Partial Face Recognition Based on Gabor Texture Kernels

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Abstract: **Biometrics refers to the recognition of individuals based on their physiological and behavioral traits. The Full and Partial face recognition is one of the challenging ongoing research works. For Public safety and national security enhance the needs for partial face recognition techniques, which are among the most secure and accurate authentication tools and these applications are not commonly used, yet, but the area is interesting especially in crime investigation. In this paper, we present the face recognition under partial visibility such of using partial face as biometric for person identification. The implemented method consists of three stages. In the first stage, pre-processing of both full and partial is done. In the second stage, features such as shape and textures are extracted. Finally, matching is done between pierced and non-pierced image of an individual.**

Keywords: **Face recognition, feature vectors, Circle, Diagonal, Rectangle, Gabor Texture Kernels.**

I. INTRODUCTION

Face biometric is considered as one of the most reliable and invariant biometrics characteristics in line with iris and fingerprint characteristics. Biometric systems have become very essential components in almost all security aspects. These systems perform the recognition of a human being based on physiological and behavioral characteristics. Physiological characteristics are related to the shape of the body. Biometric traits such as face, fingerprint, iris, hand geometry fall under this category. Behavioral characteristics are related to behavior of a person. Signature, voice, character strokes etc. are some of the biometric traits which fall under this category. Among the various physiological traits, face has gained much attention in recent years as it has been found to be a good and reliable biometrics for human verification and identification. Reason behind the partial face biometrics gaining popularity is that partial faces are remarkably consistent. Unlike faces, they do not change shape with different expressions or age, and remain fixed in the middle of the side of the head against a predictable background. To verify the various poses for a person identification we need to create a face database under the database need to perform certain operation and it can be comparing or testing with given the part of the a face image or partial image.

All identification technologies operate using the following four stages: First stage is -Capture: A sample is captured by the camera during Enrolment and also in identification or verification process, it is taken by any digital camera and easy to use. Secondly, Feature Extraction: by this unique data is extracted from the sample by using different techniques and a template is created by using it on different platforms. Thirdly Comparison: the template is then compared with a sample. And then finally, match/non match: face recognition is very complex technology and is largely software based, the system decides if the features extracted from the new samples are a match or a non match. Edge detection: A photo of the subject's ear is taken and fed into the computer. The image undergoes through pre-processing steps. Then edge detection is carried out on this picture. From this detected edge shape of the ear, is separated. Next the features like pixels count, mean, standard deviation, and skewness are extracted from the face. Matching is being conducted between subject's non pierced face and pierced face. This match is compared with a predefined threshold value, which decides the identity of the person. It is used to locate areas with strong intensity contrast and helps in extracting information about an image. Canny edge detection is used in this system for edge detection. This step creates a fine image of ear using the edge value.

II. MOTIVATION FOR THE PROPOSED SYSTEM

The human face is a stable structure that does not change much in shape with the age and with facial expressions. Uniqueness of outer half shape that do not change because of emotion etc. partial is a workable new class of biometrics since the face has desirable properties such as universality, distinctiveness and stability, Although no one has proved that each person's partial faces are unique and limited surface of the partial face allows faster processing compared with face.

III. PROPOSED SYSTEM

a. Texture based Face Detection and Verification:

Recent research in texture-based ear recognition also indicates that face detection and texture-based partial face recognition are robust against signal degradation and encoding artifacts. Based on these findings, we further investigate and compare the performance of texture descriptors for face recognition under partial visible conditions and seek to explore possibilities to complement texture descriptors with depth information. On the basis of full face images from visible light

and depth maps, we extract texture and surface descriptors. We compare the recognition performance of selected methods for describing texture and surface structure, which is Gabor filter. The proposed system for person identification by face biometrics is shown in above fig**.** In this Model, we will take Full and partial face Image of a person is captured by digital camera and then do Preprocessing to the raw image not suitable for feature extraction due to its large background so same preprocessing are required to make it suitable. Then important steps involved are: Gray scale conversion, face detection, and scale normalization.

Here we convert the full ear image into gray scale using the formula,

Ig = 0.2989 * I(R) + 0.5870 * I(G) + 0.1140 * I(B)

I(R) = Red channel value of RGB image

I(G) = Green channel value of RGB image

I(B) = Blue channel value of RGB image

Ig = An intensity image with integer value ranging from a minimum of zero to a maximum of 255.

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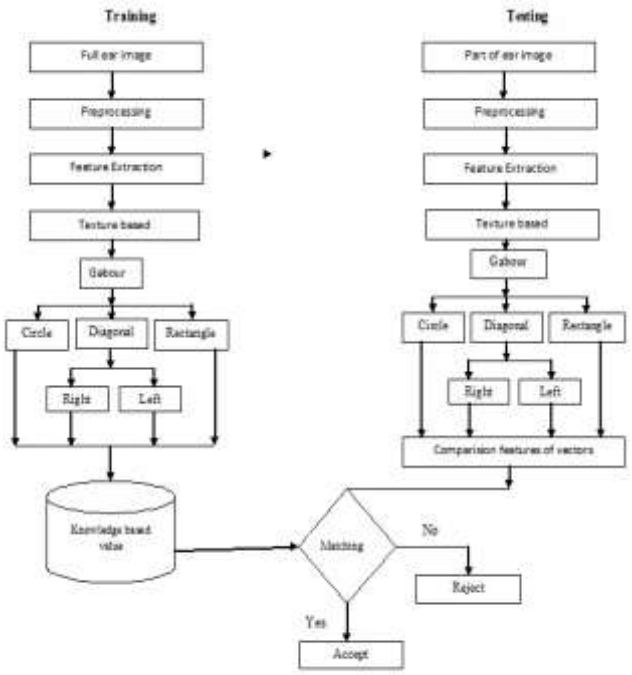

Figure: Block diagram of proposed methodology

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b. Feature Extraction:

Texture based extraction: It contains following methodology. Gabor Filter: For feature extraction, Gabor filter is applied on the face images to extract spatial local features of different directions and scales. The Gabor features are of high dimension. Gabor filters are orientation-sensitive filters, used for texture analysis. The typically travel in packs, one for each direction. A Gabor filter set with a given direction gives a strong response for locations of the target images that have structures in this given direction. For instance, if your target image is made of a periodic grating in a diagonal direction, a Gabor filter set will give you a strong response only if its direction matches the one of the grating. And After getting the Gabor based images, we will count the Histogram of gradients for both full and partial images.

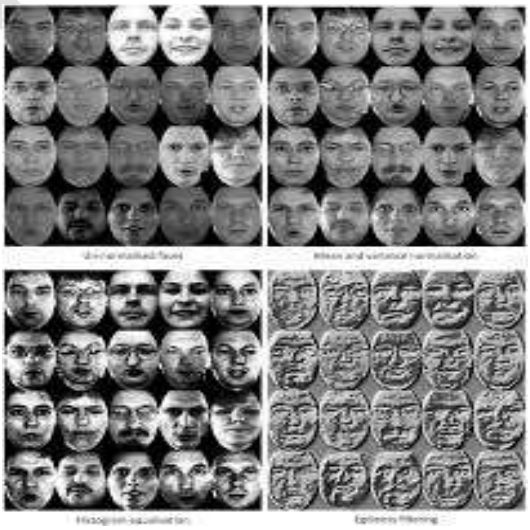

Fig.2. Resulted Gabor filter face images

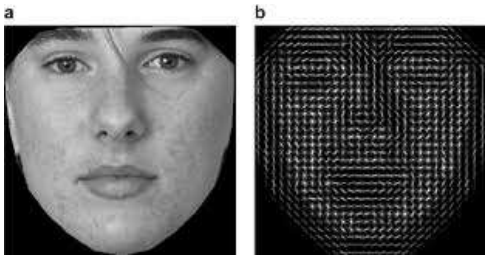

Fig.3. Resulted Histogram of gradients face images

Initially the image of the face is completely captured by the digital camera. Thereafter, the image is converted into gray or binary scale. Then the captured image is cropped in different shapes such as circle, rectangle, left and right diagonal. Then the distance of the cropped image is found by using Euclidian Formula for individual shapes. The values calculated are stored in the Knowledge Base. The same procedure is followed for the half image of face and the corresponding values are calculated by using Euclidian Formula. Then we compare both the values. If the values matches with each other then the access are granted else the access is rejected.

IV. EXPERIMENTATION

Here we will take partial face features as circle, diagonal and rectangle shapes and circle measures in terms of two vectors, diagonal in terms of two vectors and rectangle in terms of one vector which will give features representation then concatenate all these four vectors to get single vector.

Kernel is the similarity function which will take a single seed point and circle radius and here kernels are circle, diagonal and rectangle, with respect to the circle kernel: this kernel helps in preserving in texture information within the given radius, but with respect to partial face image it may fail to preserve much information compare to diagonal. Similarly, with respect to the rectangle kernel: this kernel helps in preserving in texture information within the given width and height, but with respect to partial face image it may fail to preserve much information compare to diagonal.

	Diagonal		
	Left	Right	
P1.	5		5
P2	5		5
P3.	5		5
P4.	5		5
P5.	5		5
P6.	5		5

Table.1. Number of features corresponding to different kernels for all samples.

In above table 1, Equal number of rows and columns that is why we obtained with same number of features corresponding to different kernels for all samples.

V. CONCLUSION

Use of different Gabor kernels for partial face recognition reduction of dimensions. During testing the dimension of feature matrix is handled by the threshold. In matching process, we will fix up one threshold for circle, diagonal and rectangle. Here fixed threshold up to 0.7, if it is similarity computation > 0.7(threshold value) then compare with the circle, rectangle and diagonal and this manually reduces the dimension of the matrix.

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