

Finger Vein Identification Based On Minutiae Feature Extraction With Spurious Minutiae Removal

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Abstract -In this paper, finger vein recognition system for personal authentication is implemented. Vein patterns are different for each finger and for each persons and as they are hidden underneath the skin's surface, forgery is extremely difficult these unique aspects of finger vein patterns recognitions set it apart from previous forms of biometrics and have led to its adoption in various security technology, the proposed system is implemented in MATLAB This paper consists of RFID module based user authentication and whole algorithm is implemented using MATLAB.

Key Words: Biometrics, Finger Vein, Image Acquisition, Feature Extraction, RFID, MATLAB.



Fig -1: Human Finger Veins

1. INTRODUCTION

Biometrics is identifying humans by their physiological, behavioral and biological characteristics. Biometrics can be divided into two categories: Physiological biometrics are those which recognize individuals from physiological or biological attributes like face, iris, fingerprint, finger vein, hand geometry, etc. Behavioral biometrics on the other hand, are those, which recognize individuals from human attitudes such as hand writing, signature or voice recognition. Each biometric system calculates different characteristics and then compares them with its database to check if the individual should be given access to the system or not. The proposed system based on finger vein. Disadvantages of fingerprint technology made scientists to think about using what is underneath the skin. Under the skin there are blood vessels which are unique to individuals (even in twins) and this uniqueness made a new biometric system based on finger veins.

Security is a major concern in today's world due to the increased rate of crimes and identity thefts. To overcome this problem there is a great need for efficient authentication and authorization systems. Among the many authentication systems that have been proposed and implemented, finger vein biometrics is emerging as the foolproof method of automated personal identification. Finger Vein is a unique physiological biometric for identifying individuals based on the physical characteristics and attributes of the vein pattern in the human finger.

The hardware devices used for finger vein identification are more preferred than the others because people are used to using their fingers for identification already. For capturing a vascular network, hemoglobin plays an important role by absorbing infrared light, and after absorbing infrared light vein patterns are captured. Distance is very important in absorbing infrared light between skin and vessels: bigger distance leads to more noise in the captured image. Palms, back of the hands and fingers can be used as biometric data. However, people mostly prefer to use their fingers.

1.1 Proposed Finger Vein Pattern Recognition System

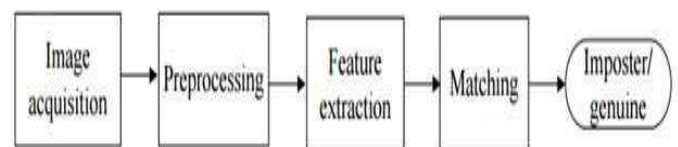


Fig -2: General Steps Involved in Finger Vein Identification Process.

Devices for Finger-vein Image Acquisition Finger-vein biometric systems use infrared (IR) light to capture blood vessels, however, the position of infrared light source affects the quality of the images. Moreover, the image acquisition device should be small and cheap, and it should provide high resolution images. In captured images, the veins appear as gray patterns.

2. LITERATURE SURVEY

V.ramya et.al, In this paper, a real time embedded finger vein recognition system for personal authentication and vehicle security is proposed. Vein patterns are different for each finger and for each persons and as they are hidden underneath the skin's surface, forgery is extremely difficult these unique aspects of finger vein patterns recognitions set it apart from previous forms of biometrics and have led to its adoption in various security technology, the proposed system is implemented in MATLAB platform and equipped with a novel finger-vein recognition algorithm. The proposed system consists of four module image acquisition module, finger vein matching model, embedded main board and communication module. The image acquisition module is used to collect a finger vein image and is a low cost device. Feature extraction is important for finger vein recognition algorithm and a HAAR classifier is used to extract the features. The finger vein image is matched by calculating the Euclidean distance.

Smita Udhavrao Sakhare et.al, In this paper biometric finger-vein recognition (FVR) system for authentication on ATM network is proposed. The system is implemented on the basis on embedded platform and equipped with a novel finger-vein recognition algorithm and implemented in MATLAB platform .The proposed system consists of three hardware modules: image acquisition module, embedded main board, & human machine Communication module. The structure diagram of the system, the image acquisition module is used to collect finger-vein images. The Embedded main board including the LPC2148 Microcontroller chip, memory (flash), and communication port is used to execute the finger -vein recognition algorithm and communicate with the peripheral device.

V Bhanu kiranmai et.al, In this project, we propose a real-time embedded finger-vein recognition system (FVRS) for authentication on mobile devices. The system is implemented on an embedded platform and equipped with a novel finger-vein recognition algorithm. The proposed system consists of four hardware modules: radio frequency identification system, image acquisition module, embedded main board, and human machine communication module. RFID module will start the very initial communication between the user and the device. The image acquisition module is used to collect finger-vein images. The Embedded main board including the Microcontroller chip, memory (flash), and communication port is used to execute the finger-vein recognition algorithm and communicate with the peripheral device. The human machine communication module (LED or keyboard) is used to display recognition results and receive inputs from users.

Kamta Nath Mishra, This paper illustrates an overview of veins based personal identification systems. The performance of different single and multi-veins based identification systems are analyzed in this paper. The

features like reliability, security, accuracy, robustness and long term stability along with the strengths and weaknesses of various veins based biometric approaches were taken into considerations while analyzing the results of existing research papers published so far.

3. SYSTEM DEVELOPMENT

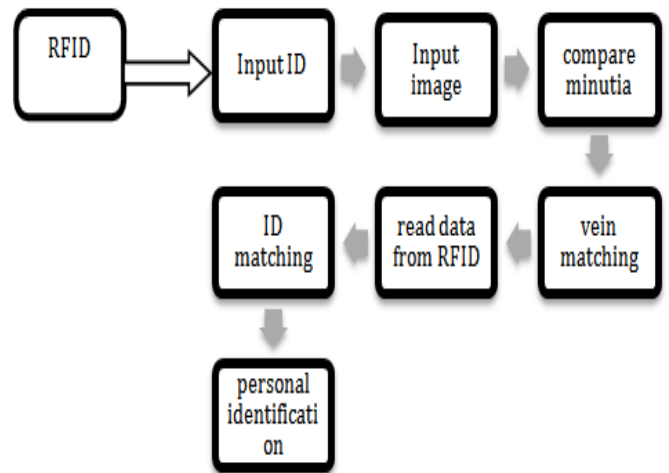


Fig -3: Block Diagram of the System

The proposed system mainly consists of two parts: The RFID Module with the RFID tag and MATLAB algorithm. Input ID is sent to PC with MATLAB. Input image is also sent to the PC. Input image is processed and its features are extracted like minutia which forms a minutia reference image. Compare Minutia of the input image with minutia of the reference minutia. We calculate percentage matching of minutia. If (percent>90), then it will display a message that veins are matched and also displays the percent match. If (percent<90) then it will display a message that veins are not matching and also displays mismatch percentage. Then, we read the data received from RFID card. Then, compare input ID with the received data. Based on comparison results, it will display message whether RFID recognized or not. When both conditions are met, i.e. RFID is recognized and veins are matched, the person gets recognized.

3.1 Hardware Development

RFID reader and RFID tag RFID is known as Radio Frequency Identification System. RFID technologies are efficient and secure compare to other network security system. The primary goal of RFID technology is to automatically identify data that are contained in electromagnetic fields. That can be implemented for several applications such as security, tracking, inventory detection and access control applications. RFID technology consists of a combination of tags and readers which is shown in figure.

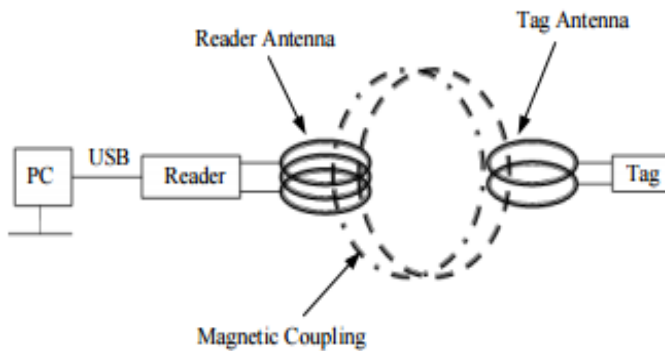


Fig -4: Block Diagram of RFID Tag & RFID Reader

Figure 4 illustrates a general working system and components of RFID. When a RFID transponder is placed a RFID reader, the reader reads information contained in the transponder without any physical contact. RFID reader transmit radio frequency and RFID tag receive radio frequency to power up the chip and then transmit its own serial number by frequency. This power is sufficiently enough to send back information on that transponder to the RFID reader to be processed. The tags store and transmit data to readers using radio waves. The readers gather data from the different tags and relay them back to the server for further analysis and processing. The system serves the purposes of identification, monitoring, authentication and alerting through this exchange of data between the tag and the reader.

3.2 Software Development

The software development for the proposed system has been done in MATLAB. MATLAB is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. MATLAB has evolved over a period of years with input from many users. In university environments, it is the standard instructional tool for introductory and advanced courses in mathematics, engineering, and science. In industry, MATLAB is the tool of choice for high-productivity research, development, and analysis.

MATLAB is a programming language developed by MathWorks. It started out as a matrix programming language where linear algebra programming was simple. It can be run both under interactive sessions and as a batch job. In this system finger vein reorganization algorithm is implemented on MATLAB GUI. Figure 6 shows the flowchart for software development for finger vein identification system.

4. RESULTS & PERFORMANCE ANALYSIS

Critical Point Image

Critical Point Image is obtained after initial scanning & pre-processing.

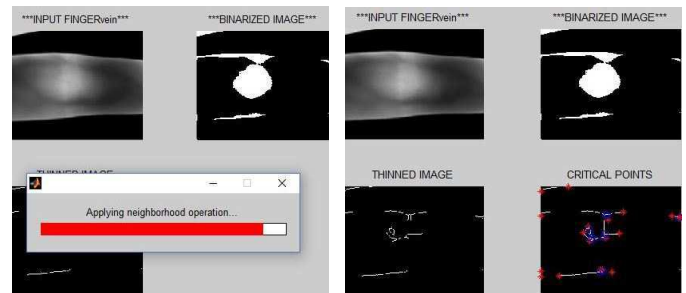


Fig -5: Critical Point Image

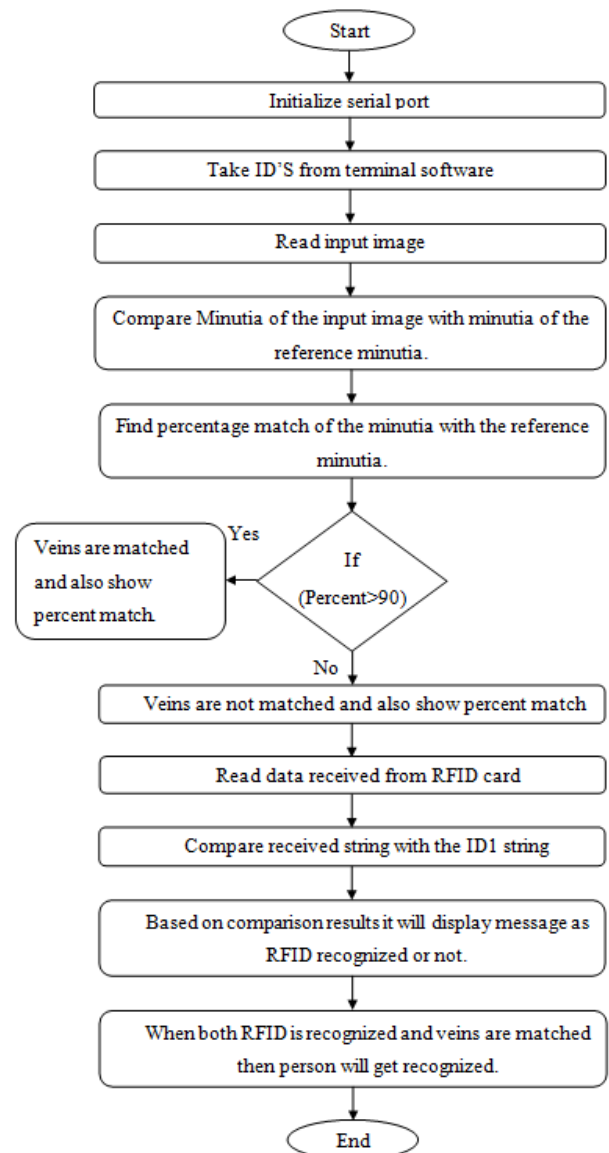


Fig -6: Flowchart

Post Processing

In the post-processing stage, the region of interest is obtained and it can be determined whether the person can be recognized or not.

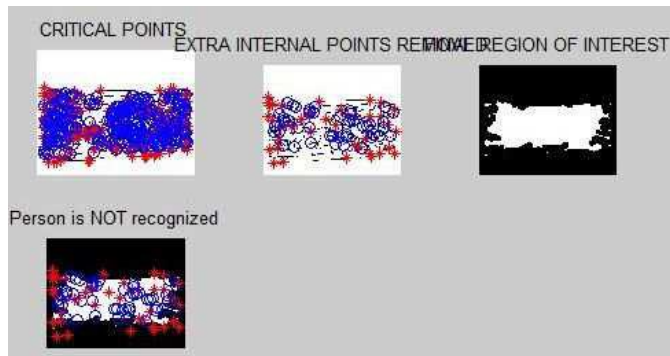


Fig -7: Person is not Recognized

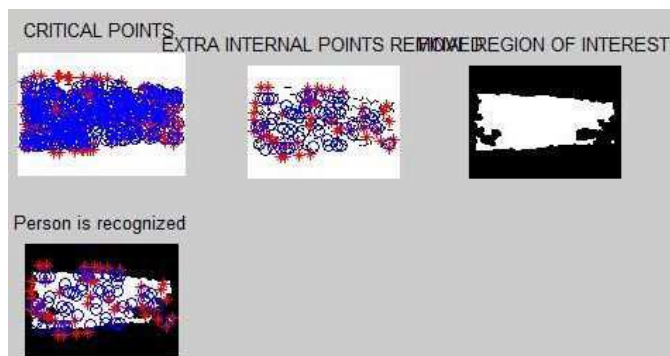


Fig -7: Person is Recognized

3. CONCLUSION

The project is a finger vein based user recognition system for biometric authentication and identification. The system provides effective and efficient features using RFID module and algorithm which is been implemented on MATLAB platform.. It is also computationally efficient with minimal storage requirement, which makes the method of practical significance. Finger-vein based identification technology has high security and reliability compared to the traditional authentication mode. It also can be applied in public or private equipments, such as entrance control systems, home or office door entry control systems, and ATM (Automated Teller Machine) systems.

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