ENHANCHED PALM PRINT IMAGES FOR PERSONAL ACCURATE IDENTIFICATION

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ABSTRACT

In this paper, we propose an innovative touch-less palm print recognition system. This project is motivated by the public's demand for non-invasive and hygienic biometric technology. For various reasons, users are concerned about touching the biometric scanners. Therefore, we propose to use a low-resolution web camera to capture the user's hand at a distance for recognition. The users do not need to touch any device for their palm print to be extracted for analysis. A novel hand tracking and palm print region of interest (ROI) extraction technique are used to track and capture the user's palm in real time video streams. The discriminative palm print features are extracted based on a new way that applies local binary pattern (LBP) texture descriptor on the palm print directional gradient responses. Experiments show promising result by using the proposed method. Performance can be further improved when a modified probabilistic neural network (PNN) is used for feature matching.

Keyword: Palm print recognition, hand tracking, local binary pattern (LBP), gradient operator, probabilistic neural networks (PNN), Harris Operator.

1. INTRODUCTION

Palm print recognition is a biometric technology which recognizes a person based on his/her palm print pattern. Palm print serves as a reliable human identifier because the print patterns are not duplicated in other people, even in monozygotic twins. More importantly, the details of these ridges are permanent. Compared with the other physical biometric characteristics, palm print authentication has several advantages: low-resolution imaging, low intrusiveness, stable line features and low-cost capturing device. Currently, most of the palm print biometrics utilize scanner or CCD camera as the input sensor. The users must touch the sensor for their hand image to be acquired. In public areas, like the hospital especially, the sanitary issue is of utmost importance. People are concerned about placing their fingers or hands on the same sensor where countless others have also placed theirs. This problem is particularly exacerbated in some Asian countries at the height of the SARS epidemic. Besides, latent palm prints which remain on the surface could be copied for illegitimate uses. Apart from that, the surface will get contaminated easily if not used right, especially in harsh, dirty, and outdoor environments. Therefore, there is pressing need for a biometric technology which is flexible enough to capture the users' hand images without having the users to touch the platform of the sensor.

1.1 Image Acquisition and database collection

Image acquisition is a first step in palm print identification system or biometric recognition system. Image acquisition is divided into two categories: offline and online. Online palm print image is captured by different sources like- digital scanner, digital cameras, video cameras, and CCD (charge-couple device) based scanner. CCD based palm print scanner collect high quality palm images. Each hand contribute at least 5 hand image sample in various rotation, translation and variation in pose. In additional segmented image of each sample are also available. These are 800 x 600 pixels in BMP format.

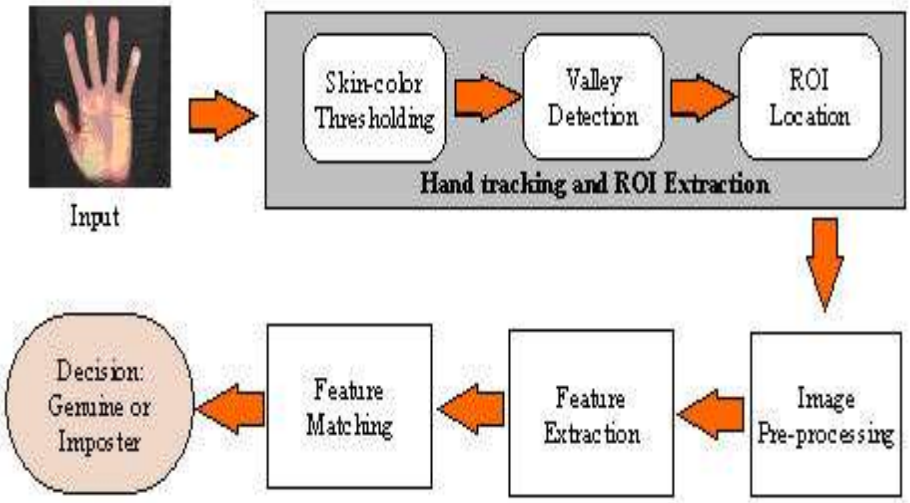


Fig.: The proposed touch-less palm print recognition system.

1. 2 Image preprocessing and segmentation:

Image preprocessing is performed in second step. From the RGB image, the image processing will be performed. The original image from the database may be in JPG type of image. Image preprocessing is process of converting RGB image into Gray scale image. Pre-processing is also used to remove noise and distortion. When palm print image are captured, some variation may occur such as translation, rotation and low image quality, cause recognition problem. Then central area of palm and region of interest (ROI) is cropped and rotated using segmentation process. It involves five steps :

a) Original palm image are converted into a binary image by using a threshold.
b) Track the boundary of palm.
c) Key point detection - Find two references point (P1 and P2) and three equidistant point pa, pb, and pc on the boundary make turning angle.
d) Establishing co-ordinate system.
e) Crop and rotate the ROI.

(a) (b)

Fig.: Skin-color thresholding:
(a) The original hand image (b) segmented hand image in binary form.

1.3 Feature Extraction

(A)

(B)

Fig.: (A) The original palm print. (B) Palm print after the contrast adjustment and smoothing effect

We propose a new way to apply the Local Binary Patterns (LBP) texture descriptor on the directional responses of gradient operator. Unlike fingerprint which flows in uniform structure with alternating ridges and furrows, the texture of palm print is irregular and the lines and ridges can flow in various directions. This motivates us to decompose the line patterns into four directions and study them separately. LBP is then used to analyze and describe the texture of the palm print in the various directions.

1.4 Pattern Matching

Matching is a process to compared test sample feature vector to the feature stored in the database and Checked with that template from which maximum similarity is obtained. Next matching is successful if the defuzzied value obtained is greater than the threshold value otherwise unsuccessful match. Fuzzy logic has been applied to many biometric matching systems such as face, fingerprint, palm print recognition and so on.

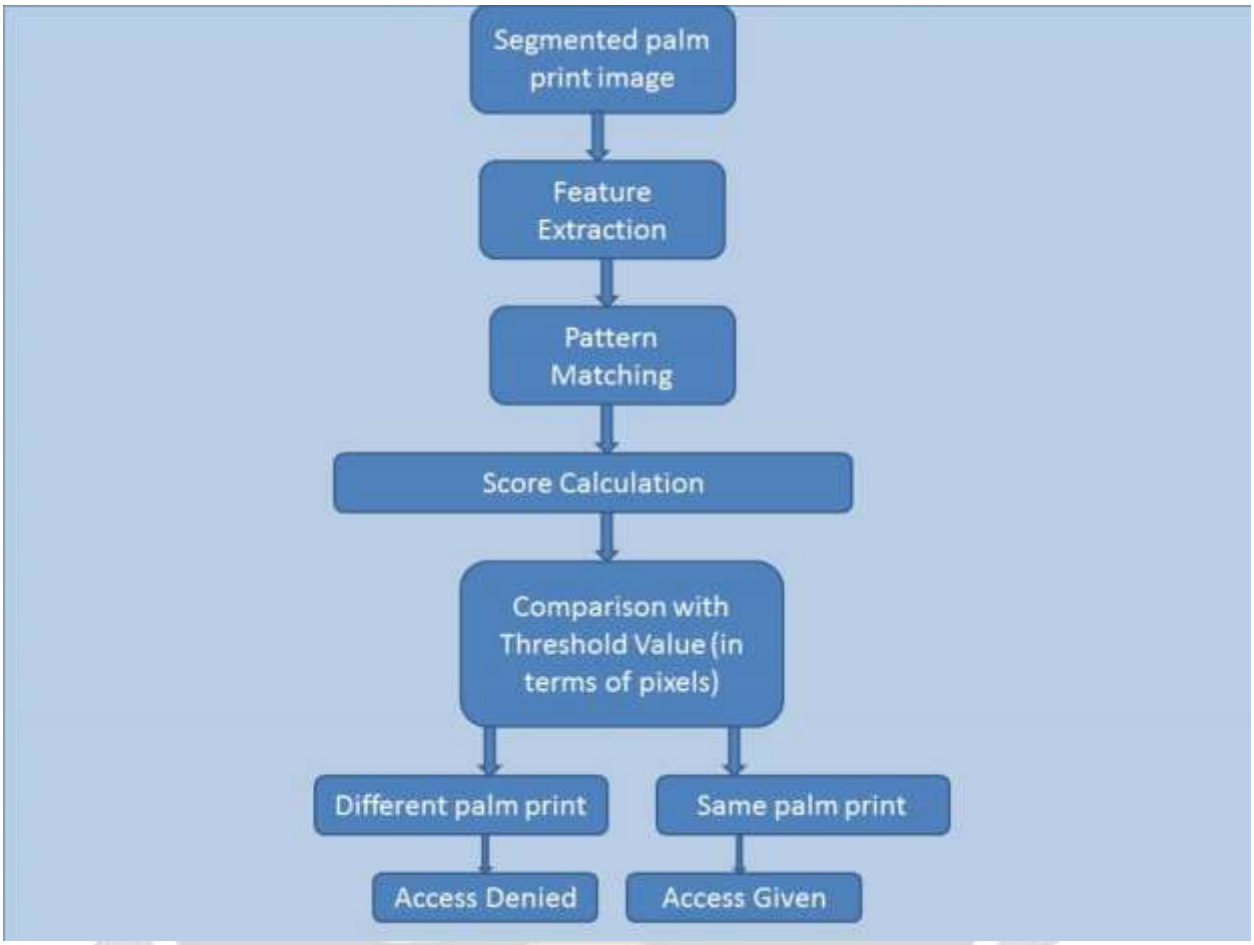
2. PROPOSED WORK

The palm print images are first binarized into minor subpart for further detailing. This binarized image is then sent for segmentation to get the exact image devoid of the background. Once the ideal image is infused the process of process extraction is started. It emphasizes on the minute and fine details of the palm image with its traces, its alignment, positioning etc. After this extraction, the pattern matching algorithm is applied to the image and compared with the stored database image.

The **score matching** module is applied here between the image taken and the image present in the database. This matching is done in two sub modules :

i] images from database compared with image considered for authentication.
ii] images of left and right palm print images (by fusion algorithm)

On basis of this the score is calculated in terms of pixels. Score matching is compared with the **threshold value** which was set by default in the database. This displays the score of images that are compared and its result is manifested in percentage. If the percentage score is satisfactory, access is given, else its denied.



3. METHODOLOGY

- Multi-biometrics can provide higher identification accuracy than single biometrics.
- Combining Left and Right palm print images to perform Multi-biometrics is easy to implement to obtain better result.
- The Proposed weighted fusion scheme allowed perfect identification performance which properly exploits the similarity of Left and Right palm print.
- The Left and Right Palm Print images are somewhat similar, which enhance the performance improvement of the palm print identification.
- The aim of working on the palm print recognition system is to develop a system with increased speed and accuracy.
- The accepting and rejecting of user is done on the basis of matching algorithm, which assures more authentication

3.1 STATISTICS

No. of Palm Print Images	No. of Correct Matches	No. of Incorrect Matches
50	40	0
50	30	0
50	40	0
50	40	10
50	20	10

Table: Statistics showing result of fifty palm print images.

Fifty different images of palm print for each person is utilized for the experiment. Different palm prints were collected from different person. First case of the above table, the source palm print image is compared with other different database palm print images. Common features have identified in the four different palm prints of the same person. The source palm print image feature is not matching with all other persons palm print image feature. The source palm print image feature is not matching with one of the palm print image feature from the database of the same person.

4. CONCLUSIONS

This paper presents an innovative touch-less palm print recognition. The proposed touch-less palm print recognition system offers several advantages like flexibility and user-friendliness. We proposed a novel palm print tracking algorithm to automatically detect and locate the resolutions and features of the palm. The proposed algorithm works well under dynamic environment with cluttered background and varying illumination. A new feature extraction method has also been introduced to extract the palm print effectively. In addition, we applied Harris Operator for palm print matching. Extensive experiments have been conducted to evaluate the performance of the system. Experiment results show that the proposed system is able to produce promising result. Apart from that, another valuable advantage is that the proposed system could perform very fast in real-time application.

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