Scope International Journal of Science, Humanities, Management and Technology. ISSN : 2455-068X
Vol.2 Issue 1 (2016) 71-77. Submitted 12/03/2016. Published 29/03/2016

Augmentation of the Face Recognition system by means of Gabor Filter – An Innovative Approach

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Abstract— In the industry, the predominant mission is to suit the infrared face pix to the optical face images. The hassle arises of the variation between two photographs (modality gap). Gabor filters have verified themselves to be a effective device for facial function extraction. An abundance of attention methods presented in the literature exploits these filters to reap robust face recognition. However, while exhibiting appropriate properties, such as orientation selectivity or spatial locality, Gabor filters have additionally some shortcomings which crucially affect the traits and measurement of the Gabor representation of a given face pattern. This is because of the infrared picture captured with the aid of the inferred imaging gadget and the optical image captured with the aid of the optical imaging device. To decrease the modality hole between infrared and optical photos one approach is used. Common feature discriminant evaluation this technique improves infrared-optical face awareness performance. This technique presents extract the common facets from heterogeneous face images, (infrared face photograph and optical face images). Second matching approach is applied to resulting facets to reap a final decision.
Keywords— Gabor filter, Gabor wavelet, PCA, Principle Gabor Filter, Eigen images.

I. INTRODUCTION

In the final various years, computerized face awareness technological know-how has developed swiftly for the need of surveillance and security, human-computer shrewd interaction, get entry to control, telecommunication, and digital libraries, and clever environments. A profitable face recognition algorithm ambitions at representing the facial feature effectively and extracting the most discriminant records from the face images. Numerous algorithms have been proposed for face recognition, such as predominant aspect analysis (PCA) [1] and linear discriminant analysis (LDA) [2], unbiased element evaluation (ICA) [3] and so on. Simultaneously, Gabor wavelets have tested to be true at neighborhood and discriminate photo characteristic extraction as they have similar traits to these of the human visible system. Gabor wavelet seriously change [10–13] allows description of spatial frequency structure in the photograph while maintaining records about spatial members of the family which is recognized to be robust to some variations, e.g., pose and facial expression changes. Although Gabor wavelet is positive in many domains, it although suffers from a limitation. The dimension of the feature vectors extracted with the aid of applying the Gabor wavelet to the complete image via a convolution technique is very high. To remedy this dimension problem, subspace projection is usually used to seriously change the excessive dimensional Gabor feature vector into a low dimension one.

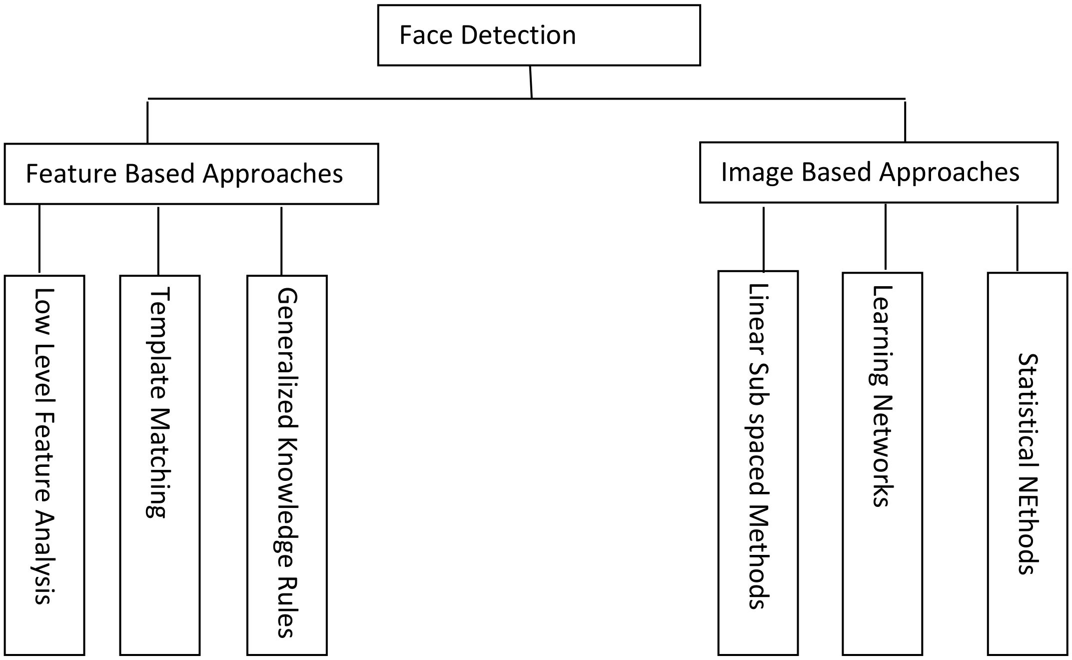


Fig. 1 : Face Detection Classification

II. CHALLENGES IN FACE DETECTION

An convenient way to comply with the conference paper formatting necessities is to use this report as a template and really type your textual content into it. Face detection is the trouble of figuring out whether or not a sub-window of an photo carries a face. Looking from the factor of view of learning, any variation which will increase the complexity of decision boundary between face and non-face instructions will additionally make bigger the concern of the problem. For example, adding tilted faces into the coaching set increases the variability of the set, and can also enlarge the complexity of the choice boundary. Image aircraft variation is the first easy version kind one might also encounter. Image transformations, such as rotation, translation, scaling and mirroring might also introduce such kind of variations. Pose variants can also be listed beneath photo airplane variants aspects. However, modifications in the orientation of the face itself on the photo can have large affects on its appearance. Lighting editions may also dramatically exchange face appearance in the image. Such versions are the most hard type to cope with due to truth that pixel intensities are at once affected in a nonlinear way through changing illumination intensity or direction. Background variation is some other difficult thing for face detection in cluttered scenes. Discriminating home windows along with a face from non-face is extra tough when no

III. EXISTING WORK

There are numerous face awareness techniques that have been projected in the past 30 years. For this topic (see [4] for a review), these current strategies are being divided into one-of-a-kind classes. The because of this given below are some viable high-level classifications: Holistic approach are used similarly processing. A well-known instance of this technique is the PCA-based strategy introduced with the aid of Sirovich[5] and Kirby, accompanied by Pentland [6] and Turk. For extracting local elements which are nose, ears, eyes, and lips, the Local Feature-based Methods are used. Their positions and neighborhood seem are key to the cognizance phase. For example, Elastic Bunch Graph Matching (EBGM) [7][1][14] proposed this work. In 1960, digital photograph processing began with semiautomated systems [10]. In order to hit upon the most important features, special marks have been made on photographs. Semiautomated structures have used aspects like mouth, eyes, and nose. Next, in order to get the common reference point, the ratios and distances were calculated from these calculations and the calculations have been in contrast with the database. In 1970s, Harmon, Goldstein, and Lesk [9] added their system. The gadget had 21 subjective markers having lip thickness and hair color. This was challenging while automating the machine because of the many complex measurements had been totally made with the aid of hand. After the Goldstein paper, Fisher and Elschlagerb projected a new development to face recognition [11]. This method calculated the aspects of the face by way of the usage of above templates. Finally, they had been mapped onto a world template. The lookup resulted in the conclusion that an person face does no longer comprise many special data. Another method is the Connectionist technique, is used to categorize human face using two matters which are gestures and a set of classifying markers. This method is typically applied to neural community ideas and 2-dimensional sample recognition. In neural networks, a big training database of faces is needed which required too a good deal time to teach the entire machine to get the favored results. The proposed approach is mechanized for standard pattern recognition. This compares faces with a prevalent face mannequin in a single face which creates a sequence of patterns. The statistical strategy depends on grayscale value.

IV. PROPOSED WORK

The proposed machine uses Gabor filters for face recognition. The maximum intensity factors dynamically on each filtered photo are located and are marked as fiducially points. If the distance is minimal between these face points then machine reduces [13] the p o i n t s . After that the system accesses the database and recognizes the picture if the distance between factors gets matched.

FEATURE EXTRACTION

Feature extraction algorithm for the proposed method has two predominant steps:
(1) Feature point localization,
(2) Feature vector computation.

1. FEATURE POINT LOCALIZATION

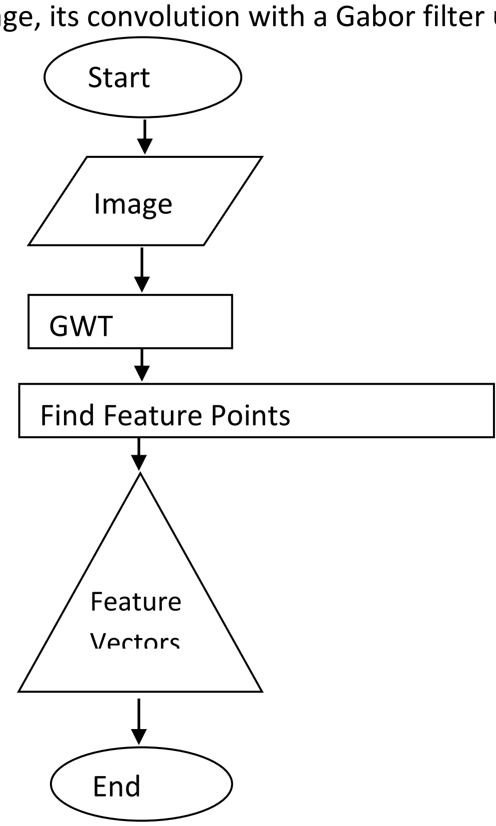
First, function vectors are extracted from points with high facts content material on the face image. In most feature-based methods, facial features are assumed to be the eyes, nostril and mouth. However, we do now not restoration the areas and additionally the number of function factors in this work. The feature vectors and their locations can fluctuate in order to better represent numerous wide variety of facial traits of one-of-a-kind faces, such as dimples, moles, etc. From the responses of the face picture to Gabor filters, peaks are observed through looking the locations in a window W0 of size WxW by way of the following procedure: A function factor is located at (x0, y0), if

2. FEATURE VECTOR GENERATIONS

$V_{i,k} = \quad X_k, Y_k, R_{i,j} (X_k, Y_k)$ j =1,……40 .

While there are 40 Gabor filters, characteristic vectors have 42 components. The first two factors represent the location of that function point through storing (x, y) coordinates. Since we have no other facts about the locations of the characteristic vectors, the first two aspects of feature vectors are very essential throughout matching (comparison) process. The ultimate 40 factors are the samples of the Gabor filter responses [12,15] at that point. Although one may also use some area facts for function point selection, right here it is important to construct function vectors as the coefficients of Gabor wavelet transform. Feature vectors, as the samples of Gabor wavelet seriously change at function points, enable representing both the spatial frequency shape and spatial relations of the nearby image location round the corresponding function point. The Gabor representation of a face photo is computed with the aid of convolving the face photograph with the Gabor filters. Let f(x, y) the depth at the coordinate (x, y) in a gray scale photo face image, its convolution with a Gabor filter ψf, θ (x,y) is defined as

$g_{f,\theta}(x,y) = f(x,y) * \psi_{f,\theta}(x,y)$



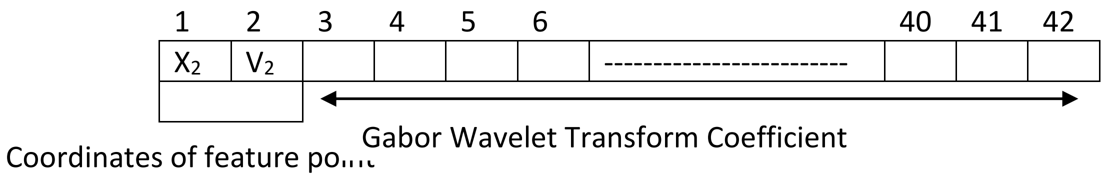


Fig. 2: Flowchart of the feature extraction stage

V. CONCLUSIONS AND FUTURE WORK

A. CONCLUSIONS:

Face detection and recognition has been an attractive field of research for both neuroscientists and computer vision scientists. Humans are able to identify reliably a large number of faces and neuroscientists are interested in understanding the perceptual and cognitive mechanisms at the base of the face detection process. Since 1888, many algorithms have been proposed as a solution to automatic face detection. Although none of them could reach the human detection performance, currently two biologically inspired methods, namely eigenfaces and elastic graph matching methods, have reached relatively high detection rates. Eigenfaces algorithm has some shortcomings due to the use of image pixel gray values. As a result system becomes sensitive to illumination changes, scaling, etc. and needs a beforehand pre-processing step. Satisfactory recognition performances could be reached by successfully aligned face images. When a new face attends to the database system needs to run from the beginning, unless a universal database exists. The method uses Gabor wavelet transform& feed forward neural network for both finding feature points and extracting feature vectors. From the experimental results, it is seen that proposed method achieves better results compared to the graph matching and eigenface methods, which are known to be the most successive algorithms. Proposed method is also robust to illumination changes as a property of Gabor wavelets, which is the main problem with the eigenface approaches. A new facial image can also be simply added by attaching new feature vectors to reference gallery while such an operation might be quite time consuming for systems that need training. Feature points, found from Gabor responses of the face image, can give small deviations between different conditions (expression, illumination, having glasses or not, rotation, etc.), for the same individual. Therefore, an exact measurement of corresponding distances is not possible unlike the geometrical feature based methods. Moreover, due to automatic feature detection, features represented by those points are not explicitly known, whether they belong to an eye or a mouth, etc.

B. FUTURE WORK:

Although detection performance of the proposed method is satisfactory by any means, it can further be improved with some small modifications and/or additional pre-processing of face images. Such improvements can be summarized as;

1) Since feature points are found from the responses of image to Gabor filters separately, a set of weights can be assigned to these feature points by counting the total times of a feature point occurs at those responses.
2) A motion estimation stage using feature points followed by an affined transformation could be applied to minimize rotation effects. This process will not create much computational complexity since we already have feature vectors for recognition. By the help of this step face images would be aligned.
3) As it is mentioned in problem definition, a face detection algorithm is supposed to be done beforehand. A robust and successive face detection step will increase the detection performance. Implementing such a face detection method is an important future work for successful applications.
4) In order to further speed up the algorithm, number of Gabor filters could be decreased with an acceptable level of decrease in detection performance. It must be noted that performance of detection systems is highly application dependent and suggestions for improvements on the proposed algorithm must be directed to a specific purpose of the face detection application.

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