are inside the hand and, for some approaches, blood needs to flow to register an image.
- **is contact-less —** Users do not touch the sensing surface, which addresses hygiene concerns and improves user acceptance.
- **has many and varied uses** — It is deployed in ATMs, hospitals, and

universities in Japan. Applications include ID verification, high security physical access control, high security network data access, and POS access control.

- **is capable of 1:1 and 1:many matching** — Users' vascular patterns are matched against personalized ID cards/smart cards or against a database of many scanned vascular patterns.





Thus vascular pattern recognition is the secure way in bio-metrics to ensure safety and reliability.

Approach

Vascular pattern in the back of hands

Near-infrared rays generated from a bank of light emitting diodes (LED's) penetrate the skin of the back of the hand. Due to the difference in absorbance of blood vessels and other tissues, the reflected near-infrared rays produce an image on the sensor. The image is digitized and further processed by image processing techniques producing the extracted vascular pattern. From the extracted vascular pattern, various feature data such as vessel branching points, vessel thickness, and branching angles are extracted and stored as the template.

Vascular pattern in fingers

The basic principle of this technology is shown in Figures 1 & 2. Near-infrared rays generated from a bank of LED's penetrate the finger or hand and are absorbed by the hemoglobin in the blood. The areas in which the rays are absorbed (i.e., veins) appear as dark areas similar to a shadow in an image taken by a Charge-Coupled Device (CCD) camera. Image processing can then construct a vein pattern from the captured image. Next this pattern is digitized and compressed so that it can be registered as a template.

4. HUMAN AREA NETWORKING

The operating principle of *RedTacton* is illustrated in Fig. 1. The electric field induced toward the body by the transmitter's signal electrode is represented by *Ea*. The system requires a ground close to the transmitter signal electrode, so electric field *Eb* induced from the body can follow a return path to the transmitter ground. Moreover, since people are usually standing on a floor or the ground, electric field *Ec* escapes from the body to ground, mainly from the feet. The electric field *Es* that reaches the receiver is $Es = Ea - (Eb + Ec)$. It couples to the electro-optic crystal and changes the crystal's optical properties. This change is detected by laser light and transformed into digital data by a detector circuit.

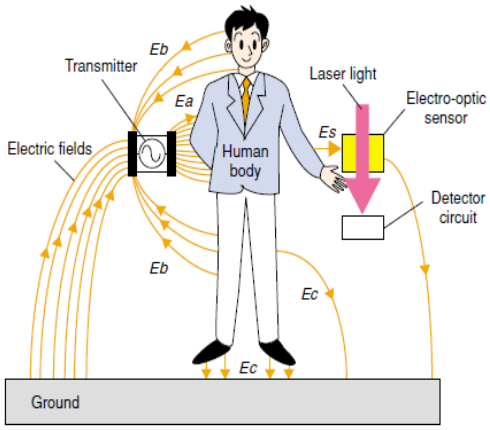


Fig. 2. Principle of *RedTacton*.

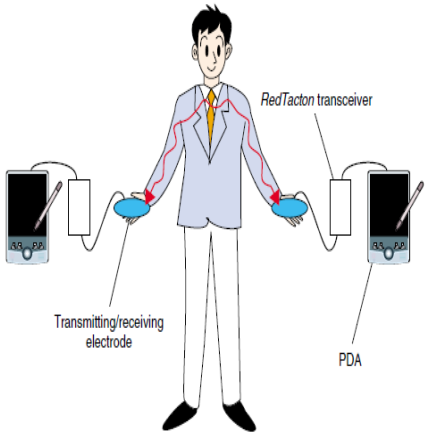


Fig. 4. Experimental setup for intrabody communication.

The transmitting and receiving electrodes of the *RedTacton* transceiver are completely covered with insulating film, so the body of the person acting as the transmission medium is completely insulated. This makes it impossible for current to flow into a person's body from the transceiver.

CONCLUSION

Red Tacton is an exciting new technology for human area networking. By inclusion biometric concepts, data security can be obtained thereby making the technology more feasible. Thus in the Techy-Fast world this system will be a life-saver for the red tacton technology and it would prove noteworthy enough against other present day technologies.

FUTURE SCOPE

Communication between devices on the same person (portable audio), Communication between devices on different people (exchange of business card data), Communication from a device on a person to a device embedded in the environment (gateway system) may be the future scope of Red Tacton. But these can be implemented with Mr.Tacton with enhanced security.

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