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Sobel Threshold Is a Different Resolution of Palmprint

Mrs. Kasturika B. Ray

Dean (Academics) Eluvia College of Engineering Technology and ScienceKusumati, Bhubaneswar, Odisha, India, Institute of Technical Education & Research. Siksha 'O' Anusandhan University Bhubaneswar (PhD contd.)

ABSTRACT

Biometric a technology which is describes the general procedures of the palmprint identification such as feature extraction, storing features, matching processes. The techniques for automatically identifying an individual based on the physical or behavioral characteristics are called biometrics. Biometrics is the words "Bio" and "metrics". Bio means living things. Metrics means measure. Currently, Biometrics stands for measuring human's features for personal identification and verification. The palmprint as a relatively new biometric feature has several advantages compared with other currently available ones. Palmprint capture devices are much cheaper than other devices. In this paper which mainly contains the different operations but I analyze palmprint texures using Sobel Threshold operation for personal authentication. Sobel Threshold can reflect the charecterstic of a palmprint texture at different resolution Here I have presented an identification approach using textural properties of palm print images like principal lines, edges and wrinkles are considered with equal importance. In the verification test good accuracy has been obtained by the proposed approach.

KEYWORDS— *Biometric Identify Verification, Palm print Classification, Feature extraction, Edge Detection, Image matching.*

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I. INTRODUCTION

Biometric identification can be considered as the technology that describes procedure for identification and verification using feature extraction, storage and matching from the digitized image of biometric characters such as Finger Print, Face, Iris and Palm Print. By using a human physiological and behavioral characteristic it must use of universality, distinctiveness and permanence. Biometric features can be extracted from human hands. The hand-shaper geometrical features such as finger width, length, and thickness are the well-known features adopted in many systems. Palm is the inner surface of a hand between the wrist and the fingers. Palmprint is referred to principal lines, wrinkles and ridges on the palm.

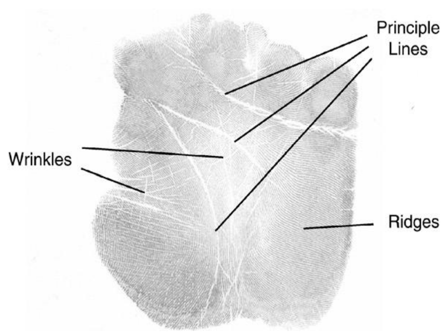


Fig.1 Layout of Palmprint image with Principle lines, Wrinkles and Ridges

- These Principle lines, wrinkles and ridges have been used to extract useful palm print features for identification purpose by Zhang et al [1]. The heart lines, life lines and head lines are the three components known as principal components analysis [2].To propose a new automatic invariant-feature-based palmprint alignment method by using invariant geometrical features has been reported Wenxin et al [3]. According to Guangming Lu et al by Karhumen-Loeve transform, the palmprint images are transform into a small set of feature space which are the

eigenvectors can represent the principal components of the palmprint [4]. Several different methods and issues relating to image acquisition, feature extractions, classification and identification have been addressed by several researchers [5, 10]. Issues relating to security and privacy that might enforce accountability and acceptability standards have been discussed Prabhakar et al [6]. Algebraic features are extracted from different palms and each pixel is considered as a coordinate in a high-dimensional image space proposed by Xiangqian et al. [7]. According to Wai Kin Kong palmprint is a piece of texture and apply
2-d Gabor filter is used to obtain texture information [8]. Another innovative method given by Poon a method of locating and segmenting the palm print into region of interest (ROI) using elliptical half-rings has been reported to improve the identification [9]. Palm-print features have been extracted from the ROI by using Sobel and morphological operations [10]. In the current paper I describe a generalized Palm Print Biometric system and suggest a simple texture feature based method for palm print identification with encouraging results.

II. GENERAL PROCEDURE FOR PALMPRINT IDENTIFICATION

Some major steps in the palmprint Biometric system are

- Capturing Palm Prints image database for selected users and features are extracted for each class of palmprint.
- Palmprint features are stored in the database and extraction of features for the input image.

- After input image extracted the matching processes have been stored and the one with the highest matching score is identified as output.
Palm print image can also be captured by using a scanner and digitized. When Palmrints are captured the position and direction of a palm may vary from time to time. The sizes of palm are different from one another. In this paper all of the Palm print images have been collected from internet (total 600 peg free poly u database collected from Hong Kong polytechnic university). The image size is 384x284 pixels in 256 gray levels. Here the pre-processing techniques may be necessary to improve the quality of the images and also a distance measure is used to measure the similarity between the input image features and the palmprint classes in the database.

III. PROPOSED METHOD

The different operations are in Image Processing like Motion, Sharpening, Sobel, Prewitt, Log (Laplacian of Gussain), Laplacian, Average, Disk or Circular Laplacian. These operations are giving different result and the histograms also vary one to other. So the proposed operations have been shown below in Fig 2.

Fig. 2: different operations with histogram.

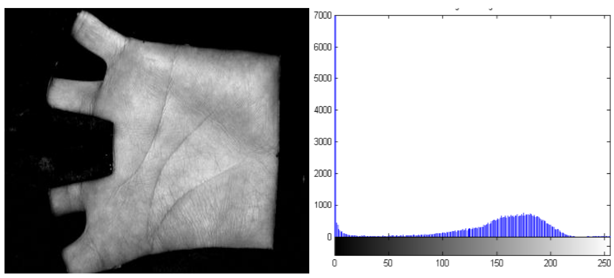
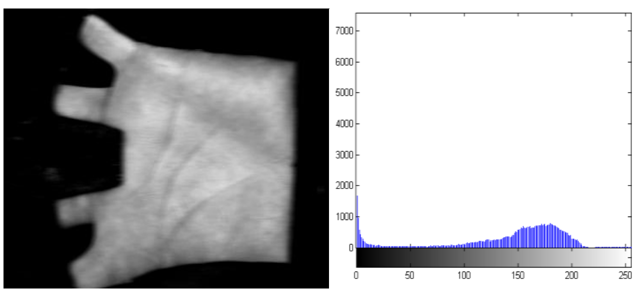
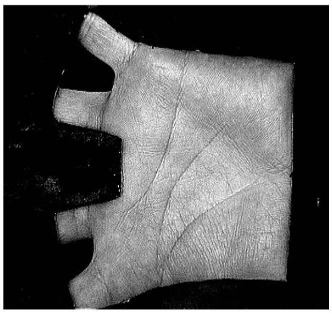
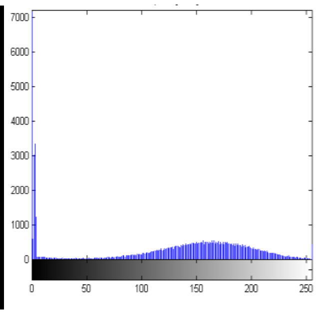


Fig.2. 1.a.Original Image 2.1. b. Histogrm of Original Image

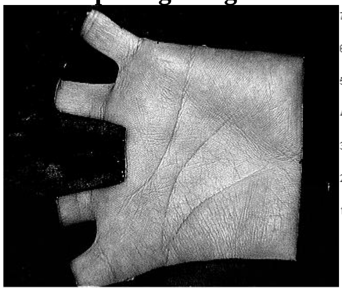


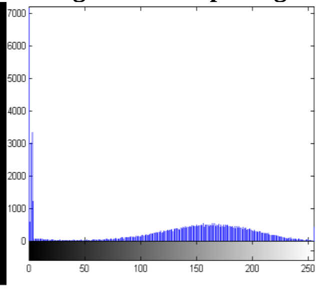
2. 2. a.Motion Image 2. 2. b. Histogrm of Motion Image



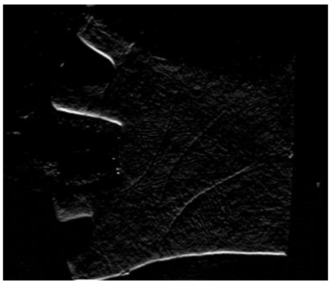


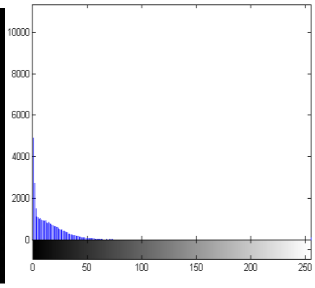
2. 3. a.Sharpening Image 2. 3. b. Histogrm of Sharpening Image



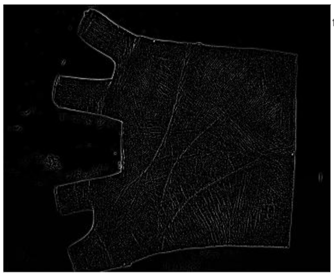


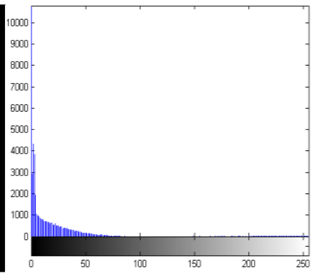
2. 4. a. Sobel Image 2. 4. b. Histogrm of Sobel Image



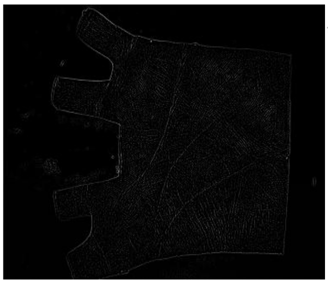


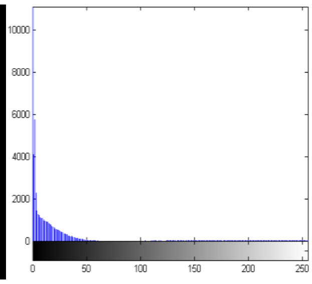
2. 5. a. Prewitt Image 2. 5. b. Histogrm of Prewitt Image



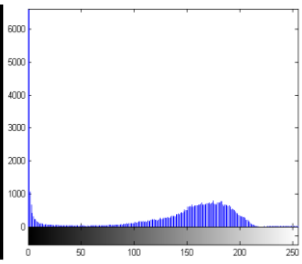


2. 6. a. LOG Image 2. 6. b. Histogrm of LOG Image

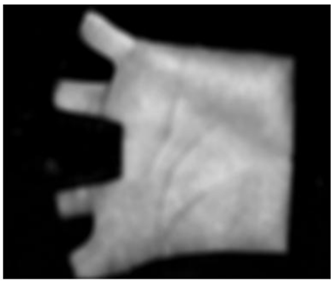


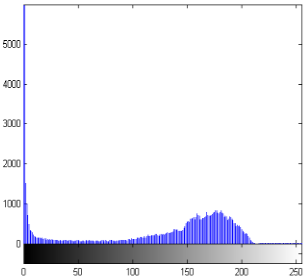


2. 7. a. Laplacian Image 2. 7. b. Histogrm of Laplacian Image



2. 8. a. Average Image   2. 8. b. Histogrm of Average Image





2. 9. a. Circular Laplacian Image 2. 9. b. Histogrm of Circular Laplacian Image

It is able to deal with various operations Sobel is one of the most important operations which experimental results demonstrate the power of the proposed approach. Here the proposed method uses the *Edge Features* of the palm to provide a description of texture features. Biometric palmprint identification methods have used features extracted from the palm lines. But Principal lines features can have similarity across different palms. Edges and Wrinkles are important characteristics but it is difficult to extract them accurately.

Edge detection using masks has been widely used in image processing literature. The number of edges in a region provides a measure of signal "busyness" or "edgyness" in that area. A palm print image can be divided into several areas and the number of edges over these areas can be used to define a feature vector for the image.

For an illustration the current method uses four equal regions denoted as *LU* (left upper), *LL* (left lower), *RU* (right upper) and *RL* (right lower) and the number of edges for each region is used to provide a feature vector for the image. A set of such feature vectors can be stored by taking several samples of the same palm. A database of known palmprints' feature vectors are then stored as classified training feature database.

When an unidentified palm is presented then its "busyness" (*b*) feature is extracted for the four regions giving a test (unknown) feature vector. The matching of feature between the unknown *(T)* palm feature vector and the database of known (training) *(K)* vectors will identify the palmprint to one set in the training data base. The *city block distance* is used to measure the similarity of two palm print feature vectors.

$$D(T,K)=|LUbt-LUbk|+|LLbt-LLbk|+|RUbt-RUbk|+|RLbt-RLbk|$$

Where *T* denotes unknown or test palm feature vector, *K* denotes a known or training palm feature vector, the subscript '*bt'* denotes test palm "busyness" and '*bk'* denotes known palm "busyness", and *LU, LL, RU* and *RL* denote the four regions.

The distance of the single unknown palm to a set of samples for a known classified palm in the training database is obtained by averaging the distances using,

$$D\,i = \sum_{J=1}^{N} D\,(T\,,K\,i\,,j\,)\,/\sum_{j=1}^{N} j$$

Where i denotes the unknown class *(i= 1, M)* and j denotes the individual samples in the training class, N being the total no. of sample in a class.

The process can be extended to dividing the image into 8 or 16 equal regions. The edge feature in this case is an 8-component or a 16-component vector.The different steps in the proposed methods have been illustrated in the system Diagram of Fig 3.

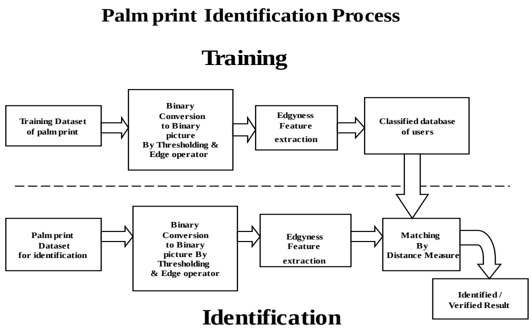


Fig. 3: Palmprint system diagram.

IV. EXPERIMENTAL RESULT

(a) Palm print Acquisition:-

Fig. 4: Snapshot of the Dataset

Palm print peg free images have been collected from internet (total 600 peg free poly u database collected from Hong Kong polytechnic university). The image size is 384x284 pixels in 256 gray levels. The entire palm was preserved, fingers and thumb were omitted. The database consists of palm print of 60 different individuals. Each data set has 12 samples of left palm and 12 samples of right palms.

(b) Preprocessing:-

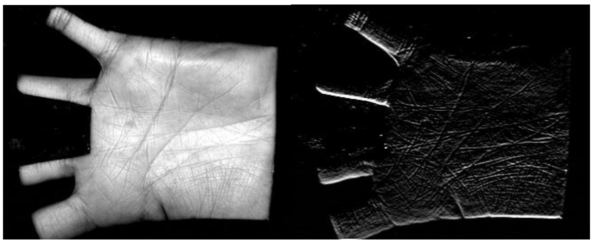
For the experiment 10 classes of left palm print having 12 samples each was considered. For each set, 6 samples were taken as training samples and 6 samples for test. Initially each palm is divided to 4 equal regions denoted as *LU* (left upper), *LL* (left lower), *RU* (right upper) *and RL* (right lower).

(c) Texture Feature Extraction:-

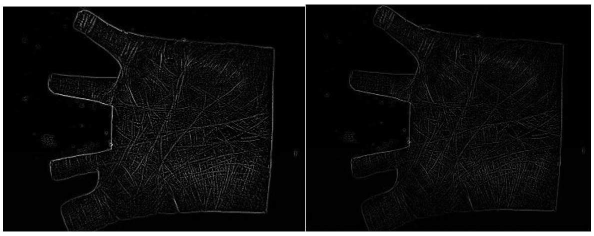
Experiments have been conducted to select a suitable edge detector for the palm print Texture Feature using *threshold log,Laplacian and Sobel* operator over a *3X3* area (Fig 5). Further an *8-connectivity* region is used to filter out unwanted edges.

The number of connected lines provides the measure of “edgyness” or “busyness”. The feature vector of each palm describing the texture pattern thus consists of the “edgyness” or “busyness” value for the four regions of palm as extracted above (Fig 6, Fig 7.a to 7.d).

Thus for each palm sample in the training database a 4-element feature vector containing the “edgyness” of each region was stored as training feature database.



(a) (b)



(b) (d)

Fig. 5: (a) Original image, (b) Sobel Threshold image, (c) Log Threshold , (d) Laplacian Threshold.

The training database thus contains *MxN* feature vectors where M is the number of palm classes *(M=10)* and N is the number of training samples *(N=6)* in each class.

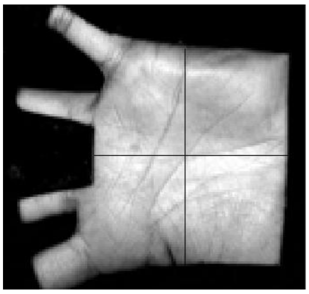


Fig. 6: Original image with 4 regions.

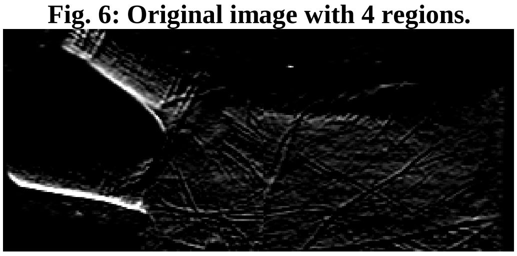


Fig. 7.a: Extracting edgyness of Left Upper(LU)And of Right Upper(RU)

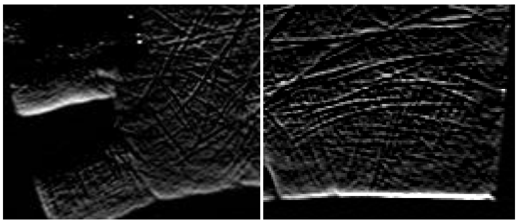


**Fig. 7.b: Extracting edgyness of Left Lower(LL)
and of Right Lower(RL)**

(d) Test Data Identification :-

Palm prints for the test (unknown) samples were selected randomly from the test database. The test palm was divided into four equal regions as given in (b) and texture feature vector was extracted as described in (c).The identification problem is now to classify the test palm to one of the 10 sets of palm in the training database, by comparing the feature vector of the test palm with the feature vector database of training samples. This is achieved by:

- Determining the average distance of unknown sample from the N samples of each of the M classes *(here $N=6$, $M= 10$).*
- The minimum average distance identifies the palm class to which the unknown sample belongs.

The method of pre-processing, feature extraction and test data identification was then repeated with 8 and 16 equal regions.

(e) Result Analysis:-

All the experiments have been conducted using Matlab. The experimentations with different *edge gradient operator*s showed best result for the *Sobel operator* (Fig 5.b).

To determine the effectiveness of the proposed method we need to examine the correct identification rate *(R)* . *R* can be defined as

$$R = \frac{\text{No of test samples correctly classified}}{\text{Total number of test samples selected}}$$

The correct identification rate using the averaging distance method to a class of palm prints with 4, 8 and 16 regions was found to be 90%, 70% and 80% respectively.

The process of finding minimum distance between known and training samples was then iterated over the individual members of the training classes. However, instead of using all the $M \times N$ samples of the entire test database only the two test classes which have least average distance from the unknown image feature vector were chosen. This reduces the number of operations required for identification. In this second iteration the correct detection rate was found to be 100% for 4, 8 and 16 regions.

V. DISCUSSION AND CONCLUSION

This paper describes a new approach to palm print identification using texture.feature extraction. Simple edge processing has been used to describe the texture. Palm print identification involves the search for the best matched test samples with the input palm print in the texture feature space. The feature vector here consists of count of connected edges. The correct detection rate with a single iteration is between 70-90%, where as in the second iteration it is found to be100%.The proposed texture detection method combines the wrinkles, ridges and lines characteristics available in the palm print. The major advantage of this method is its simplicity of implementation and the small size of feature vector. Comparison of identification rate with other methods reported in the literature.Additional improvements in the first iteration results can be achieved by extracting a region of interest for each palm before the feature vector extraction. This will involve some additional pre-processing.

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Kasturika B. Ray has a Post graduate degree in MIT (Master of Information Technology), Manipal Deemed University, Karnataka and continuing her Ph.D. research in the field of Digital Image processing in Computer Science and Engineering, SOA University, Bhubaneswar, India under the guidance of Dr. Mrs. Rachita Misra. She has nearly eight years of teaching experience.

Currently she is working as a Dean Academics in Eklavya College of Engineering Technology and Science, Kusumati, Bhubaneswar, Odisha, India. She has several publications in the areas of Image Processing in International and National journals, Seminars and Conferences.

She has published three International Journal research papers and presented in two National conferences and has attended ten National Workshops / Seminars etc. She has one article. She is the research member of Global Research Club. Her area of interest is Digital Image Processing and Networking.