

# Efficient Face Recognition Technique using PCA in Neural Network

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**Abstract:** The Security is the main aspect to protect the confidential information from the intruder. The features are initially required for recognize any object. Feature extraction technique is used for extract the face features. Face Recognition is a term to describe the feature selection, detection and image processing to analyze and classification. In the past years, feature selection techniques have been proposed to make the possible for classification using neural network, supervised Learning and Un-supervised learning. In this work, the PCA learning technique has been proposed and training will be initial points for train the proposed algorithm and this complete work has been chosen for analyze and improve the efficiency of algorithm. The complete steps will be implementing in MATLAB for simulation of work and accuracy will be calculated by providing the different training images to the learning algorithm and then detection of face will be analyzed.

**Keywords:** Face Recognition, Neural Network, Face Recognition, PCA.

## I. INTRODUCTION

Since the early 70's face recognition has drawn the attention of researchers in fields from security, psychology, and image processing, to computer vision. ACE recognition has become a very active area of research in recent years mainly due to increasing security demands and its potential commercial and law enforcement applications. The last decade has shown dramatic progress in this area, with emphasis on such applications as human-computer interaction, biometric analysis, content-based coding of images and videos, and Surveillance. Although a trivial task for the human brain, face recognition has proved to be extremely difficult to imitate artificially, since although commonalities do exist between faces, they vary considerably in terms of age, skin, color and gender. The problem is further complicated by differing image qualities, facial expressions, facial furniture, background, and illumination conditions. Face recognition has a large number of applications, including security, person verification, Internet communication, and computer entertainment.

In today's networked world, the need to maintain the security of information or physical property is becoming both increasingly important and increasingly difficult. From time to time we hear about the crimes of credit card fraud, computer breaking's by hackers, or security breaches in a company or government building. It goes without saying that if someone steals duplicates. Recently, technology became available to allow verification of "true" individual identity. This technology is based in a field called "biometrics. Face recognition is one of the few biometric methods that possess the merits of both high accuracy and low intrusiveness. It has the accuracy of a physiological approach without being intrusive. Face recognition has the benefit of being a passive, non-intrusive system for verifying personal identity.

The human faces represent complex, multidimensional, meaningful visual stimulant. Developing a computational model for face recognition is difficult. Face detection can be regarded as fundamental part of face recognition systems according to its ability to focus computational resources on the part of an image containing a face.

### Image Processing

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods to them. It is among rapidly growing technologies today, with its applications in various aspects of a business. Image Processing forms core research area within engineering and computer science disciplines too. Image processing basically includes the following three steps.

- Importing the image with optical scanner or by digital photography
- Analyzing and manipulating the image which includes data compression and image enhancement and spotting patterns that are not to human eyes like satellite photographs.
- Output is the last stage in which result can be altered image or report that is based on image analysis.

### Feature Extraction and Face Recognition

Face detection takes images/video sequences as input and locates face areas within these images. This is done by separating face areas from non-face background regions. Facial feature extraction locates important feature (eyes,

mouth, nose and eye-brows) positions within a detected face.

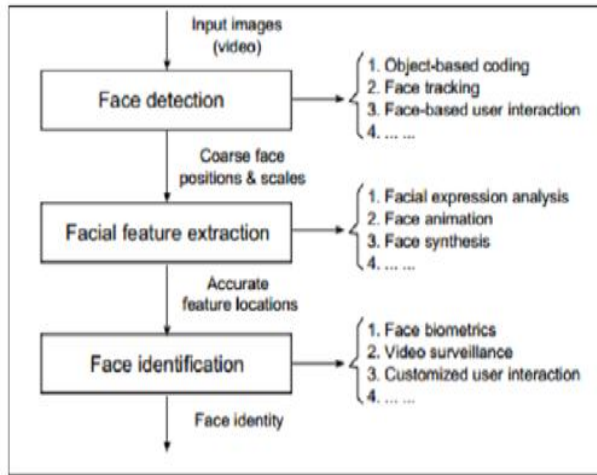


Figure 1: Framework of Face Recognition System

Feature extraction simplifies face region normalization where detected face aligned to coordinate framework to reduce the large variances introduced by different face scales and poses. The accurate locations of feature points sampling the shape of facial features provide input parameters for the face identification. Other face analysis task: facial expression analysis, face animation and face synthesis can be simplified by accurate localization of facial features.

Face recognition involves comparing an image with a database of stored faces to identify individual in input image. The related task of face detection has direct relevance to face recognition because images must be analysed and faces identified, before they can be recognized. Detecting faces in an image can help to focus the computational resources of the face recognition system, optimizing the systems speed and performance.

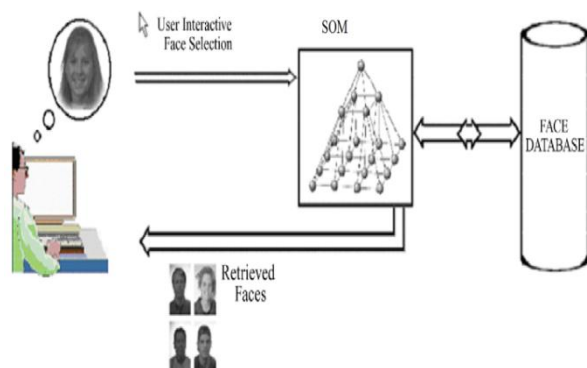


Figure 2: Face Recognition Procedure

Face identification generates the final output of complete face-recognition system: the identity of the given face image. Based on normalized face image and facial feature locations derived from previous stages, a feature vector is generated from given face and compared with a database of known faces. If a close match is found, the algorithm returns the associated identity. A main problem in face identification is the large differences between face images

from the same person as compared to those from different persons. Therefore, it is important to choose a suitable face classification technique that can provide a good separate ability between different persons. Face identification has a wide range of applications. Because it offers a non-intrusive way for human identification, the face is used as an important biometric in security applications.

Recently, face recognition has received wide interest in number of countries are integrating facial information into electronic passport and to other biometrics. In addition to security and law enforcement, face recognition is also applied in entertainment and consumer electronics as a means for a natural user interface. By recognizing the existence of the user and his identity, consumer devices can offer customized enhanced user experience. To achieve high-performance face recognition system, each processing stage in the system has to be designed to satisfy application requirements.

## II. LITERATURE REVIEW

Biometric recognition became an integral part of our living. This paper deals with machine learning methods for recognition of humans based on face and iris biometrics. The main intention of machine learning area is to reach a state when machines (computers) are able to respond without humans explicitly programming them. This area is closely related to artificial intelligence, knowledge discovery, data mining and neurocomputing. We present relevant machine learning methods with main focus on neural networks. Some aspects of theory of neural networks are addressed such as visualization of processes in neural networks, internal representations of input data as a basis for new feature extraction methods and their applications to image compression and classification. Iris recognition is analyzed from the point of view of state-of-the art in iris recognition, 2D Gabor wavelets, use of convolution kernels and possibilities for the design of new kernels. Software and hardware implementations of face and iris recognition systems are discussed and an implementation of a multimodal interface (face and iris part of a system) is presented. Also a contribution of Machine Learning Group working at FEI SUT Bratislava to this research area is shown [1].

The image of a face varies with the illumination, pose, and facial expression, thus we say that a singleface image is of high uncertainty for representing the face. In this sense, a face image is just an observation and it should not be considered as the absolutely accurate representation of the face. As more face images from the same person provide more observations of the face, more face images may be useful for reducing the uncertainty of the representation of the face and improving the accuracy of face recognition. However, in a real world face recognition system, a subject usually has only a limited number of available face images and thus there is high uncertainty. In this paper, we attempt to improve the face recognition accuracy by reducing the uncertainty. They devise a representation approach based on the selected useful training samples to perform face recognition.

Experimental results on five widely used face databases demonstrate that our proposed approach can not only obtain a high face recognition accuracy, but also has a lower computational complexity than the other state-of-the-art approaches [2].

Face recognition is an emergent research area, spanning over multiple disciplines such as image processing, computer vision and signal processing. For each facial image a spatially enhanced, concatenated representation was obtained by deriving a histogram from each grid of the divided input image. These histograms were projected to lower dimensions by applying PCA which represents local features to characterize the face of a subject. The global face representation of a subject was derived by projecting several images of the subject into lower dimensions applying PCA. Face Recognition was performed with different similarity metrics on ORL, JAFFE and INDIAN face databases and compared with other works. It was found that the local features (MB-LBP) are better than the global features (PCA) for face recognition [3].

Human-computer interaction system for an automatic face recognition or facial expression recognition has attracted increasing attention from researchers in psychology, computer science, linguistics, neuroscience, and related disciplines. In this paper, an Automatic Facial Expression Recognition System (AFERS) has been proposed. The proposed method has three stages: (a) face detection, (b) feature extraction and (c) facial expression recognition. The first phase of face detection involves skin color detection using YCbCr color model, lighting compensation for getting uniformity on face and morphological operations for retaining the required face portion. The output of the first phase is used for extracting facial features like eyes, nose, and mouth using AAM (Active Appearance Model) method. The third stage, automatic facial expression recognition, involves simple Euclidean Distance method. In this method, the Euclidean distance between the feature points of the training images and that of the query image is compared. Based on minimum Euclidean distance, output image expression is decided. True recognition rate for this method is around 90% - 95%. Further modification of this method is done using Artificial Neuro-Fuzzy Inference System (ANFIS). This non-linear recognition system gives recognition rate of around 100% which is acceptable compared to other methods [4].

Face recognition has been studied extensively; however, real-world face recognition still remains a challenging task. The demand for unconstrained practical face recognition is rising with the explosion of online multimedia such as social networks, and video surveillance footage where face analysis is of significant importance. In this paper, we approach face recognition in the context of graph theory. We recognize an unknown face using an external reference face graph (RFG). An RFG is generated and recognition of a given face is achieved by comparing it to the faces in the constructed RFG. Centrality measures are utilized to identify

distinctive faces in the reference face graph. The proposed RFG-based face recognition algorithm is robust to the changes in pose and it is also alignment free. The RFG recognition is used in conjunction with DCT locality sensitive hashing for efficient retrieval to ensure scalability. Experiments are conducted on several publicly available databases and the results show that the proposed approach outperforms the state-of-the-art methods without any preprocessing necessities such as face alignment. Due to the richness in the reference set construction, the proposed method can also handle illumination and expression variation [5].

### III. OBJECTIVES

In research of Face Recognition, there are issues in detection and matching of face with the trained images. Our main goal is to detect the image by different perspectives.

- a. To analyze the existing techniques of Face Recognition.
- b. To identify the issues in existing system.
- c. Research on new parameters for improves the efficiency.
- d. Implement PCA Algorithm to improve the efficiency of face detection.
- e. Analyse the improved efficiency.
- f. Analyse the results and accuracy.

#### Problem Statement

In face recognition system, the face detection and feature mapping is core concern to analyze the face. There is need of training for detection of faces from different perspective. The efficiency is the main concern for feature selection and multiple algorithm proposed for solve the accuracy problems. In the past techniques, there is need to provide the large test or training images to detect and assign the particular class means efficient image processing. Automatic recognition of people is a challenging problem which has received much attention during recent years due to its many applications in different fields. Face recognition is one of those challenging problems and up to date, there is no technique that provides a robust solution to all situations.

### IV. PROPOSED METHODOLOGY

The different steps need to consider for design the face recognition algorithm. This section provides the steps to implement the proposed work. The different steps need to follow for improve the efficiency with the algorithm.

- a. Study existing techniques of face recognition.
- b. Research on these Techniques for identification of issues and problems.
- c. Flow Development of new proposed technique using PCA
- d. Implementation in MATLAB for simulation of algorithm.
- e. Generate Results.

### V. CONCLUSION AND FUTURE WORK

In this paper, we have been proposed face recognition system's steps and techniques which can be used for detect

the faces based on features mapping and will be implemented using MATLAB tool.

The implementation part will be covered in the next paper, which will demonstrate the real working of proposed algorithm.

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