# Implementation of a Face Recognition System Based on Matlab and LabVIEW

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**Abstract.** A face recognition system based on Matlab and LabVIEW is designed in this paper, which is implemented by mixed programming of LabVIEW and Matlab. This system is composed of image acquisition module, image preprocessing module and face recognition module. Face acquisition module is mainly consisted of several subVIs of NI vision image processing module in LabVIEW. Face image preprocessing is to normalize the face image. Face recognition adopts the eigenface method to recognize faces. By extracting low dimensional part of the face with K-L transformation feature subspace of the face is generated. In recognition, the collected image will be projected into this space, and a group of projection coefficients are obtained. Then they will be compared with every face image in training base. At last, the system will find the smallest gap and the identification is completed. The collected face image, the most similar face found in the training base and the face image number will be shown as the final result. Experiments show that the recognition system can recognize persons' identity accurately.

## Introduction

With the rapid development of society and technology, the demand of security insurance brought by the identification is gradually increasing. Faces have uniqueness just as fingerprints, and people can use them to identify a person's identity accurately. Face recognition has become a technology which is widely applied in many fields [1.2]. So the technology of face recognition has great research value and application prospect. This paper studied one design scheme for face recognition system. The system uses Matlab and LabVIEW together to build a software program to achieve the purpose of accurate recognition of human faces [3-5]. The system combines the advantages of LabVIEW and Matlab. It can detect and recognize the face in real time, and has the advantages of simple structure, friendly interface, easy to use and so on.

## Implementation of the System

This system is composed of three parts: face image acquisition, face image processing and feature extraction and recognition. The system chart is shown in figure 4.1. The system collects real-time face images through the camera, and then chooses the path to store the image. After gray processing, the image is converted into 2D images. Finally, the face recognition based on PCA is performed. The results show the collected face image, the matching image and the face image number. Next, we introduced the each part and its implementation in LabVIEW.

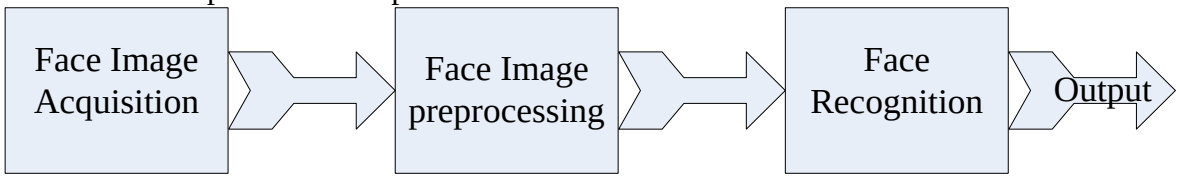


Figure 1 System Chart

 

**System main interface.** The main interface of the system consists of four parts: image acquisition, image preprocessing, face recognition, and stop. When we click the button, the system will jump to the appropriate subroutine. The main interface is shown in figure 2.

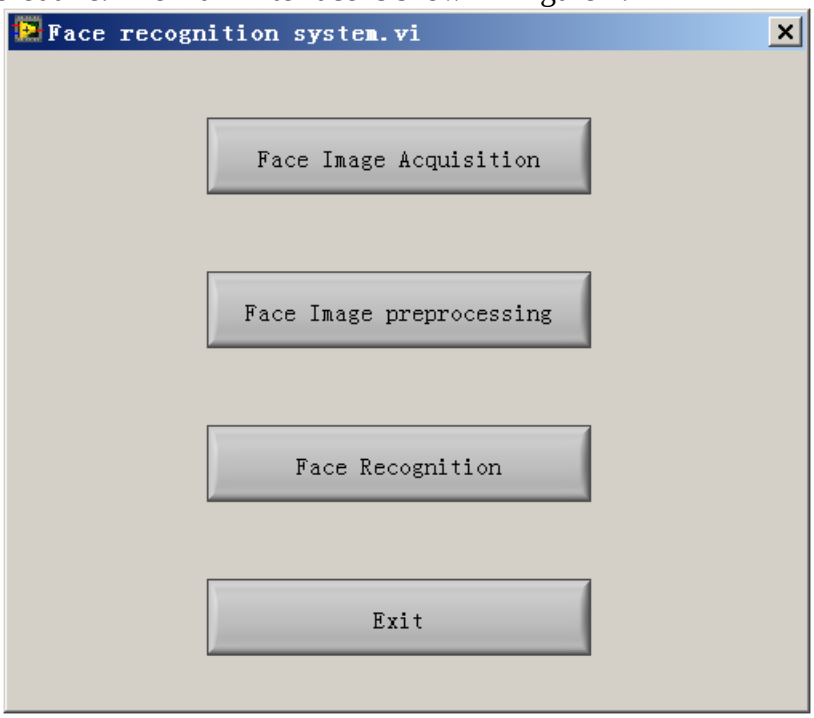


Figure 2 Main Interface

**Face Image Acquisition Module.** The face image acquisition module directly uses the USB Acquisition Assistant to generate the image acquisition program, which is connected with the Image Display control to display the captured image. The image data is saved by IMAQ Write File2.vi. Through the VI selector, the image can be saved to any path with the specific format. In this paper JPEG image is selected. The connecting block diagram in LabVIEW is shown in Figure 3. The front panel of face image acquisition module include the following buttons: the real-time display button, the option button of path to save, the quality button of the input image, the save button and the stop button.

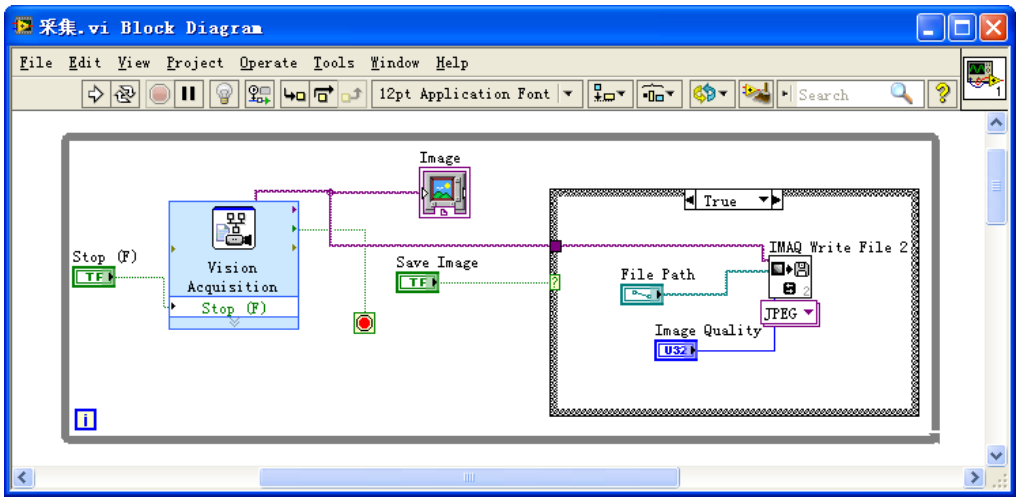


Figure 3 Face Image Acquisition Module

**Face Image Preprocessing Module.** In the image acquisition process, the image data can be affected by illumination conditions, and the gray level of image data varies widely in different illumination conditions, so we need gray normalization to reduce the effect by the illumination. Because of the difference between Matlab and LabVIEW, the dimension of the image is reduced to two dimensions, which is beneficial to the operation of Matlab program in LabVIEW. Gray processing block diagram is shown in Figure 4. The front panel of gray processing module include

the following buttons: the real-time display button, the option button of path to read and save, the quality button of the input image, the save button.

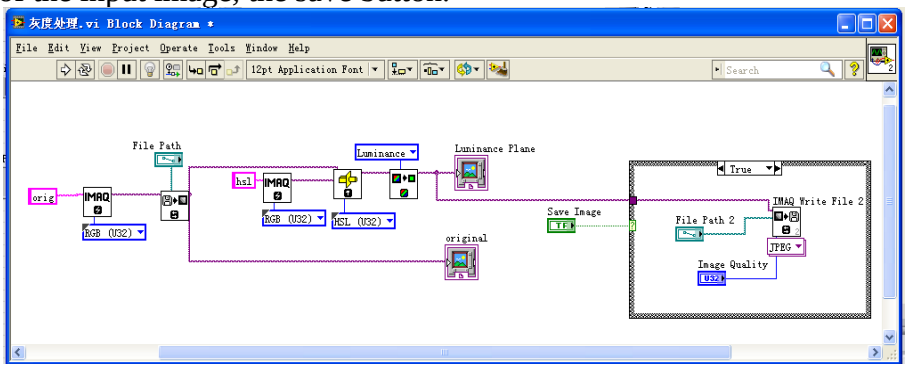


Figure 4 Face Image Preprocessing Module

**Face Recognition Module.** Eigenfaces method is used to realize the face recognition in this system. The main element subspace is constructed with a set of training face images. Because the main element has the shape of the face, it is also known as the eigenfaces. When recognizing, the image is projected onto the main element subspace, a set of projection coefficients is obtained and it is compared with the all known face images.

First we need to load the face database. Here we use Create database function to choose the training face database by reading into Train Database Path. Then the optimal characteristics of face images is decided by PCA principle and the two-dimensional image is transformed as a column vector for construction of T, a two-dimensional matrix. Then we use the EigenfaceCore function to read into the collection of all the image information of the training set T, to return the three output: the training mean m, the training set covariance matrix of the feature vector and each image and the mean image of the variance matrix. Then read the test image, call the Recognition function, and take one of the one-dimensional processing, get an array, then use the Euclidean distance to get the image with the minimum difference between the test image.

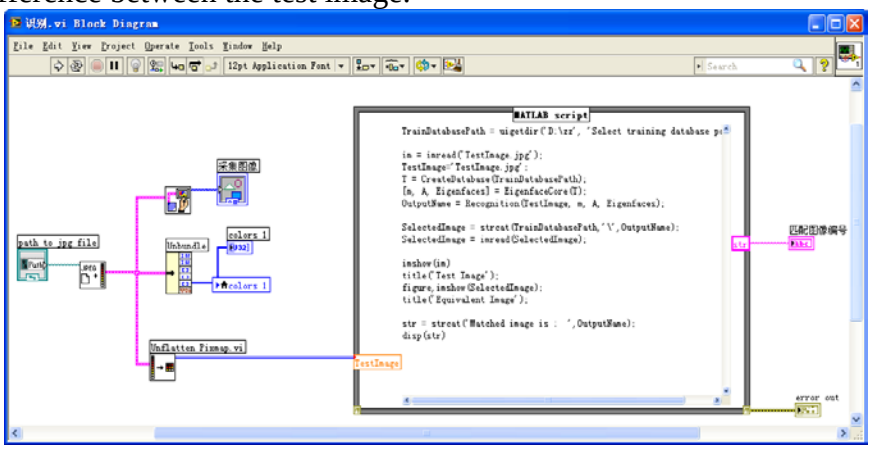


Figure 5 Face Recognition Module

The block diagram of the face recognition is shown as Figure 5. It includes the input and display of the image, the script MATLAB which is used to call the MATLAB program to process the collected image, and the matching image number. The front panel of face recognition. The front panel of gray processing module include the option button of path to read, the display of the face and the number of the final match.

## Experimental Results and Analysis

The face database of the simulation experiment is designed as follows: one is the human face image, the others are samples of the face database. The recognition is mainly for a specific person with many times. This person face recognition system was tested for thirty times and the correct rate was 93.3%. Due to the complexity of the face pattern, which brings a lot of obstacles to the recognition of the human face, resulting in the identification of the individual is not accurate. But

from the experimental results we can see that the system has a higher recognition rate, and can better complete recognition. This is because the system uses the PCA algorithm, which is a relatively new algorithm and it has the advantages of high recognition rate and rapid recognition speed.

## Conclusion

In this paper a face recognition system is accomplished by using the software of virtual instrument software LabVIEW and Matlab. LabVIEW has simple structure, convenient programming, friendly interface and is easy to use. Matlab has rich functions to complete the complex algorithm. The advantages of the two software are integrated in this system. This system is simple and reliable to realize the face image recognition.

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