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# "CHARION - FINDING MISSING CHILD USING FACE RECOGNITION"

**Neha Gupta[1], Km. Amrita[2], Rambha Yadav[3],Tanya Jaiswal[4]**

**Mr.Rajeev Ranjan Kumar Tripathi[5]**

*[1]Student, Department of Computer Science and Engineering, Buddha Institute of Technology, GIDA, Gorakhpur, (India)*

*[2]Mr.Rajeev Ranjan Kumar Tripathi Department of Computer Science and Engineering, Buddha Institute of Technology GIDA, Gorakhpur, (India)*

**Abstract**

*Face Recognition is one of the most important topics in computer vision field due to its wide application possibilitiesBecause of its wide application possibilities Face recognition has attained a very crucial role in the area of facial image processing.This papergives a brief insight into the featureextraction method of these facerecognition techniques. The features extraction technique plays a crucial role in the efficiency of these algorithms.But before recognizing, it is necessary to detect a face. Many methods have been developed in order to perform this but the biggest problem they take more time to detect the object.This was greatly solved with the creation of the Haar Cascade Classifiers, which made possible the real time detection.This work presents a faster way to detect faces by combining a Bayesian classifier with Haar Cascade classifiers. Face detection is a challenging task because faces are not rigid and it changes in size, shape, color etc. Face detection become more challenging task when given image is not clear and occluded by any other thing and not proper lightning, not facing camera etc. In this paperHaar Cascade classifiers is used to detect face and principal component analysis for face recognition.This paper provides a brief insight of some famous and particularly important algorithms used for face detection. Face detection is a technology used by computer systems to detect faces in a given digital image. Automatic face detection is a very complex problem in image processing.*

***Keywords :****Bayesian classifier,Face Detection,FaceRecognition, Feature Extraction, Haar Cascade Classifier.*

## 1. INTRODUCTION

Face detection is a process of detecting faces in a given scene. The algorithms proposed focuses on the frontal human faces. For humans, it's not a difficult task to do as they know how a face looks like for their brain has been collecting data since childhood. But for machines it's a very difficult task.Machines work on the instructions given by us, it needs specific and clear instructions as what to do. Differentiating a face from a given image is a challenging task and in order to accomplish it we need to train machines. Given a digital image, it needs to find faces in it. We have also tried to do the same by giving a survey on some important and recent

techniques.Image processing is tool or an algorithm to process an image in order to compress image,enhance image or to extract some useful information from the image. There are two methods for image processing, digital and analog. Digital image processing use mathematical model and computer algorithms to process a digital image and a digital image is processed by a digital computer. Analog image processing is used for hard copies like photographs and printouts. Face detection is the area of image processing. In recent years face detection has been studied due to wide use of computer and human interaction.

## 2. Working of the algorithm

First of all a set of training images are given. From these training images eigenfaces are extracted. Then weight is calculated using the image and stored in the gallery. After that if a new image comes while working, it's weights are calculated and compared with the weights present in the gallery. If a nearest match is present in the gallery then that image is said to be matched. For comparing Euclidian distance is used. More details on calculation of Eigen vectors and PCA can be found in (Pissarenko, 2002, pp. 70-72). We have given just the rough idea about what is eigenface and how it works. Eigenface algorithm is mainly used for face recognition applications. Some of its advantages are:

1- It simplifies the complex representation of the image.

2- Its training is completely automatic.

3- It can handle a large set of data.

4- Once the data is calculated, it can be used in real time.

Some of their shortcomings are:

- It is very sensitive to scale and transformation, lightning.
- The most important Eigenfaces are about illumination encoding and they provide very less information about the actual face.
- Capturing expression changes is difficult.

## 3. TECHNIQUES AND METHODS

The Face Recognition is a multistage process [17]. i.e. it is processed in stages. The main stages of FR are :

1. Preprocessing
2. Face Detection
3. Facial component Detection
4. Feature Extraction and
5. Classification.

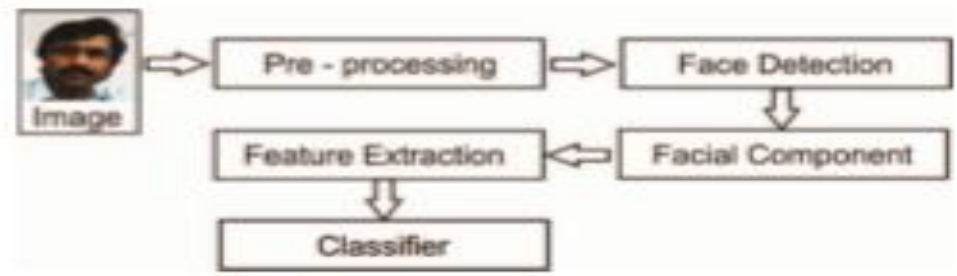


Fig.1.Steps in Face Expression Recognition

**3.1. Pre processing**

This is the first step of any image processing technique. In this stage we make the input image compatible for processing. The image may be taken under different conditions using different equipment. So the images that we get may not be in a standard form. The Input image may also be affected by various disturbances like noise, illumination variations, backgrounds etc. Also the images may be varying in sizes. So the first step in FR is the image standardization which involves Noise removal, enhancement, resizing of the input image. This is done in the pre- processing stage. Also most of the FR techniques use gray scale images rather than color images. In such cases the conversion from color to gray scale also comes under the pre-processing stage. We can say that images are standardized in the pre-processing stage.

**3.2. Face Detection**

Once the image is pre-processed our next aim is to remove all the unwanted back grounds and extract the face alone for further processing. This stage is called Face detection. The most common techniques used for face detection is Edge detection. [50] Canny, Laplacian, Kirsch, Sobel and Prewitt are some of the most widely used edge detection techniques in Face Recognition.

**3.3. Facial Component Detection**

In this stage various Region of Interest are detected. The ROIs in Face detection are Eyes, eyebrows, nose, mouth/ lips, ear, fore head etc. Both Local and Global approaches are used for detecting ROIs of Face.

**3.4. Feature Extraction**

This is the most critical stage in FR. The technique used in this stage is critical as it determines the efficiency of FR. Jyoti Kumari [17] in their paper has discussed about the most popular feature extraction techniques that are used for extracting the facial features. The common feature extraction techniques are Gabor filters [18], Local Binary Patterns (LBP) [19], Principal Component Analysis (PCA) [20], Independent Component Analysis (ICA) [21], Linear Discriminant Analysis (LDA) [22] etc.

**3.5.Classifier**

In this stage the classifier classifies the features that are extracted from the face images to the respective expression classes. Support Vector Machine (SVM) [23] is the most commonly used classifier. Neural Networks, Nearest Neighbor etc. are also used for classification.

## 4. DIFFERENT METHODS FOR FACE RECOGNITION (FR)

The range and texture images of the 3D face model is created. One point on the face is chosen as the reference point. The Geodesic distance for all the face points is calculated with reference to this reference point. The texture image of the face is transformed into a new texture image based on the computed Geodesic distance. The new image is called transformed texture image. The transformed texture image is then partitioned to patches. The patches are of same size and also they are non-overlapping. Feature vector is extracted for each patch by applying a patch descriptor. All the feature vectors that are extracted from the individual patches are concatenated to get the final feature vector. The input face feature vector is compared with the face feature vectors in the gallery and the similarity between the query image and the images in the database is taken to identify the face.Order of the PZMs is one of the main parameter that determines the accuracy of this method. Size of the patches is the second factor, the accuracy increases as the size of thepatches decreases. The order zero of the PZM is the DC components that do not carry any personal identity information. BU-3DFE database was used for experimentation purposes. The neutral face was taken as gallery images and the face with expressions were used as probes. The rank-I recognition rate of the proposed algorithm was calculated. The angry expression showed an accuracy of 90% and the disgust expression has shown the worst accuracy of 78%.

B. Curvelet Feature Extraction for Face Recognition and Facial Recognition

Xianxing and Jieyu Zhao [2] has proposed a new approach for facial recognition based on the Curvelet transform and PCA. This method is based on the fact that the face expression contains details like curves and lines. It is more accurate to use curvelet rather than wavelet in this condition because the wavelets can represent only point singularities. The algorithm follows a four stage process for the expression recognition. The flow chart of the steps involved in this method is shown in Fig 3.

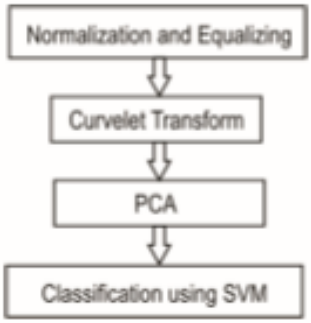


Fig.2. Steps involved in Curvelet feature extraction

The first step in this method is face detection. Once the face is detected the face area is extracted. The extracted face area is then normalised and it is processed using histogram equalization. The resulting image is decomposed by using discrete curvelet transform. The curvelet co efficient are obtained by performing the fast curvelet transform. These co efficients are then converted to vectors. Then the dimensionality reduction is done in order to reduce the huge amount of curvelet coefficient obtained in previous step. For this Principal Component Analysis can be used. This is the third step. The final stage is the classification. This can be done

using SVM. C. Local Directional Number Pattern for Face Analysis: Face and Expression Recognition.

**5. RELATED WORK**

Face recognition is easy for the human but it is more difficult for the computer because human body is not rigid that means, it will not remain same for very long time change takes place in human body time to time. For face recognition first and most important problem is face detection. For automatic face recognition face detection is prerequisite. In face detection there may be some problems like different position for observation make different face, to solve this problem we can make a group of different face image position for a person, face image may be different because of different facial expression and with same expression and same position face image may be different because of lighting. In this paper we have discussed about frontal face detection system which has detect face and has some false positive rate.

In [2][3], Sung and Piggo, developed a face detection technique as distribution based system and in this technique an object class learned using positive and negative examples. Distribution based system have two components, multilayer perceptron classifier and distribution-based models for face nonface pattern. After normalizing and processing of each face example in a 19*19-pixel image, each image is vectored in 361-dimentional vector. Now using a modified K-means algorithm images are clustered into six faces and six non-facecluster. Each cluster is then represented as a multidimensional Gaussian Function with a mean image and covariance matrix. In between an input image and cluster, two distances are calculated, normalized Mahalanobis distance and Euclidian distance.

In [3], Yang and Huang used a face detection method, in this method set of rules are defined as a knowledge based method and it has rules on an input images first scanning is applied on face and all possible face can be found by scanning. Different rules are defined for face detection from image and at different level of rules are applied like at highest level set of rules are defined to define a human face and at lower level rules for facial feature are described. By averaging and sub sampling multilevel of hierarchy of images is created.

In [4], Ekman and Friesen in 1977, proposed a robust facial action coding system. The Facial Action Coding System works on the changing behavior of facial muscles and try to analyses facial expression. This algorithm gives 7.8% more average detection rate. The algorithm works with 46 Action Points (AP) comprising of the facial behavior of human.

In [5], Lajevardi and Wu suggested a technique to represent the static color images in tensor based representation. It is used to recognize facial expression into color image. It has achieved 68.8% accuracy with different resolution of color image.

In [6], Principal Component Analysis was invented in 1901 by Karl Pearson for recognition of face. It is used to recognize face by reducing the dimensionality of the image by which database size reduces and computation speed reduces. When high dimensional data is used problem arises. It calculates an Eigen picture on training set of face images. PCA is applied on Eigen face approach to reduce dimensionality of big dataset. It is appearance based approach to recognize face and use information to encode and compare image individual faces in a holistic manner and it reduces space complexity and computation. Encoded image is compared with the encoded

dataset .This approach is very useful to capture the information the important information in an image of face which are useful for recognition of face. The number of the Eigen face is equal to the number of face image in training set. By using fewer Eigen face computation performs efficient.

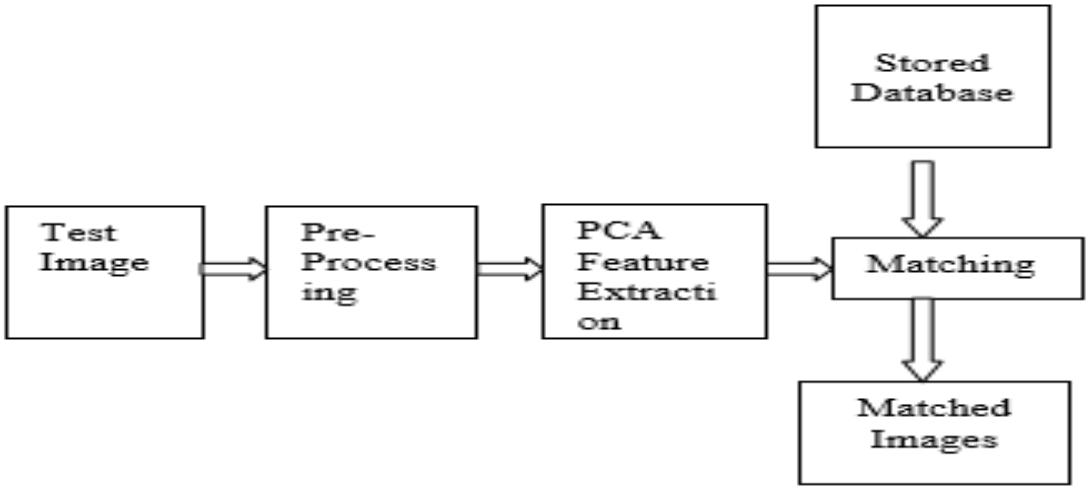


Fig.2. Block Diagram of Face Recognition with PCA

## 6. CONCLUSION AND FUTURE WORK

\In this paper we have concluded the Principle component analysis gives result with fast detection and high accuracy. Some drawbacks of these techniques are high computation time when image size is large and resolution is high and if high dimensional data is used problem arises. Future work is to increase the accuracy of the face detection and recognition.We have tried to survey all the important and influential algorithms in most simple and understandable way. We have categorized each algorithm and provided their pros and cons. We have provided the most abstract survey/review of each algorithm so as to enable one to get an idea about that algorithm.

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