Neural Networks for Face Recognition Using PCA and BPNN

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Abstract- *A biometric system provides automatic identification of an individual based on unique feature or characteristics possessed by the individual. The work presented in this project involves developing a face recognition system for security system based on PCA and BPNN. Along with well known methods such as fingerprint or DNA recognition, face recognition opens new possibilities. Many prerequisites for putting face recognition into practice, eg, face localization in digital cameras, have already been adopted by companies and are commercially available. Face recognition is already being implemented into image organizing software, web applications, mobile devices, and passports already contain face biometric data. This common interest among researchers working in diverse fields is motivated by our remarkable ability to recognize people and the fact that human activity is a primary concern both in everyday life and in cyberspace. Besides, there is a large number of commercial, security, and forensic applications requiring the use of face recognition technologies. [2]*

Keywords- Water scarcity, waste water, samples, zero discharge facility.

I. AIM AND OBJECTIVE

The aim of the study is to Capturing devices using digital cameras.

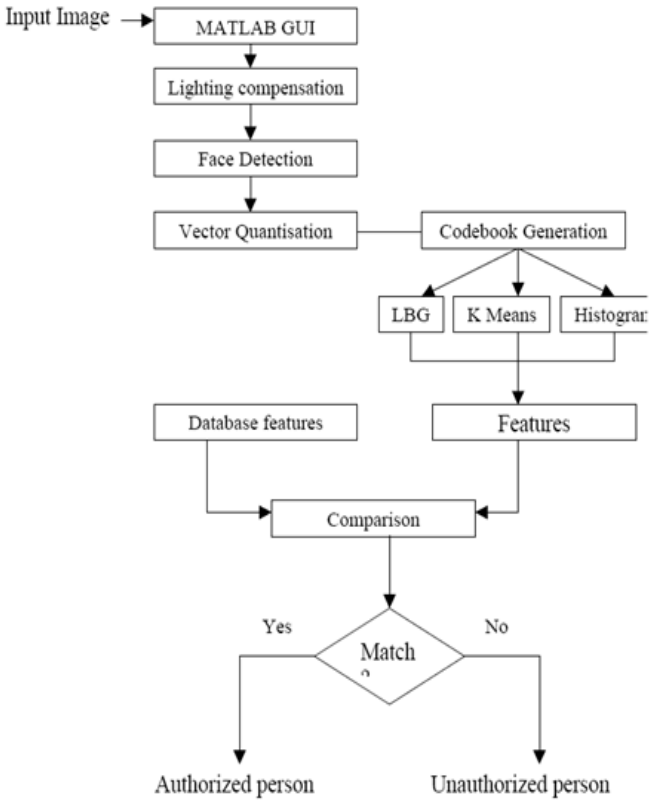
- It involved in the face image space include mouth, nose and eyes.
- To design such systems which can compete with what a small child does and thus making computers as lively as humans can.
- This face recognition system is implemented using a MATLAB software package. The overall performance of PCA-BPNN is satisfactory.

1.2 Introduction

In recent years, there is a great interest of many researchers on the face recognition problem. Among these researchers are the engineers, neuroscientists, and psychophysicists studying this problem in different fields and in different points of view. There are several application areas of face recognition in our real life such as identification of personnel using credit cards, passport checks, entrance control, criminal investigations, etc.

Various automated systems for identification of people based on biometrics are used recently. Along with well known methods such as fingerprint or DNA recognition, face recognition opens new possibilities. Many prerequisites for putting face recognition into practice, eg, face localization in digital cameras, have already been adopted by companies and are commercially available. Face recognition is already being implemented into image organizing software, web applications, mobile devices, and passports already contain face biometric data . All this implies that face recognition is an increasingly important field of biometry. The advantages of face recognition are relatively modest requirements on hardware and simple real-time process from the viewpoint of the identified subjects.[3]

II. METHODOLOGY



Face Recognition

Face recognition is one of the most popular problems in the field of image analysis and understanding. Identifying a person from an unknown face is usually done by comparing the unknown face with the known faces from a face database. The interest of researchers and engineers in face recognition problem has grown rapidly in the recent years since there is a wide range of commercial and law enforcement applications on face recognition. The increasing need for surveillance-related applications, especially due to drug traffic and terrorist activities, has a great impact on the growth of interest in the field of face recognition. Some of the application areas of face recognition includes personnel identification of credit cards, driver's licence, passport checks, entrance control, computer access control, criminal investigations, crowd surveillance, witness face reconstruction, and ATM machines.

Face Detection

Face Detection is a part of a wide area of pattern Detection technology. Detection and especially face Detection covers a range of activities from many walks of life. Face Detection is something that humans are particularly good at and science and technology have brought many similar tasks to us. Face Detection in general and the Detection of moving people in natural scenes in particular, require a set of visual tasks to be performed robustly. That process includes mainly three-task acquisition, normalisation and Detection. By the term acquisition we mean the detection and tracking of face-like image patches in a dynamic scene.

III. MATHEMATICAL OPERATIONS

The mathematical operations involved in using LDA will be analyzed the aid of sample .For ease of understanding, this concept is applied to a two-class problem. Each data set has 100 2-D data points. Note that the mathematical formulation of this classification strategy parallels the Matlab implementation associated with this work.

IV. PERFORMANCE ANALYSIS

- It is observed that recognition rate of the ATT database is higher as compare to IFD database. This observation is due to the nature of images contain in the IFD. In this database, each subject is portrayed with highly varying orientation angles. It also shows that each image has rich background region than the ATT database.
- It is observed that when four algorithms employed on ATT database and IFD then ICA take the longest time to train the system with database that is 10.5 and 9.6 ms / image respectively
- It is observed that LDA and ICA take very less time to test the data when it is employed both databases. Testing time is same for both the above algorithms when they employed on the both databases that is .1ms/image.
- It is observed that ICA consumes more execution take than other three methods. The use of learning based approach and the complex mathematically steps of the sphering matrix takes more time to compute.
- It is observed that the Model image size of the SVM is larger.

V. SIMULATION

MATLAB is a software program that allows you to do data manipulation and visualization, calculation. Math and programming. It can be used to do very simple as well as very sophisticated asks we will start very simple.

In this project, we used MATLAB13a version. MATLAB is a numerical computing environment and fourth-generation programming language.

Developed by the Mathworks, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C,C++, and Fortran.

Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD symbolic engine, allowing access to symbolic computing capabilities. An additional package, Simulink, adds graphical multi-domain simulation and Model-Based design for dynamic and embedded systems.

MATLAB has evolved over a period of years with input from many users. In university environments, it is the standard instructional tool for introductory and advanced courses in mathematics, engineering, and science. In industry, MATLAB is the tool of choice for high-productivity research, development, and analysis.

MATLAB features a family of application-specific solution called toolbox. Very important to most users of MATLAB, toolboxes allow you to learn and apply specialized technology.

MATLAB R2013a Image Processing Toolbox

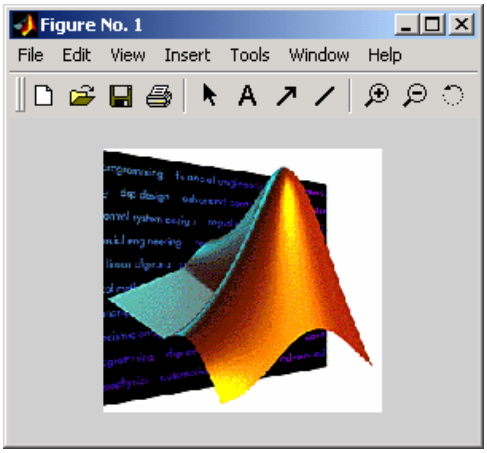
5.1.1 Images

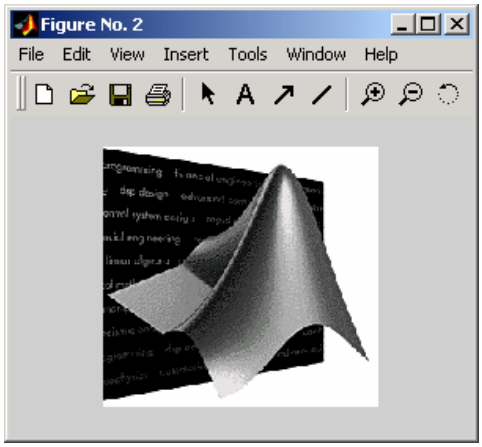
The first step in MATLAB image processing is to understand that a digital image is composed of a two or three dimensional

matrix of pixels. Individual pixels contain a number or numbers representing what grayscale or color value is assigned to it. Color pictures generally contain three times as much data as grayscale pictures, depending on what color representation scheme is used.

5.1.2 Loading an Image

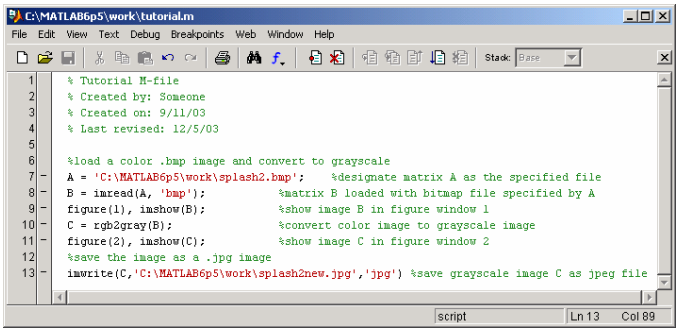
Many times you will want to process a specific image, other times you may just want to test a filter on an arbitrary matrix. If you choose to do this in MATLAB you will need to load the image so you can begin processing. If the image that you have is in color, but color is not important for the current application, then you can change the image to grayscale. This makes processing much simpler since then there are only a third of the pixel values present in the new image.





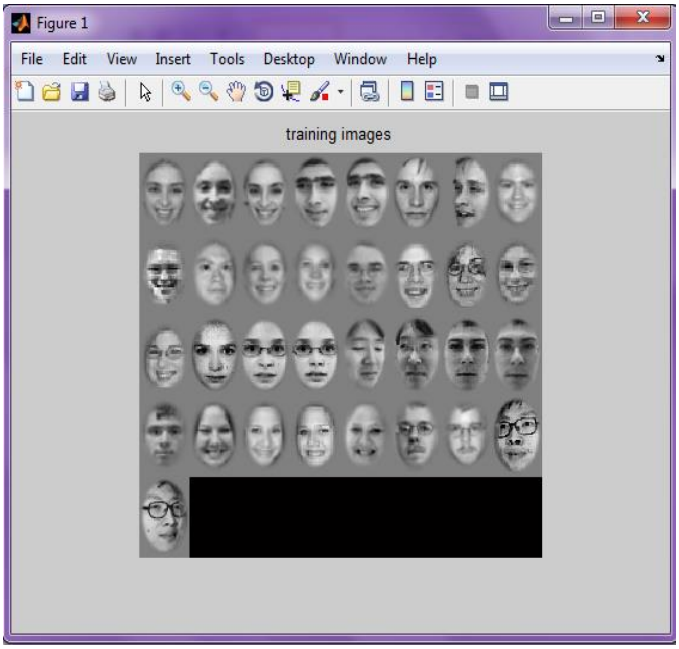
5.1.3 Writing an Image

Sometimes an image must be saved so that it can be transferred to a disk or opened with another program. In this case you will want to do the opposite of loading an image, reading it, and instead write it to a file. This can be accomplished in MATLAB using the imwrite function. This function allows you to save an image as any type of file supported by MATLAB, which are the same as supported by imread.

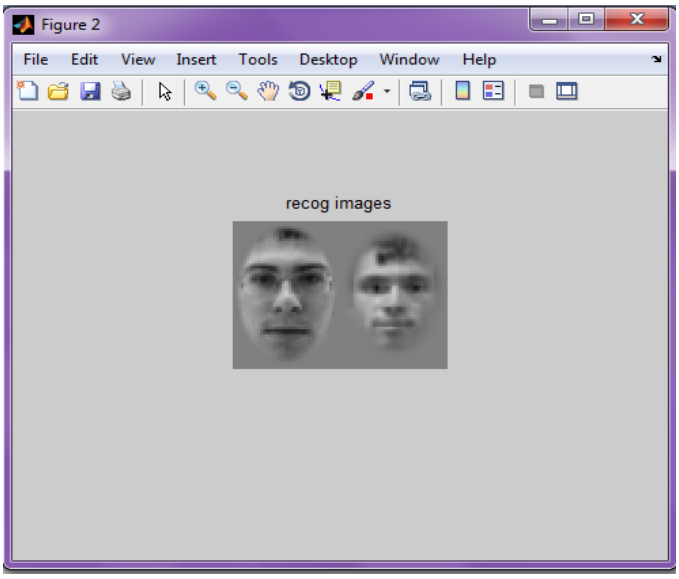


VI. EXPERIMENTAL RESULTS

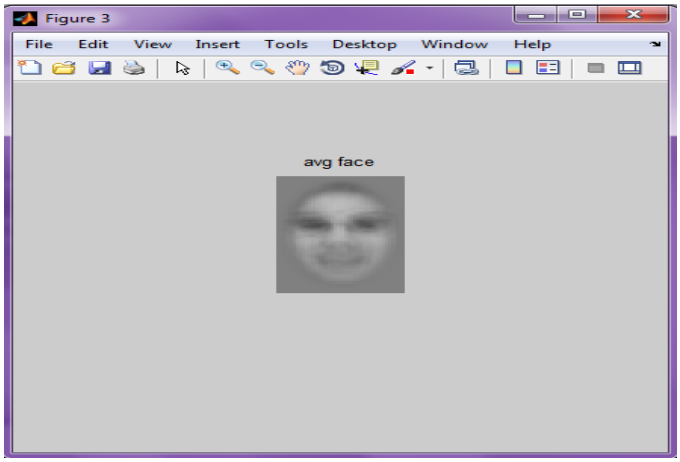
6.1 TRAINING IMAGE



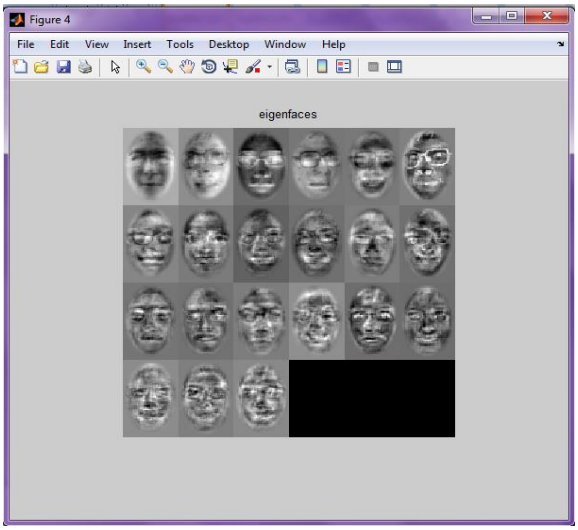
6.2 RECOGNIZATION IMAGE



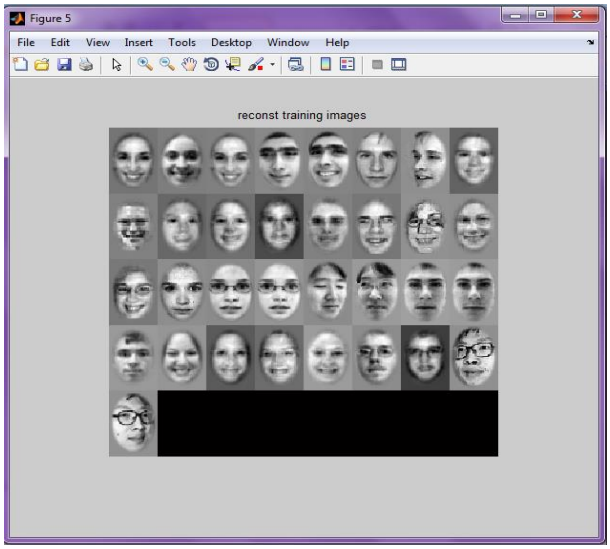
6.3 AVERAGE FACE RESULT USING EDGE



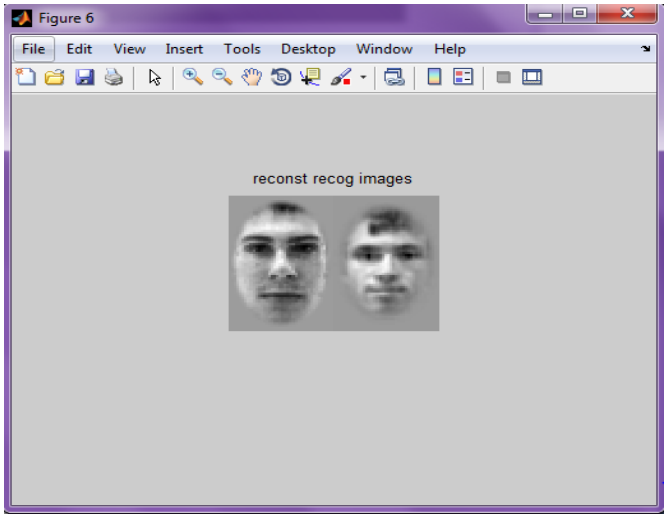
6.4 EIGEN FACES



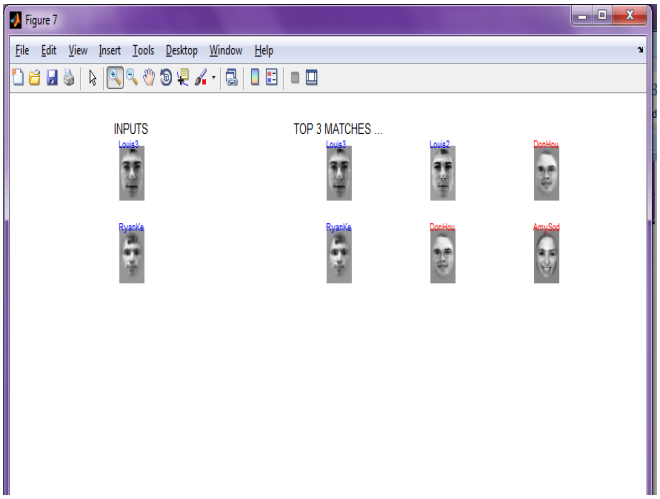
6.5 RECONSTRUCTIVE TRAINING IMAGE



6.6 RECONSTRUCTIVE RECOGNIZATION IMAGE



6.7 OUTPUT OF TOP 3 MATCHES



VII. CONCLUSION

Face recognition is a challenging problem in the field of image analysis and computer vision that has received a great deal of attention over the last few years because of its many applications in various domains. Research has been conducted vigorously in this area for the past four decades so, and though huge progress has been made, encouraging results have been obtained and current face recognition systems have reached a certain degree of maturity when operating under constrained conditions; however, they are far from achieving the ideal of being able to perform adequately in all the various situations that are commonly encountered by applications utilizing these techniques in practical life.

The weighted combination of similarity or dissimilarity scores suggested by all projection coefficients is the basis for membership values. Several results on face recognition and gender classification are presented, in which highly competitive recognition accuracies are achieved with a small number of features. The feature extraction can be applied to WT representation of images to provide a multiscale discriminant framework. In such cases the system becomes more complex at the expense of improving separability and performance.

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