International journal of basic and applied research

www.pragatipublication.com

ISSN 2249-3352 (P) 2278-0505 (E)

A LOWCOST OPTICAL SENSOR FOR SECURED ANTISPOOF TOUCHLESS PALMPRINT BIOMETRIC

[1]SHIVA PARVATHI,[2]SHEIK BEEBI JHONY,[3]PUPPALA SOUMYASRI ,[4]POSA KALYANI,[5]SHIKARI NAVYA SRI

[1]ASSISTANT PROFESSOR, DEPARTMENT OF ECE, MALLA REDDY ENGINEERING COLLEGE FOR WOMEN, HYDERABAD

[2,3,4&5]UGSCHOLAR, DEPARTMENT OF ECE, MALLA REDDY ENGINEERING COLLEGE FOR WOMEN, HYDERABAD

ABSTRACT-Biometrics have gained popularity over the last decade and palmprint have rich and unique features which makes it a reliable biometric identification methodology. There are many different low resolution palmprint recognition algorithms have been developed. Deep learning plays a prominent role in biometrics. This paper focus on the process of design palmprint biometrics system, from summary of palmprint databases with their characterizations and preprocessing, feature extraction and training the dataset with RFCNN deep learning algorithm and also, we present some palmprint recognition techniques and some research works related to palmprint purposes.

Keywords: Palmprint, Feature extraction, RFCNN

INTRODUCTION In the recent years, there are number of biometric characteristics such as face, fingerprint, palmprint, iris, gait, voice, and handwriting have been proposed. Some of them, e.g., people's fingerprint and iris have already achieved very high accuracy and been commercially deployed Palmprint recognition, which is evolving as a biometric identification technology, has recently piqued interest. In comparison to other biometrics traits, the palmprint modality played the most important trait in increasing the security of a person's authentication, and it is active research that has attracted further attention from researchers interested in biometrics fields. As a description of palmprint, it is a small area of the palm surface that contains more details that is useful for individual authentication systems. It also has a special function called permanence, which means it will not alter over time. For this reason, palmprint are reliable and confident modality between the same categories of palmprint like fingerprint and face etc [1]. Palmprint characteristics such as flexion creases, wrinkles, ridges, and minutiae are found on the palmar side of the hand and are permanent and exclusive to a person [2]. Palmprint recognition has the potential to achieve high

International journal of basic and applied research

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ISSN 2249-3352 (P) 2278-0505 (E)

accuracy and reliable performance for personal verification and identification [3], as these significant features of the palmprint are considered to be permanent and unique to a subject [4]. As a result, palmprint recognition has the potential to achieve high accuracy and reliable performance for personal verification and identification. Palmprint recognition is often considered a non-invasive biometric technology because of its high user-friendliness and ease of self-positioning. As a result, palmprint-based biometrics have a wide variety of civilian and forensic applications [5]. The standard palmprint recognition pipeline consists of modules for pre-processing, segmentation, palm region of interest (ROI) extraction, feature extraction, and matching. At each stage, the modules are designed to extract desired features and pass that information on to the next module. In most current methods, the features are carefully handcrafted using human knowledge of the hand, palm, and image acquisition settings to successfully process the details. This paper focus on the process of design palmprint biometrics system step-by-step, started from giving summary of palmprint databases with their characterizations and pre-processing, feature extraction and training the dataset with RFCNN (Region fully based convolutional neural network) deep learning algorithm and also, we present some palmprint recognition techniques and some research works related to palmprint purposes. First the system we will use OpenCV for identifying the palm from an image, then the palm landmarks are extracted from image. Using these landmarks, align the image. Using a Custom RFCNN deep learning model to train the system and these models will be able to predict person based on palm image.

RELATED WORKS There are many palmprint identification methods available but deep learning-based methodologies are commonly used. CNN have been successfully used in biometric identification and computer vision-based problems. Deep learning is successful in image classification, shape analysis and biometrics. Deep learning paradigm referred as d prime CNN allows learning optimal features for genuine/imposter separation task. The parameters of the neural network are learned to minimize a loss function. Here the computed scores are directly calculated and approximate the genuine/impostor score distributions as normal distributions and maximize their separation, trying to achieve the largest difference between the means and smallest standard deviations. Thus, the system learns more general representation of palmprints andperforms better on new unseen data.[1] Palmprint acquisition

methods can be divided into two categories contact-based and contactless-based. Traditional contact based palmprint acquisition device is similar to optical fingerprint. During the acquisition the palm is pressed against the contact surface and light is totally internally reflected and in the ridge region and absorbed in valley region. However, when the palm is pressed on the surface, the centre region is lost in acquiring the image. Another methodology in contact-based palmprint acquisition is Diffuse Reflection (DI) image which captures diffuse reflection of light, and the camera isperpendicular to the contact surface. Thus, the centralregion of the palm can be imaged in the acquired image,even without touching the contact surface. Both DI and TIR is combined so that they can be used simultaneously and the centre region of the image can be captured [2] We compare three contactless based palmprint acquisition. First palmprint images are pre-processed using fuzzy enhancement algorithm. Second approach is based on CNN for feature extraction, which is widely used in face recognition and biometric identification systems. Third methodology compares three set of databases PolyU II, CASIA and IITD.[3] Palmprint identification method based on block mean grey value.Firstly, based on the coordinate position of fingerroot in palm outline and bylocating the contour feature points of palm, we obtain thepalmprint region of interest, and then the block mean greyvalues are calculated as the palmprint features. Finally, we usefeature matrix distance for the palmprint matching. These algorithms come under the category of non-contact-based recognition system and is an online stimulation system using GUI of MATLAB.[4] The main advantage of ultrasound is that it is possible to collect 3D images. 3D images allow high defined extraction of all the features which improves accuracy. Ultrasound image uses a coupling medium, an ultrasound probe and images are collected by submerging the palm in the probe. But such a system is not acceptable by the users. To solve this problem a commercial gel is used as a coupling system.[5] The surface feature of3D palmprint by weighted shape index feature. The feature vector of sub-region histogram is obtained by shape indexfeature. Our feature can overcome the effect of illuminationchange of training palmprint data. At the same time, localsparse coding can quickly find n samples similar to testsamples. Most of the training palmprint data can be excludedand some samples similar to the test palmprint are retainedby comparing the correlation between the test palmprint andthe training data. So, the classification problem can be clearand simple. And the

International journal of basic and applied research

www.pragatipublication.com

ISSN 2249-3352 (P) 2278-0505 (E)

classified information of the testsamples in the database will be finally determined.[6] Initially DL method is to perform biometric recognition by fusing palmprint and IFT extracted from single hand acquisition.method has thefollowing advantages: i) it uses a DL model that consists ofa CNN trained using an unsupervised procedure, which doesnot require class labels; ii) it uses the same CNN model for allbiometric traits, adapted separately to the palmprint and to theIFT extracted from the different fingers; iii) it adopts a feature-level fusion of palmprint and IFT to increase the recognitionaccuracy, without requiring additional biometric acquisitions.[7] Existing palmprint approaches are broadly classified into three categories: holistic, structural and hybrid based. Holistic approach uses the whole palmprint image as a feature with some statistical technique such as Principal Component Analysis(PCA), Linear Discriminant Analysis (LDA), Independent Component Analysis (ICA) and KernelFisher Discriminant Analysis (KFDA).in order to enhance the discriminative capability, the FourierTransform, Discrete Cosine Transform (DCT), Wavelet Transform, and Gabor Transformwere performed along with statistical techniques on the palmprint images to extract palm features.The structural or local feature approaches uses stable palmprint features such as palm lines and texture. These approaches can be further divided into three main categories: (1) line based, (2) coding based and (3) texturebased. Line based extracts the palm lines via several line detection algorithms. Second category encodes the palmprint features into bitwise codes by using theresponses of a bank of phase or directional filters.The hybrid-based approach utilizes both holistic and structural features to represent palmprint images.

PROPOSED METHODOLOGY A deep learning-based method for identifying a person from palmprint image using OpenCV. Palmprint features which are prominent for a person are identified and these features are extracted and the region of interest (ROI) identified. These extracted features are aligned in vertical alignment. A custom RFCN deep learning model to train the system and themodel predicts the person based on palm image. Thus, the saved model can easily identify a person based on the input. The proposed system has two stages training stage and prediction stage. In training stage, the dataset containing the palm images are loaded into the memory for preprocessing and the palm features are extracted using OpenCV and these extracted features are trained using RFCN architecture model

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andsaved for prediction stage. In prediction stage the saved model is loaded and process the input image to identify the person and return a result.

A Modules Palmprint based biometric identification system has the following modules:

- Palm detection
- ROI extraction
- Alignment of images
- CNN creation
- Training
- Prediction

In the palm detection module palm coordinates are detected by using OpenCV. After marking the palm coordinates the ROI is extracted from the extracted features and are aligned. The next module is the CNN creation, here the convolution layers, Dense layers, Dropout layers and SoftMax activation layers are initialized and fixed for training the model and create the RFCN architecture. In training stage, the dataset containing the palm images are loaded into the memory for pre-processing and the palm features are extracted using OpenCV and these extracted features are trained using RFCN architecture model and saved for prediction stage. In prediction stage the saved model is loaded and process the input image to identify the person and return a result

System Architecture System architecture have two component training stage and prediction stage. In training stage, the dataset containing the palm images are loaded into the memory for pre-processing and the palm features are extracted using OpenCV these features include principal line, wrinkles, ridges etc., which is unique to an individual. ROI is extracted from the features and align them. These extracted features are trained using RFCN architecture model and saved for prediction stage. In prediction stage the saved model the input is pre-processed and features are extracted which are then aligned after ROI extraction. The saved model is loaded and process the input image to identify the person and return a result. It

International journal of basic and applied research

www.pragatipublication.com

ISSN 2249-3352 (P) 2278-0505 (E)

compares the input and the saved model and find the right person; the expected output is person id which is a unique number for identifying a particular person in our database

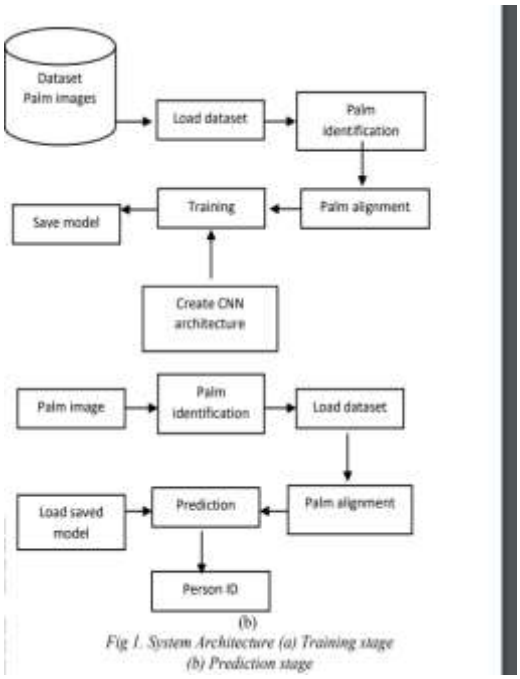

Fig 1. System Architecture (a) Training stage (b) Prediction stage

CONCLUSION Palmprint identification has improved significantly in recent years. In this paper, we focused on palmprint identification using deep learning approaches, deep learning is the most powerful tool and RFCNN have successful applications in biometric and computer visionbased problems. Palmprint recognition system based on RFCNN is high in terms of accuracy when compared to other identification system and is expected to be a new phase in biometric identification methodologies. Future research should suggest using segmentation algorithms, as well as other classifiers and distance measures, to extract the hand even in pictures with unconstrained backgrounds

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