Image Based Periocular Biometeric Recognition Using Python

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Abstract— **The Security is one of the main problems of concern among the people. Biometrics is robotic method of identifying a person based on physiological or behavioral uniqueness. Periocular biometric refers to the facial region in the immediate vicinity of the eye. Acquisition of the periocular biometric does not require high user cooperation and close capture distance unlike other ocular biometrics Image based periocular recognition is an automated method of biometric identification that uses ICP (Iterative Closest Point algorithm) ,Curvelet transform and Deep neural network techniques on images of an individual's eyes. Camera based implementation instead of Scanner implementation is to reduce the cost. Parallel classification using Neural network gives a modal security. Periocular-based methods are used as alternative means of biometric authentication because they do not require expensive equipment. Compared to the fine pattern of the iris, these features (sclera, eye lash, eye shape and eyelids) can be used for identification because they do not require a high resolution image and differ for each person.**

Index Terms— **Periocular,ICP,Deep Neural Network**

I. INTRODUCTION

Digital data are rapidly becoming a key platform for many authentication processes in a large number of applications. However sensitive data is at risk, if a pc and smartphone is protected with methods providing an insufficient level of security. Since the advent of desktop and mobile phones, PIN and password authentication using a mix of alpha numeric and symbols were the most commonly used methods for access control. In that to avoid the risk of short passwords, one can use long passwords with a mix of special characters at the cost. Biometric recognition is an automated process used to recognize humans by measuring their structure and physiological characteristics. Biometric recognition systems are generally used either for verification or for identification . Based on the literature survey, among different biometric traits such as fingerprint, ears, sclera, retina, face etc., ocular and face biometrics are the most popular ones. Ocular biometrics (using eyes iris) requires lots of user cooperation ,high quality camera and good camera stand-off distance for capturing the images while face biometrics generally fails if the captured face images(human volunteers) are suffering with A-PIE (Aging, Pose, Illumination, and Expression) challenges. To overcome these problems, researchers proposed to use the surrounding area of eye known as periocular region for recognition. Park et al were the first researchers who analysed the feasibility of periocular region of a biometric trait. performed an experiment in which they created a GUI to present a pair of eye images to human volunteers(students) and asked them to analyse the periocular features to find out whether the pair of eyes belongs to the same person or not , the person

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is authorised person are not. Based on the response from the volunteers(student), they ranked the features which were most often used in determining the response. The ranking from the most helpful to the least helpful feature was eye lashes, tear duct, eye shape , eye lids, eyebrow, outer corner and skin. for NIR spectrum images, eye lids eye shape and for Visible spectrum images, shape of the eyebrow are the most discriminating features. In biometric Periocular region also has great importance in soft biometric classification and in features matching of medically altered face images (recognition of surgically altered faces and images of human subjects captured pre and post cataract surgery, images captured after and before the process of gender transformation). The main strength of this biometric trait is that it requires less quality image, very low user cooperation which makes periocular region interesting for security, surveillance applications and the scenario where faces are partially occluded . This paper overcome the drawbacks of the existing system state-of- the-art survey of existing literature on Periocular biometrics.

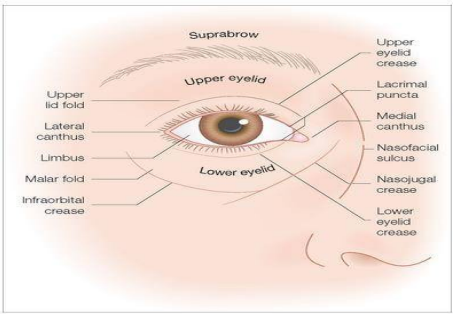

Figure 1. Eyebrow

II. LITERATURE SURVEY

Jamie R. Lyle Philip E. Miller Shrinivas J. Pundlik Damon L. Woodard and 2010. Extract gender and ethnicity information from the periocular region images using grayscale pixel intensities and periocular texture computed by Local Binary Patterns as our features and a SVM classifier. The classifiers of choice are Adaboost (along with various variants of boosting), SVM, Neural Networks, and LDA among others. The soft biometric information thus obtained can be effectively used for improving the performance of existing periocular based recognition approaches. This could be due to the uneven lighting of the face such that left part appears darker as compared to the right part. Females are also more likely to wear makeup than males, and that could be a factor affecting the classification accuracy of these genders.

Chandrashekha r N. Padole and Hugo Proenca,2012. Different biometric traits such as face, iris, fingerprint and gait, exist to provide the flexibility to choose one or combine more than one modalities for recognition, as per the availability and feasibility associated with objectives of application. A new strategy to initialize the periocular ROI, based on the geometric mean of eye corners and that as our experiments confirmed can consistently improve performance when compared to the classical approach of initializing the ROI based on the location of the iris center. Biometric recognition systems usually operate in constrained lighting scenarios and under rigid data acquisition protocols, although the development of non cooperative systems has been motivating numerous research efforts . The main hurdles are the data quality decrease and its nonuniformity in terms of the traditional variation factors (translation, rotation, scale, pose and lighting changes).

Muhammad Uzair, Arif Mahmood, Ajmal Mian, Chris McDonald and 2013. Human identification based on iris biometrics requires high resolution iris images of a cooperative subject. Such images cannot be obtained in nonintrusive applications such as surveillance. However, the full region around the eye, known as the periocular region, can be acquired nonintrusive and used as a biometric. In this paper we investigate the use of periocular region for person identification. The performance of the periocular biometrics is tested using six state-ofthe- art image-set classification algorithms.

Affine and Convex Hull based Image Set Distance (AHISD and CHISD), Sparse Approximated Nearest Points (SANP) distance, Discriminative Canonical Correlation, Manifold Manifold Distance and Manifold Discriminant Analysis. full face recognition performance degrades in the presence of pose variations whereas the periocular region based identification may perform better in the case of extreme pose changes when only one eye is completely visible. Techniques inherently suffer from the lack of information since only one image cannot contain all possible variations in the periocular region of an individual.

III. PROPOSED FRAMEWORK

Implement biometric based recognition system to capture periocular image using web camera for recognition. Extract periocular pattern using curvelet transform approach. Using Neural network algorithm to classify the users in database. Convolutional neural network are used for image classification and image recognition because of its high accuracy.The main objective is to provide multi modal biometric based recognition system for authentication system using image processing techniques.This paper overcome the drawbacks of face and iris recognition and periocular databases and its use in future for various real time applications.

A. System Architecture

In this system periocular image are captured through webcam and matching periocular images stored in database after capturing periocular region pre- processing process start to quantised. Quantization is the process of converting a continuous range of values into a finite range of discreet values. As number of bits to represent a pixel intensity (assume Gray scale image for convenience) is limited, quantization is needed. 8 bit is used for a pixel, it equivalent value ranges from 0 to 255 (discrete values) 255 is used for pure White , and 0 is used for pure Black. Intermediate values are used for grayscales as shown in this image. This process is quantization. For 8 bit pixels, quantization level is 256.

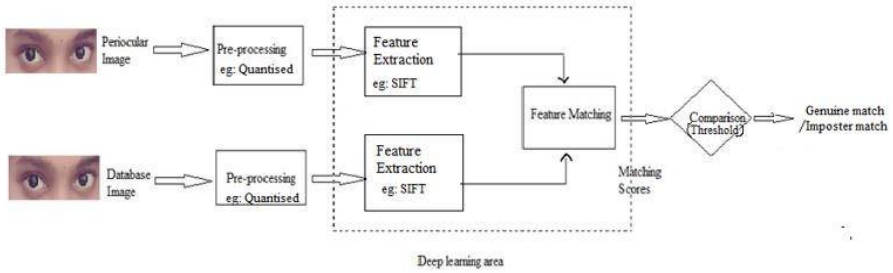

Figure 2 Image Processing

B. Key Point Matching Features

Matching Features matching is a part of camera calibration and object recognition, many computer vision applications such as image registration isthe task of establishing correspondences between two images of the same scene/object. Some common approach for image matching consists of detecting a set of interest points each associated with image descriptors from image data. when the features have been extracted from images, the next is to establish some preliminary feature matches between these images. The performance matching methods is based on interest points depends on both the properties of the underlying interest points

C. Algorithms

Brute-ForceMatcher
FLANN(Fast Library for Approximate Nearest Neighbors) Matcher Final step in this architecture comparison Thresholding means converting image into binary format. It is important for image processing. simple technique , we convert an image from color to grayscale into a binary image, i.e., one that is simply black and white .

D. Image Acquisition

In image acquisition module, It is defined as the action of retrieving an image from the source, usually a hardware-based source for processing. It is the primary step within the workflow sequence because, without a picture , no processing is feasible . images are often captured using camera or some input sensors to make image databases. Researchers can use their own proprietary image database or benchmark databases (created and released by different organizations through online) for their research work. The image that is acquired is completely unprocessed.

E. Image Pre-Processing

The primary aim of this module is to reinforce the pictures so as to extract useful features from them. Image pre-processing is the name for operations on images at the lowest level of abstraction whose aim is an improvement of the image data that suppress undesired distortions or enhances some image features important for further processing. Its methods use the considerable redundancy in images.There are various techniques available for pre-processing such as histogram equalization for contrast enhancement. This method picked the most frequent

intensity valuefrom the image histogram and based on that it adjusts the global contrast of the image. Multiscale retinex (MSR) algorithm is a subsequent of single scale retinex algorithm which use the combined output of more than one smoothing kernel of different sizes as center-surround image filters for handling different lighting conditions.

F. Feature Extraction

Features are distinctive properties which may be wont to differentiate the categories of input patterns. Feature descriptors can be classified. After feature extraction, different dimensionality reduction techniques like Principal Component Analysis and Linear Discriminant Analysis can be applied for the optimization of feature sets. Feature extraction may be a a part of the dimensionality reduction process, in which, an initial set of the data is split and reduced to more manageable groups. The most important characteristic of these large datasets is that they have a large number of variables.

G. Feature Matching

The goal of the feature matching module is to match probe sample with gallery sample to get matching scores. Few samples of distance measures used for matching are, IDivergence metric (Ahuja, K, 2017) and Euclidean distance (Alonso-Fernandez et al., 2016).

H. Experimental Result

This experiment is based on recognition using image based periocular biometric features and using Iterative closest point algorithm(ICP). The Experiment used the Large amount of texture information present around the eye. The performance of the system is evaluated using standard biometric measures.The major purpose of the database is to constitute a new tool to evaluate feasibility of recognition under far from ideal imaging conditions.

IV. CONCLUSIONS

The primary objective of this paper is to supply an explanatory view of periocular biometrics literature and about what features, feature extraction methods and matching schemes are already explored and what issues are remaining to be unexplored during this field. With the fast- growing technological world, it's necessary that the system used for identification and verification of the persons must ask for less user cooperation and periocular biometrics is a very good solution for this problem. Periocular region can be considered as a really promising trait both as one modality and as a support for face and iris biometric. Periocular region achieved better end in many cases where face biometric suffers from different constraints like pose, illumination variation, occlusion and aging effect. Fusion of iris and periocular region also achieved better results as compared to iris as a stand-alone modality. More over iris biometrics requires high user cooperation and it needs images captured in NIR Spectrum. In contrast to the present , periocular biometric doesn't require very high user cooperation and work well with the pictures captured in color spectrum and in wild. This paper also demonstrates the importance of periocular biometry in some special scenarios like soft biometric classification (classification of Gender, Race and ethnicity) and recognition of medically altered faces (Transgender, cataract surgery) and proved that periocular region is one among the promising traits for biometric authentication systems.

FUTURE SCOPE

Even after few years there are various possibilities in periocular biometrics as given below. Improving the recognition accuracy of images and latency. Periocular biometrics can be used with deep neural networks to find important features of periocular region and

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