ROBUST & ACCURATE FACE RECOGNITION USING HISTOGRAMS

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Abstract:

A large number of face recognition algorithms have been developed from decades. Face recognition systems have been grabbing high attention from commercial market point of view as well as pattern recognition field. It also stands high in researchers community. Face recognition have been fast growing, challenging and interesting area in real-time applications. This face recognition system detects the faces in a picture taken by web-cam or a digital camera, and these face images are then checked with training image dataset based on descriptive features. In this paper, we use a histogram approach for human face detection. Since different faces contains different facial features, having the features which are unique. In this paper the vector machine is used for skin detection and face detection.

Keywords: Face recognition, PCA, LDA Histogram.

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1. Introduction:

Face recognition is one of the most active and widely used technique [1-2] because of its reliability and accuracy in the process of recognizing and verifying a person's identity. The need is becoming important since people are getting aware of security and privacy. For the Researchers Face Recognition is among the tedious work. It is all because the human face is very robust in nature; in fact, a person's face can change very much during short periods of time (from one day to another) and because of long periods of time (a difference of months or years). One problem of face recognition is the fact that different faces could seem very similar; therefore, a discrimination task is needed. On the other hand, when we analyze the same face, many characteristics may have changed. These changes might be because of changes in the different parameters. The parameters are: illumination, variability in facial expressions, the presence of accessories (glasses, beards, etc); poses, age, finally background. We can divide face recognition [7-8] techniques into two big groups, the applications that required face identification and the ones that need face verification. The difference is that the first one uses a face to match with other one on a database; on the other hand, the verification technique tries to verify a human face from a given sample of that face.

2. Histogram:

Histogram or Frequency Histogram is a bar graph. The horizontal axis depicts the range and scale of observations involved and vertical axis shows the number of data points in various intervals ie. the frequency of observations in the intervals.

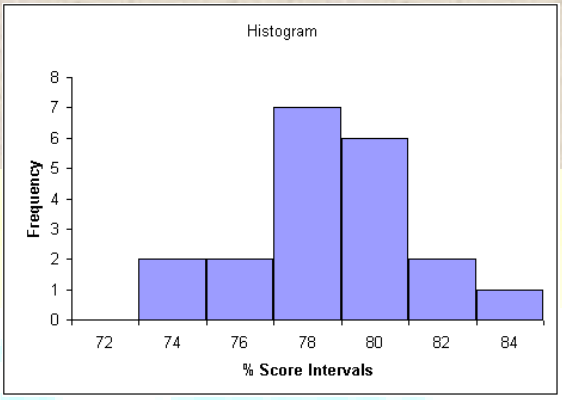
Histograms are popular among statisticians. Though they do not show the exact values of the data points they give a very good idea about the spread of the data and shape.

Let us try drawing a histogram of percentage scores in a test . The scores are as follows :-

82.5, 78.3, 76.2, 81.2, 72.3, 73.2, 76.3, 77.3, 78.2, 78.5, 75.6, 79.2, 78.3, 80.2, 76.4, 77.9, 75.8, 76.5, 77.3, 78.2

When any data is provided to XLMiner®, it decides the size and number of intervals amongst which the data should be distributed. It uses "Nicing" to decide the number of intervals. Five to Twenty intervals are fixed on the dataset depending on its range.

Now see the histogram of the same data.



The values on the horizontal axis are the **upper limits** of bins (intervals) of data points, and not the mid-points of the intervals, although they may appear to be so. This is in keeping with the way the Analysis Toolpak of Excel works. As an example, the bar shown against 78 has a frequency of 7. That means 7 data points lie in the range above 76 and upto (including) 78.

As is evident, the histogram gives a fairly good idea about the shape and spread of data at a glance.

3. Face Recognition:

Face recognition is one of the few biometric methods thatpossess the merits of both high accuracy and low intrusiveness.It has the accuracy of a physiological approach withoutbeing intrusive. For this reason, since the early 70's, face recognition has drawn the attention of researchersin fields from security, psychology, and image processing, tocomputer vision. Numerous algorithms have been proposedfor face recognition; While network security and access control are it most widelydiscussed applications, face recognition has also proven useful in other multimedia information processing areas.

Face recognition [5]techniques can be used to browse videodatabase to find out shots of particular people. Also for face images with a compact parameterizedfacial model for low-

bandwidth communication applicationssuch as videophone and teleconferencing.Recently, as the technology has matured, commercial productshave appeared on the market. Despite the commercialsuccess of those face recognition products, a few researchissues remain to be explored.

3.1 General face recognition system

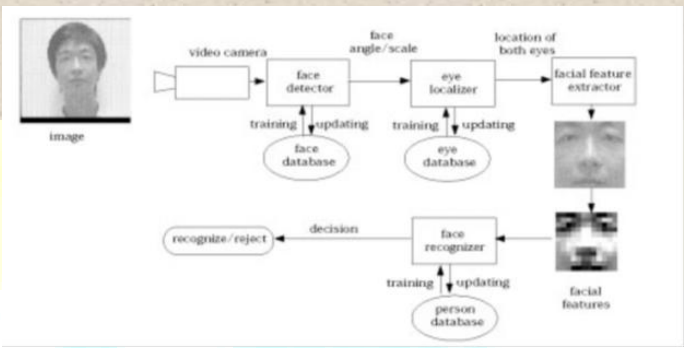


Figure : Block Diagram for Face Recognition System

4. Histogram Method used for Face Detection:

As per [9], RGB colour space is commonly used in image processingbecause of its basic synthesis property and direct application inimage display. According to the requirements of different imageprocessing tasks, RGB colour space is often transformed to othercolour spaces. From a visual perception's point of view, hue,saturation and value are often employed to manipulate colour,such as de-saturation or change of colourfulness. When thecolour is quantized to a limit number of representative colours,one will have to deal with two problems. The first is how to bestmatch the distance[3-4] of data representation to human perception. Itis desirable that numerical colour distance is proportional toperceptual difference. The second problem is how to bestquantize the colours such that the reproductions from thesequantized colours is the most faithful to the original. In thiswork, we adopt a perceptually meaningful colour space, theHMMD colour space, and used a carefully worked outquantization scheme of the MPEG-7 standard

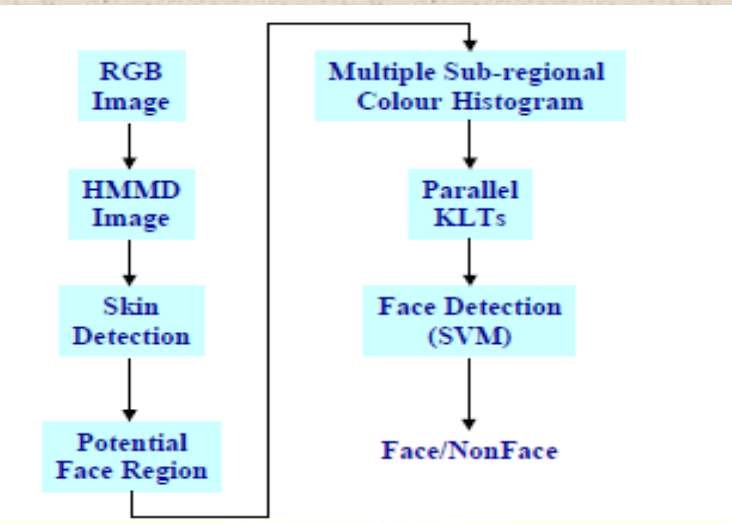


Fig. 2 The schematic of the new face recognition/detection method

5. Proposed work and Algorithm:

Recognizing objects from large image databases, histogram based methods have proved simplicity and usefulness in last decade. Initially, this idea was based on color histograms .This algorithm presents the first part of our proposed technique named as "Histogram processed Face Recognition" as compared to detection use in [9]

Histogram techniques are well designed for face detection[6] as shown above.But in our case we apply histogram calculation for face recognition .The algorithm given below worked for face recognition with success rate of 95%.

For training, grayscale images with 256 gray levels are used. Firstly, frequency of every gray-level is computed and stored in vectors for further processing. Secondly, mean of consecutive nine frequencies from the stored vectors is calculated and are stored in another vectors for later use in testing phase.

This mean vector is used for calculating the absolute differences among the mean of trained images and the test image. Finally the minimum difference found identifies the matched class with test image. Recognition accuracy is of 95 in our case.

6. Experimental Results:

The ORL Database of Facial Images [19] is used for performing the experiments. The database consists of 400 facial images of 40 individuals with 10 images of each. For performing the experiments we have taken 100 images of 10 individuals with 10 images of each. The training set consists of 50 images from these with 5 images of each individual.

The experiment is performed first by recognizing images of each individual using HISTOGRAM approach .Then, the accuracy rate for both the approaches is calculated, by finding out, how many results are found correct.Table 1.

Table 1.

Approach	No. of correct outputs out of 100	Accuracy Rate (%)
HISTOGRAM	93	93
HISTOGRAM AND INTENSITY VALUE	98	98

7. Algorithm Steps:

Step 1: Take input image I

Step 2.Test the gray level

For I1=1: N %where N is number of Images

Step3: Compute frequency

For I2=1: N

Step 4: Make frequency vector

ForI3=1:M %where M is the dimension of frequency vector and taken as M=9

Step5: Calculate mean or mean difference M_d

M_d=Trained image –Test image

If M_d= 0 then

Matched

Got to Step 7

Else

%Again check for the next image

Go to step 4

Endif

Endfor&Goto step 3

Endfor&goto step 2

Endfor& got to step 6

Step 6: Print Not Matched & Stop

Step 7: Show the Mapped Output in GUI & Stop

8. Conclusion:

In this paper, we investigated the use of the Histogram approach and the Histogram approach using intensity values for recognizing images. We compared both the approaches and from the outputs, it was found that for about 50% of individuals, the output image from both the approaches were different, which clearly shows the variation between the two approaches..

Also, it was found from the accuracy rate that the Histogram with pixel intensity value is more accurate as compared to the Histogram only. Hence, Histogram with pixel intensity value

approach is recommended for better results in Face Recognition as compared to alone Histogram .

9. Results:

Here we are showing outputs for each individual one by one from both the approaches by taking one image for each individual.

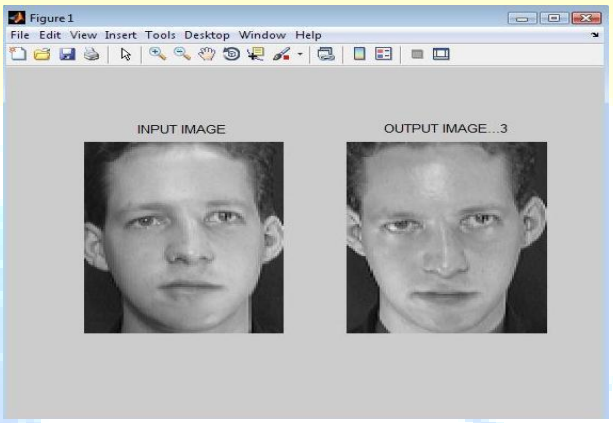


Figure. 9.2. HISTOGRAM Output for First Individual

Figure. 9.3. HISTOGRAM Output for Second Individual

Figure. 9.4. HISTOGRAM and PIXEL INTENSITY Output for Second Individual

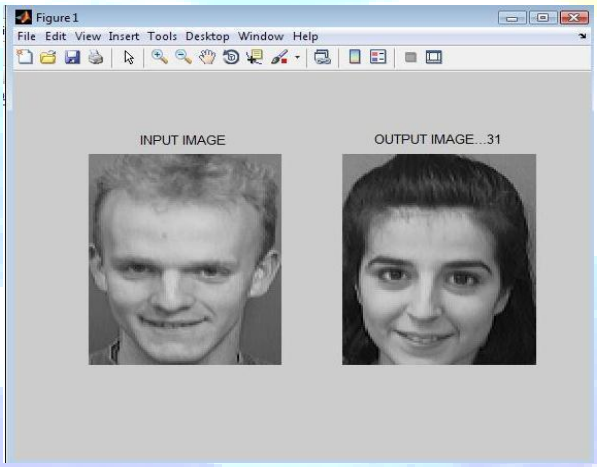


Figure. 9.5. HISTOGRAM Output for Third Individual

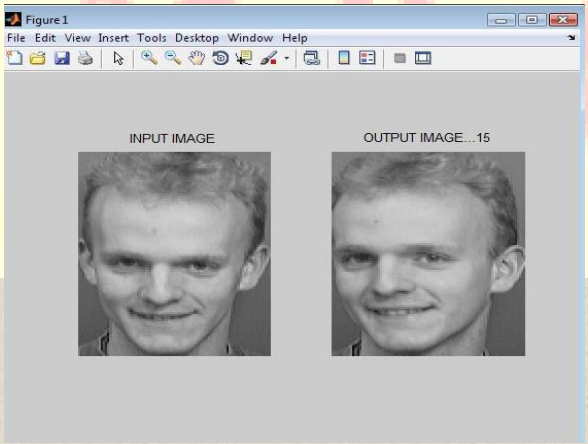


Figure. 9.6. HISTOGRAM and PIXEL INTENSITY Output for Third Individual

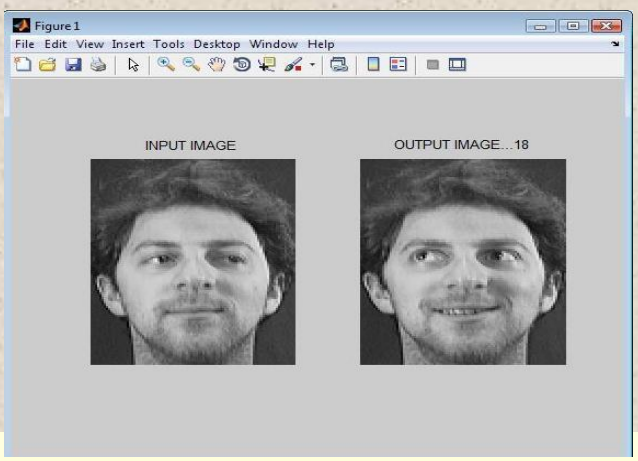


Figure. 9.7. HISTOGRAM Output for Fourth Individual

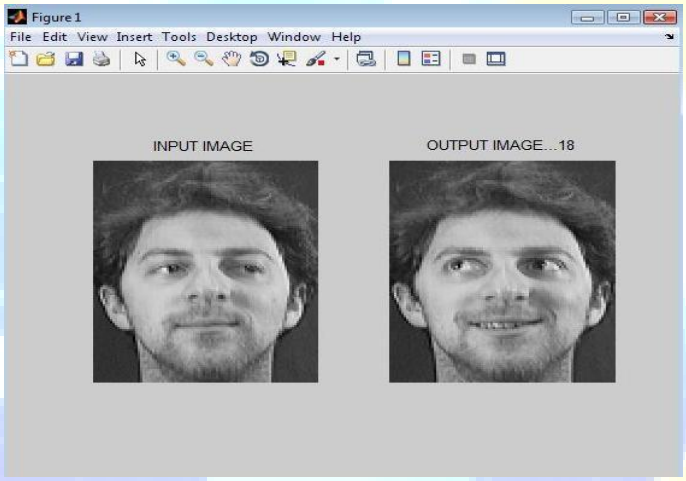


Figure. 9.8. HISTOGRAM and PIXEL INTENSITY Output for Fourth Individual

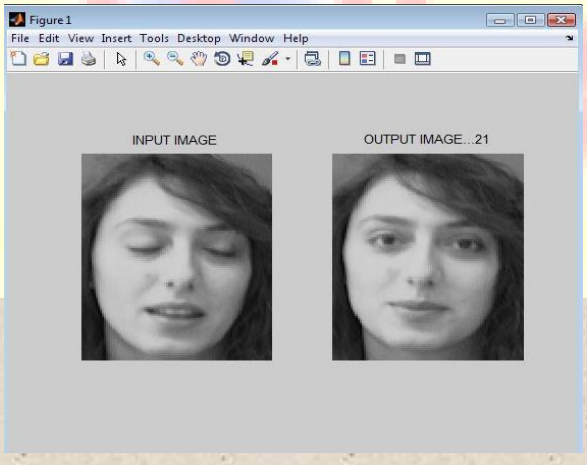


Figure. 9.9. HISTOGRAM Output for Fifth Individual

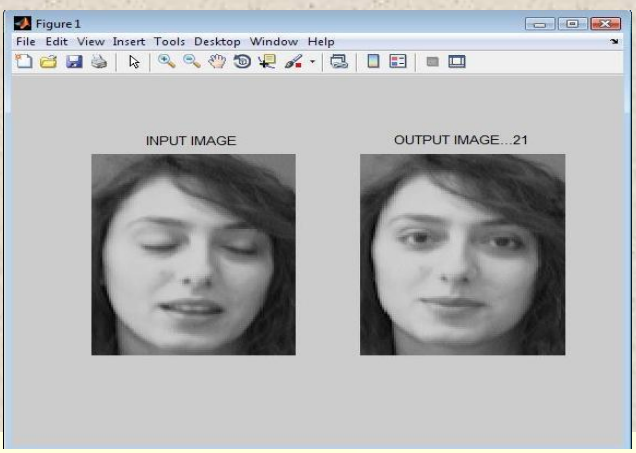


Figure. 9.10. . HISTOGRAM and PIXEL INTENSITY Output for Fifth Individual

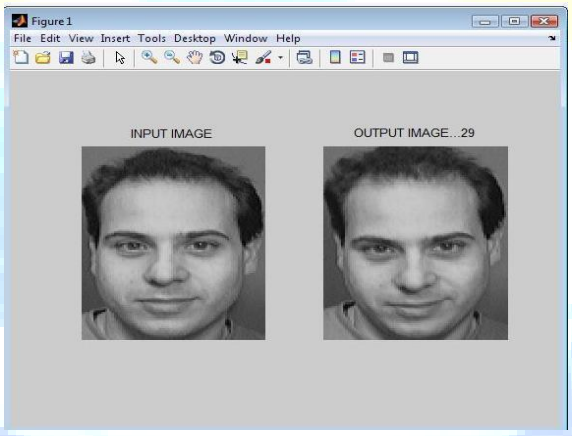


Figure. 9.11. HISTOGRAM Output for Sixth Individual

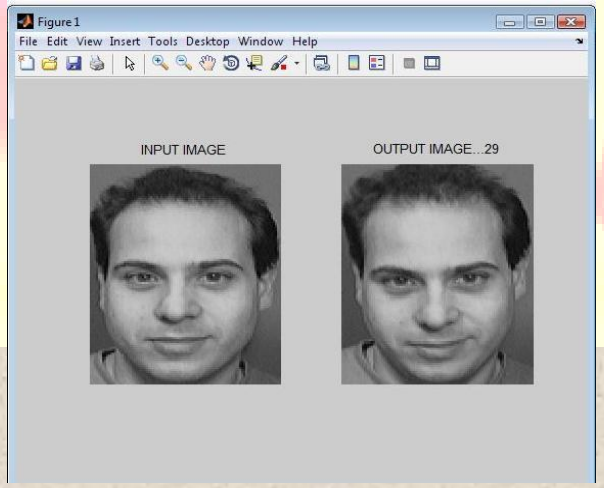


Figure. 9.12. . HISTOGRAM and PIXEL INTENSITY Output for Sixth Individual

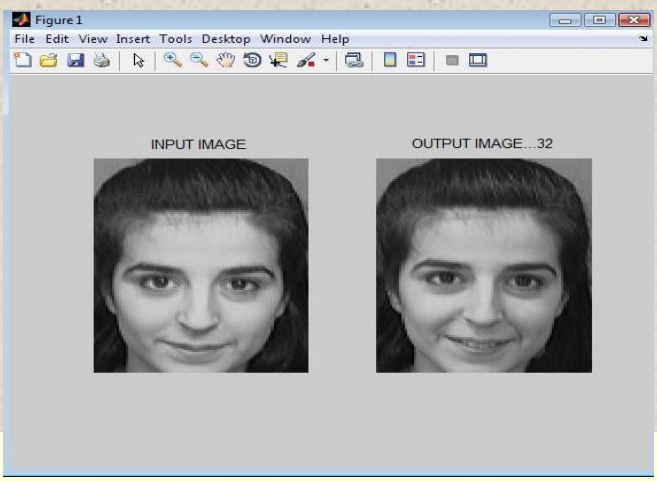


Figure. 9.13. HISTOGRAM Output for Seventh Individual

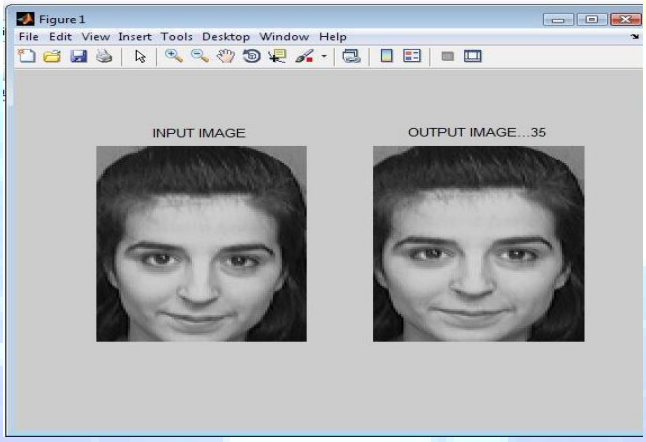


Figure. 9.14. . HISTOGRAM and PIXEL INTENSITY Output for Seventh Individual

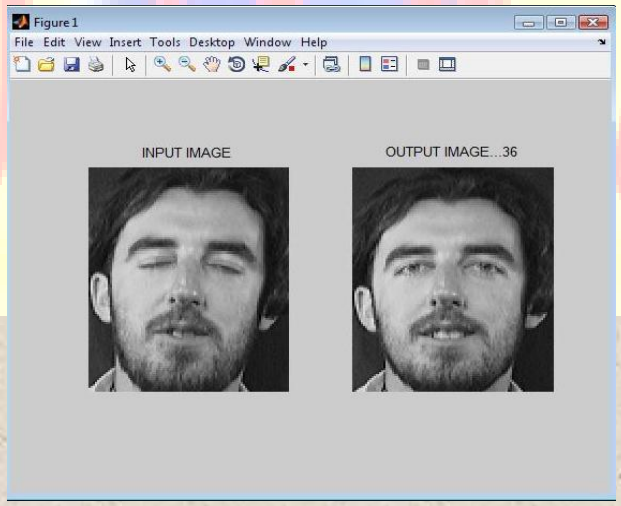


Figure. 9.15. HISTOGRAM Output for Eighth Individual

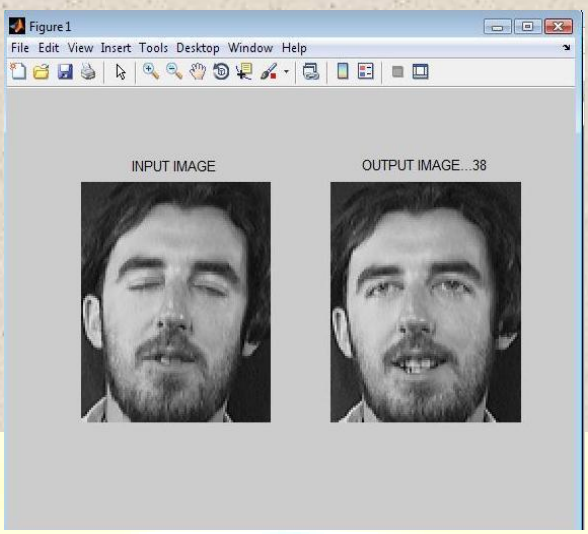


Figure. 9.16. . HISTOGRAM and PIXEL INTENSITY Output for Eighth Individual

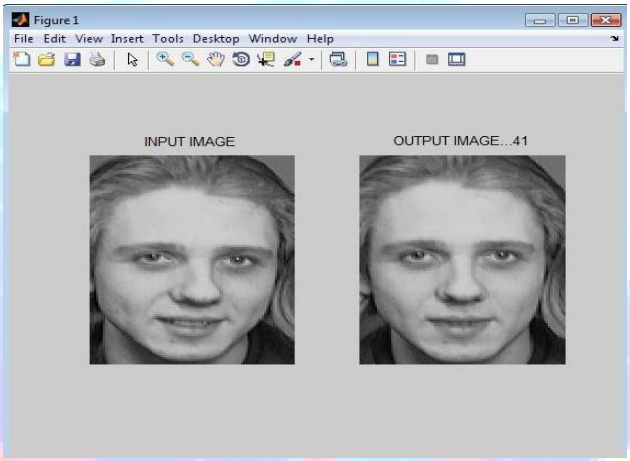


Figure. 9.17.HISTOGRAM Output for Ninth Individual

Figure. 9.18. HISTOGRAM and PIXEL INTENSITY Output for Ninth Individual

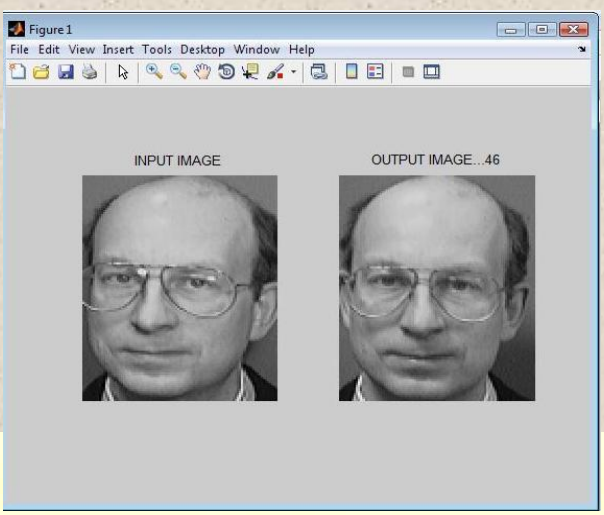


Figure. 9.19. HISTOGRAM Output for Tenth Individual

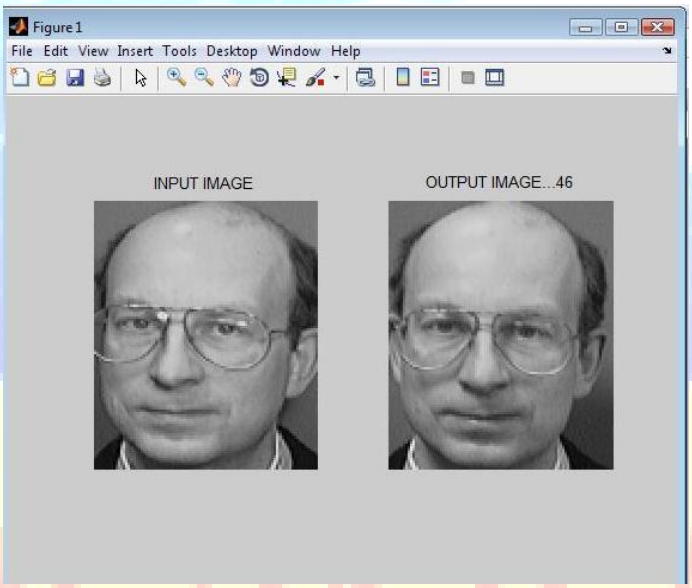


Figure.9.20. . HISTOGRAM and PIXEL INTENSITY Output for Tenth Individual

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