



Contents lists available at ScienceDirect

## Materials Today: Proceedings

journal homepage: [www.elsevier.com/locate/matpr](http://www.elsevier.com/locate/matpr)

## Palm print identification and classification using KNN algorithm

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## ARTICLE INFO

## Article history:

Received 13 January 2021  
 Received in revised form 13 January 2021  
 Accepted 24 January 2021  
 Available online xxxx

## Keywords:

Palm print  
 KNN  
 Classifier  
 Accuracy  
 Biometric

## ABSTRACT

The best way of biometric security is face recognition, iris' recognition, and palm print recognition. Palm recognition is a form of biometric process which is based on the different patterns of different characteristic. As in the case with the patterns in fingers, scanning the palm scanner uses optical, tactile, thermal methods to bring out the details in the patterns of raised areas which are called as ridges and branches called bifurcations, palm recognition is considered as a special type for security purposes as the finger patterns vary from person to person with different characteristics. This is scanned by a scanner or CCD. They can also be used for forensic, criminal, or commercial uses. Palm print gives a better level of accuracy and it is the best biometric way for security purposes. Various classifiers are used to match the palm print with the stored data. This system proposes a KNN classifier to match the current palm print with the existing dataset. This system produces a better result than other matching techniques.

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Selection and peer-review under responsibility of the scientific committee of the Emerging Trends in Materials Science, Technology and Engineering.

## 1. Introduction

Biometrics are in contact with human characteristics. This is also used to detect the individuals in a team that is under surveillance. Biometric authentication is the method of analyzing the data for the individual's characteristics to the specific person's biometric template to calculate the resemblance. The character of the person is already stored and when the biometric status is applied we can retrieve the wanted data.

Palm recognition methods make use of a scanning device or a visually based use, with the software associated that makes the process of the image which is captured and is compared with the stored records of the particular person. This method is used in various application some of the common applications are to detect some of the medicinal disorders and providing biometric securities. The finger pattern consists of ridges, wrinkles, and principal lines. The following Fig. 1 shows the important parts of the palm print. This method has unique features so it has more security when compared with other security methods.

All this varies from person to person so this is considered as the best way for biometric security.

KNN algorithm is also called an N nearest neighbor algorithm which is a non-parametric process which is proposed by Thomson

that is mainly used in the application of classification and regression. This method of the algorithm is considered as one of the simplest ways for classification. However, other classification algorithms are suitable for other biomedical applications [1–3].

The second part of this research part deals with the overview of various researches conducted on this palm print identification. Section three elaborates on the proposed methodology and the fourth section discussed the output of the current system. Finally, section four concluded the proposed work.

## 2. Literature review

In the biometric system, palm print is one of the most familiar research areas. Many people accepted palm print features. This system is classified into various stages like image collection, pre-processing the collected images, extracting features, and checking with the stored database. Harcharan kaur et al., developed a system for private reorganization of palm area. The local features are extracted by using the SIFT method and texture features are retrieved by using the GLCM technique. The SIFT method is to formulate the system as a better system. This proposed system is tested with IITD online database. 235 user's data is taken for testing this system. The collected images are BMP format and the resolutions of the images are 800 × 600 pixels. Here the authors use a new concept using SIFT, GLCM with KNN [4].

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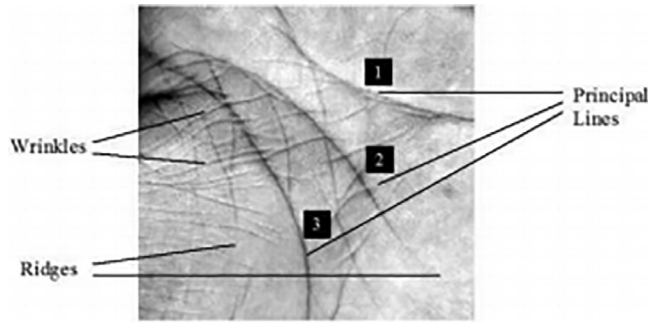


Fig. 1. Parts of the palmprint.

Anita Gautam Khandizod et al., says that most of the life values are measured by using palmprint identification. Mainly palm prints are used for the identification of the people that depends on their behavioral and psychological features. Many algorithms are developed to identify the palm print, but accuracy is one of the main issues. In this research article uses the PolyU dataset for palm print reorganization, CLAHE concept is used to increase the quality of the image, and at last KNN classification technique was developed. The outcome of the proposed system shows a 95.31% accuracy in palm print identification [5].

In most of the applications, biometric techniques are used for managing security problems. The main intention of the biometric techniques is to use the physical features for verification systems. Various physical properties like face, iris, palmprint, and retina are used in security systems. From the various properties, palmprint identification is one of the common research areas. Palmprints are described as unique characteristics due to the occurrence of wrinkles, creases, and ridges. Palmprint images are also collected by using inexpensive sensors with less resolution. Srushti Kureel et al., 2017 proposes a new approach for palmprint identification with the help of the texture of images. The images are categorized by using various features like lines, wrinkles, and ridges. Texture extraction can be used to collect the data accurately [6].

Biometric approaches are also used in the design of mobile applications. Haryati Jaafar et al., designed a new method for palm identification for smartphones. Here the authors discussed managing hands and ROI retrieval methods. LHEAT technique is used to increase the image quality and managing the fewer quality images. In this article, the authors propose a new classifier IFkNCN model was implemented by using the fuzzy technique. This new method produces a 98.4% recognition rate [7].

From the past few years, various efforts have been taken for biometric identification. A traditional palmprint recognition method depends on the encoding approach. It is one of the best methods for providing better security. Priyanka Kamboj, et al., reviewed the various palmprint identification methods such as palm line checking, filtering, etc. [8,9].

Most of the biometric system works based on only one technology like fingerprint matching, facial recognition, and iris recognition. Single identification has its own merits and demerits. Lang Zhai et al. insists biometric system based on the shape of the palm and fingerprint. Compared with existing systems this system produces a better result in terms of security and accuracy rate [10,11].

Palm feature is one of the exclusive and consistent security systems with better usability. Multispectral imaging technique has been used to produce more relevant data and increase the ability of the palm print outcomes. I. Awate et al., uses the PolyU database for the palmprint identification system. Data acquired from 250 common people and the features are retrieved with the help of the Stockwell transform method. This proposed system produces a 99% accuracy rate and a 91% precision value [12].

P. D. Deshpande et al says that traditional techniques like the single biometric model produce better results in terms of robustness and accuracy. Merging more than one biometric model has increased the efficiency of the system. The integration of palm prints and palm vein models increases the ability of the security system than existing systems. In this research paper, the author proposed a new biometric system using the features of palm print and palm vein for the biometric recognition system. In the first stage, the images are preprocessed and extract the palm features with the help of the wavelet decomposition method. The features of palm veins are collected by using the filter method. In the second stage, the matching process is used to check the palm prints [13].

### 3. Proposed system

Biometric systems are mainly used in various real-time security-related applications. This research work uses a KNN classifier to match the collected data with existing data. This algorithm is non-parametric. This algorithm is applied to the database and the dataset is classified as the need. KNN algorithm is considered as lazy algorithms as it doesn't have the ability to discriminative functions from the training dataset but alternatively, it can keep in memory of the training dataset. The quality of this KNN algorithm depends on the distance measure. The following Fig. 2 shows the outline of the proposed system.

In this system, the data collected from the online dataset and preprocessed. In the preprocessing state unwanted features are removed from the original images. During the image enhancement stage, the preprocessed image quality is improved. Desired features are extracted during the feature extraction phase. The current image is compared with the stored image by using a KNN classifier. The current image is matched with the stored image, it is accepted otherwise it is rejected. Image classification and enhancement process can be evaluated depends on the time taken for processing and accuracy. The accuracy rate can be calculated using the following Eq. (1).

$$C_A = \frac{N_C}{N_T} \times 100\% \quad (1)$$

From Eq. (1)  $N_C$  indicates the number of query points that are correctly classified, and  $N_T$  refers to total query points.

### 4. Results and discussion

The first step will be the Image Acquisition where the input palm print image will be loaded when executing the program. The next step is preprocessing stage which involves the conversion of RGB image to grey scale. Then enormous noise will be there it will be removed by designing a new filter. When the noise is removed the accuracy rate also will be good. Then the segmentation process is carried out which involves segmenting each and every pixel in the given input image. Then we will go to the feature extraction stage where the important feature of the image parameters are selected and analyzed. Then at last we will go for classi-

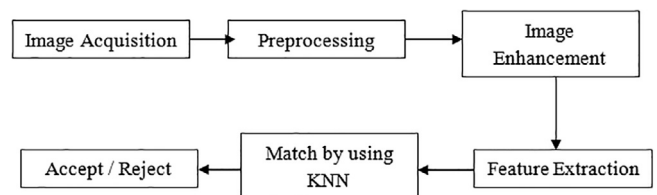


Fig. 2. Proposed systems.

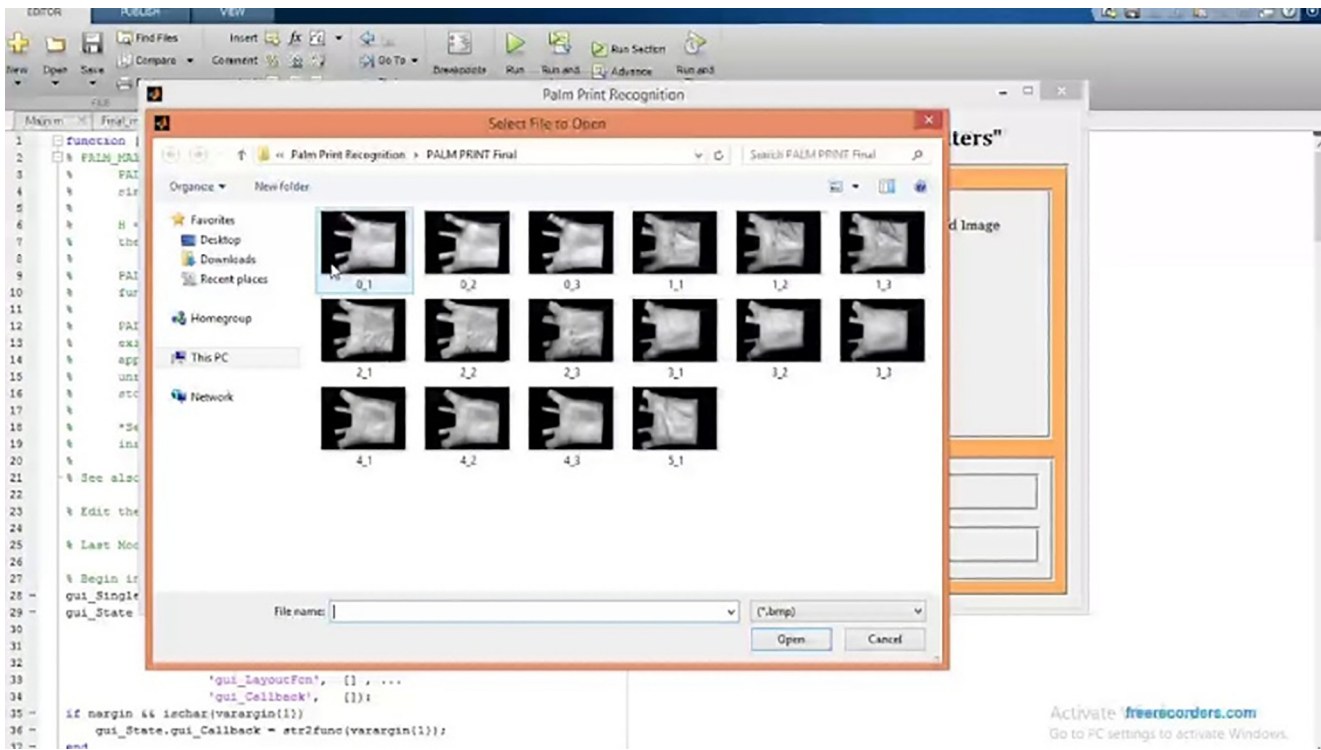


Fig. 3. Palm print recognition output.

fication section which involves the concept of KNN algorithm in identifying the palm which is given as input. Fig. 3 represents the output of palmprint recognition.

## 5. Conclusion

Biometric authentication is said to be the most secure method for all security purposes because the characters which are stored in the biometric form varies from one person to another person. Mainly in the banking system fraud can be avoided with biometric authentication. The biometric security system has secured the systems or application in better ways because biometric features of the peoples are changed depending on the person and it also not able to easily guessable. Among the various biometric system palms, print identification is one of the major techniques. Machine learning classifiers are also used for matching purposes. In this proposed system, palm prints are matched by using a KNN classifier. Compared with other classifiers KNN classifier is simple and easy to implement. The outcome of the proposed system shows a better accuracy rate than other classifiers.

## CRedit authorship contribution statement

**M. Sowmiya Manoj:** Writing - original draft. **S. Arulselvi:** Methodology, Formal analysis, Supervision, Validation.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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