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IMPLEMENTATION OF PALMPRINT AND FINGER TEXTURE RECOGNITION AND CLASSIFICATION

Saumendra Behera[1], Dr. K. P. Swain[1]

[1]Associate Professor, [1]Department of ECE

[1]Gandhi Institute for Technology (GIFT), Bhubaneswar, India

ABSTRACT

The study and implementation of a fingerprint recognition system based on minutiae-based matching quite frequently used in various fingerprint algorithms and techniques. Human fingerprints are rich in details called minutiae, which can be used as identification marks for fingerprint verification. The goal of this project is to develop a complete system for fingerprint verification through extraction and matching minutiae. To achieve good minutiae extraction in fingerprints with varying in quality, orientation field estimation, pre-processing in form of image enhancement, fingerprint classification, feature extraction and database matching, finally it extracts the desired personal details.

Keywords: Palmprint, image recognition, classification.

1.INTRODUCTION

Biometric recognition or biometrics is defined as the application of anatomical or behavioral identifiers or traits that are highly unique in nature for personal identification [1]. Examples for biometric traits are fingerprint (FP), iris, ear, face, facial thermo gram, hand thermo gram, hand vein, hand geometry, face, retina, signature and voice. The word biometrics is derived from Greek words bios (life) and metron (measurement). Biometric identifiers are measurements from living human body. Any biometric trait can be used for personal identification as long as Distinctiveness: The biometrics of any two persons should be sufficiently Universality: Each person should have the particular biometric. it satisfies the following requirements [1]: Performance: This includes speed, recognition accuracy, resourceCollectability: Biometrics can be measured quantitatively. Permanence: Biometric should be invariant over a period of time. different. Acceptability: Whether the user is willing to accept the trait in their dailyrequirements and robustness to environmental and operational factors. Circumvention: Ease with which traits can be circumvented by fraudulentlife. Fingerprint recognition refers to the automated method of verifying a match between two human fingerprints. Because of their uniqueness and consistency over time, fingerprints have been used for over a century, more recently becoming automated due to advancement in computing capabilities. Digital image processing is a process of manipulating images in a digital computer. This processing can be achieved by development of a computer based algorithm in order to process these images. It is a technology widely used for digital image operations like feature extraction, pattern recognition, segmentation and classification.

2. LITERATURE REVIEW

Most of the methods used for fake FP detection are based on the design of hardware to measure overt characteristics of live fingers which are not present in the fake FPs [1-2].Osten et. al. have used a combination of pulse oximetry, electrocardiography (ECG), and a temperature sensor to measure liveliness [3]. Determination of Ridge orientation field is classified into two categories, local estimation and global modeling. In the former, the orientation is obtained for each pixel of the image and in the latter, the orientation for whole image is obtained by mathematical modeling. Most widely used local estimation is the gradient-based method. In this, the gradient at each pixel of the image, both in x and y direction, is found. Then the orientation is the direction perpendicular to the gradient. Local estimation fails in poor quality and noisy regions of the FP image.

Albeit programmed unique finger impression acknowledgment innovations have quickly progressed amid the most recent forty years, there still exists a few testing research issues, for instance, perceiving low quality fingerprints [2]. Unique mark matcher is exceptionally touchy to picture quality as saw in the FVC2006 [3], where the coordinating precision of a similar calculation changes fundamentally among various datasets because of variety in picture quality. In an adverse acknowledgment framework, for example, distinguishing people in watch lists and identifying numerous enlistment under various names, the client of intrigue (e.g., lawbreakers) should be uncooperative and does not wish to be recognized. In a positive acknowledgment framework, low quality will prompt bogus react of true blue clients and accordingly bring bother.

The result of low quality for a negative acknowledgment framework, nonetheless, is significantly more genuine, since pernicious clients may deliberately decrease unique mark quality to keep unique finger impression framework from finding the genuine character [6]. Truth be told, law implementation authorities have experienced various situations where crooks endeavored to maintain a strategic distance from distinguishing proof by harming or carefully changing their fingerprints [7].Versatile bending is acquainted due with the intrinsic adaptability of fingertips, contact-based unique mark securing system, and a deliberately parallel power or torue, and so forth. Skin contortion expands the intra-class varieties (distinction among fingerprints from a similar finger) and along these lines prompts false non-coordinates because of restricted capacity of existing uniue mark matchers in perceiving extremely twisted fingerprints.

3. PROPOSED METHOD

FP Image Segmentation: FP preprocessing stages includes segmentation and enhancement. Segmentation is used to select the FP region which consists of necessary information. The enhancement is needed to increase the overall quality of the Fingerprint. The quality of the FP image is important since the success of matching methods depends upon the quality. FP segmentation is an important step in automatic FP identification system. The image captured by a sensor involves foreground area that originated from the contact of the fingertip with the sensor and background area or noisy area which is the boarders of the FP image. The task of the FP segmentation algorithm is to decide which part of the image belongs to the foreground and which part to the background [1]. Accurate segmentation is especially important for the reliable extraction of features like minutiae and singular points.

FINGERPRINT ENHANCEMENT:a FP image may contain good, medium and low quality regions. Common types of Cuts, creases and bruises on the FP.Parallel ridges are not well separated. The ridges are not continuous degradation associated with a FP image are [1] FP area resulting from segmentation can be divided into well defined region, recoverable region and unrecoverable region. The goal of an enhancement algorithm is to improve the quality of the recoverable region and mark the unrecoverable region too noisy for further processing. The FP image enhancement methods are broadly classified into pixel-wise enhancement, contextual filtering and multi-resolution enhancement [1]. Among these most widely used method is contextual filtering. In pixel-wise enhancement, the new value of each pixel depends only on its previous value and some global parameters. These methods do not provide the needed results in the enhancement and are used as initial preprocessing methods.

ORIENTATION FIELD ESTIMATION : The first step in minutiae density feature extraction is the detection of minutiae points known as ridge ending and bifurcation. There are two methods used for

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finding the ridge ending and bifurcation from the FP image. One is based on gray scale image and other is based on binarized image [1]. The second method is used in this work. The different steps applied for finding minutiae points are explained below.Image linearization is a process which transforms the 8 bit gray scale image to a '1'- bit image with '0' value for ridges and '1' value for furrows. It is used for the extraction of ridge and valleys and to suppress all other gray scale values. After the operation, ridges in the fingerprint are highlighted with black color while furrows are white.Thinning is done to make the ridges one pixel wide so that the ridge endings are easily found by scanning with a 3x3 window. It is a morphological operation that successively erodes away the foreground pixels until they are one pixel wide. The application of a thinning algorithm to a fingerprint image preserves the connectivity of the ridge structures while forming a skeleton zed version of the binary image which is then used in the subsequent extraction of ridge ending.

FINGERPRINT CLASSIFICATION: For every ridge end point in the fingerprint image, Hough transform space consists of a sinusoidal curve with corresponding (ρi θj) values. The ridge end points lying on single line have same value of ρ and θ. These values are recorded on a 2D array known as Hough accumulator. The ρ and θ axes of accumulator are divided into a number of equal divisions of resolution $\Delta\rho$ and $\Delta\theta$ respectively. As the number of ridge end points lying on a single line increases, values in the corresponding cell of Hough accumulator also increases. Number of ridge end points is higher in altered fingerprint and this in turn leads to higher number of collinear ridge end points as compared to normal fingerprints.In fact the peak of the Hough accumulator of altered fingerprints becomes high. Increase in ridge ending density from imitation, through distortion to obliteration causes the increase in peak of Hough accumulator. This makes the classification of altered fingerprints possible. In order to detect collinear ridge end points, it is necessary to select a threshold that is low enough to ensure all possible cells are included while high enough to exclude unwanted cells.

FEATURE EXTRACTION : The FP classified as obliteration type by Hough transform method comes to the matching stage. The proposed matching method uses three features namely Ridge Orientation Field (ROF), Ridge Texture (RT) and Ridge Frequency (RF). RT and RF are extracted from the unaltered region of the altered FP. The computation of a single matching score from these three features is not possible since automatic selection of unaltered region from the altered FP is not possible in one to many matching. Thus the proposed method is implemented in two stages. First stage reduces the number of normal FP to be matched in the second stage so that manual selection of unaltered region becomes easier.

First stage utilizes the approximated ridge orientation for matching. This stage starts with orientation estimation of altered and unaltered mate by orthogonal wavelet based method proposed in previous chapter. Alignment between normal and altered FP is performed by using the estimated orientation. Matching score is computed in terms of Euclidian distance. The altered FP is matched with normal FPs in the database until it becomes successful. The FP goes to next stage once it is successful. Second stage starts with Region of Interest (ROI) selection from both altered and unaltered FP. Fused matching between RT and RF is computed to confirm the successful matching of the first stage. A matching is declared as successful, if genuine match occurs in both the stage.

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4. SIMULATION RESULTS

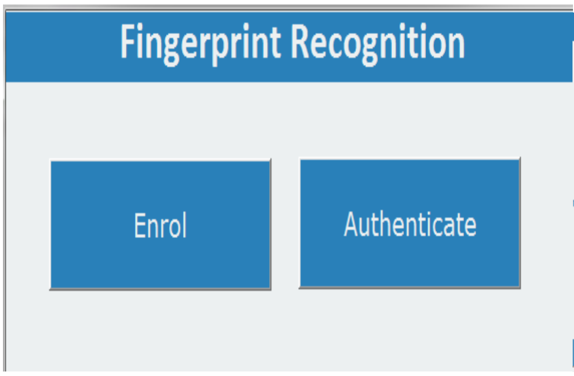

Figure 1: Main

Figure 2: Data enroll to database

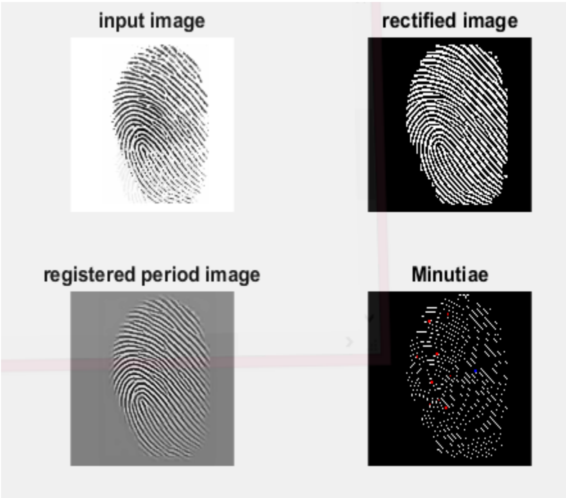

Figure 3: fingerprints enrolling

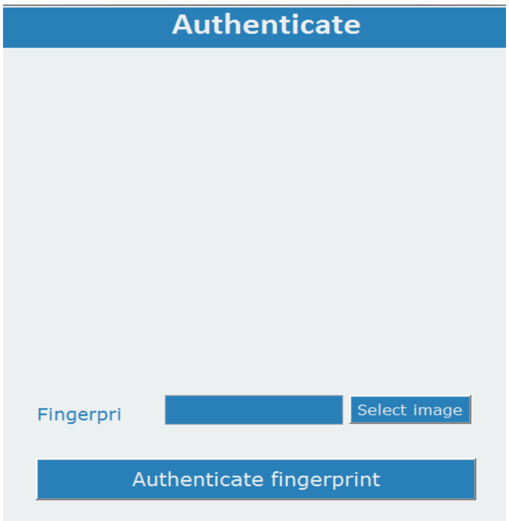

Figure 4: authentication

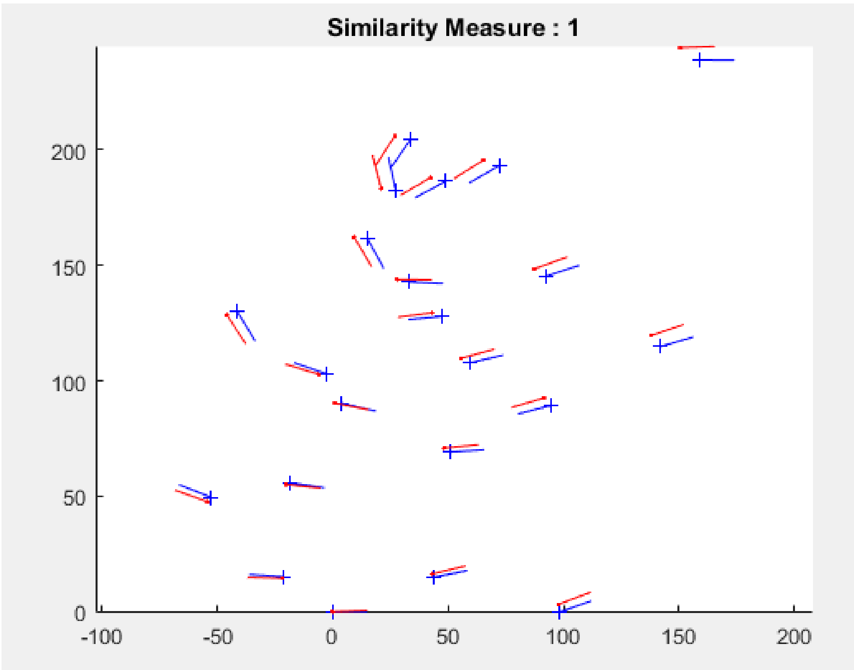

Figure 5: fingerprints matching with database

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5. CONCLUSION

This paper presents a solution to prevent altered FP threats against AFIS by detection, classification and matching using ridge and minutiae features. First step to defeat the altered FP threat is the detection. Proposed a method for altered FP detection based on Minutiae Density (MD), Ridge Discontinuity (RD) and Scar(S). Scar is an important feature present in altered FP since all process of alteration creates the absences of ridges and valleys. Scar detection is performed by average filtering and thresholding. Extraction of scar from low quality FP images is difficult. This difficulty is overcome by changing the window size with respect to dryness of the FP. Thus the average filtering process becomes adaptive. It is concluded that addition of scar increases the TPR and decreases FPR as compared to the methods proposed in literature.

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