PCA applied to Face Recognition

Submitted by

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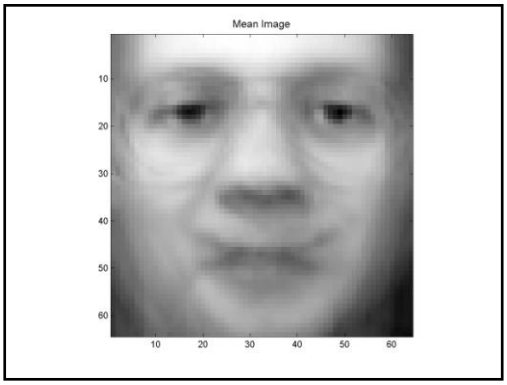
0800215

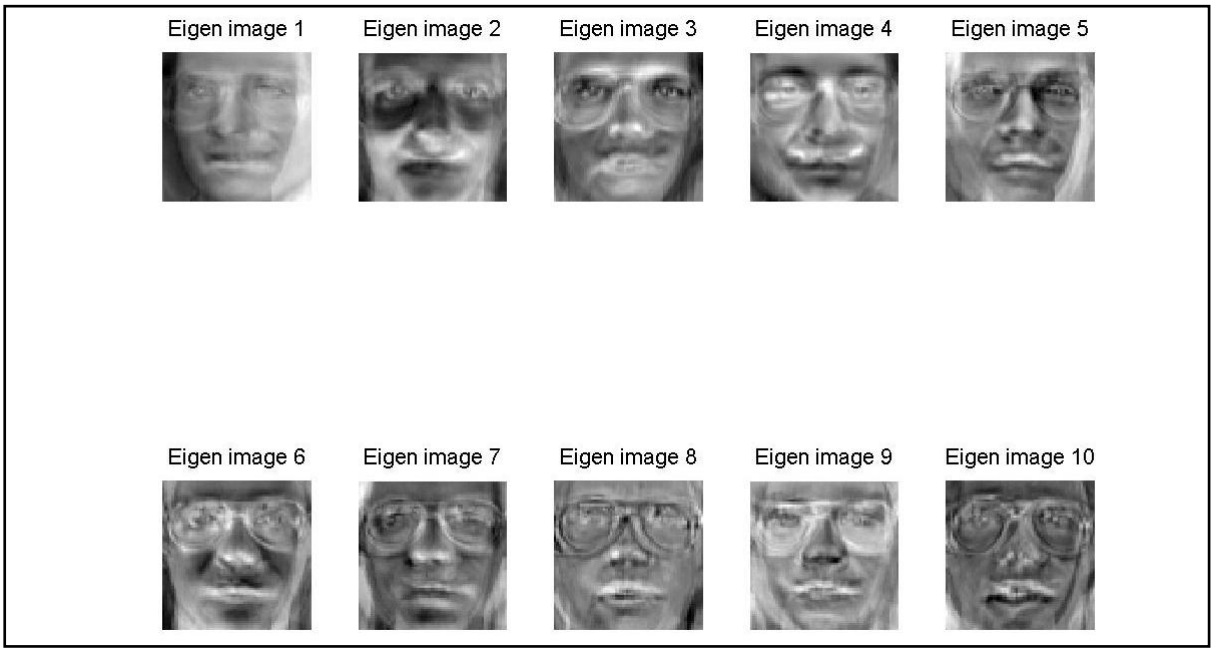
IN 332

PCA based face recognition

Mean Image:

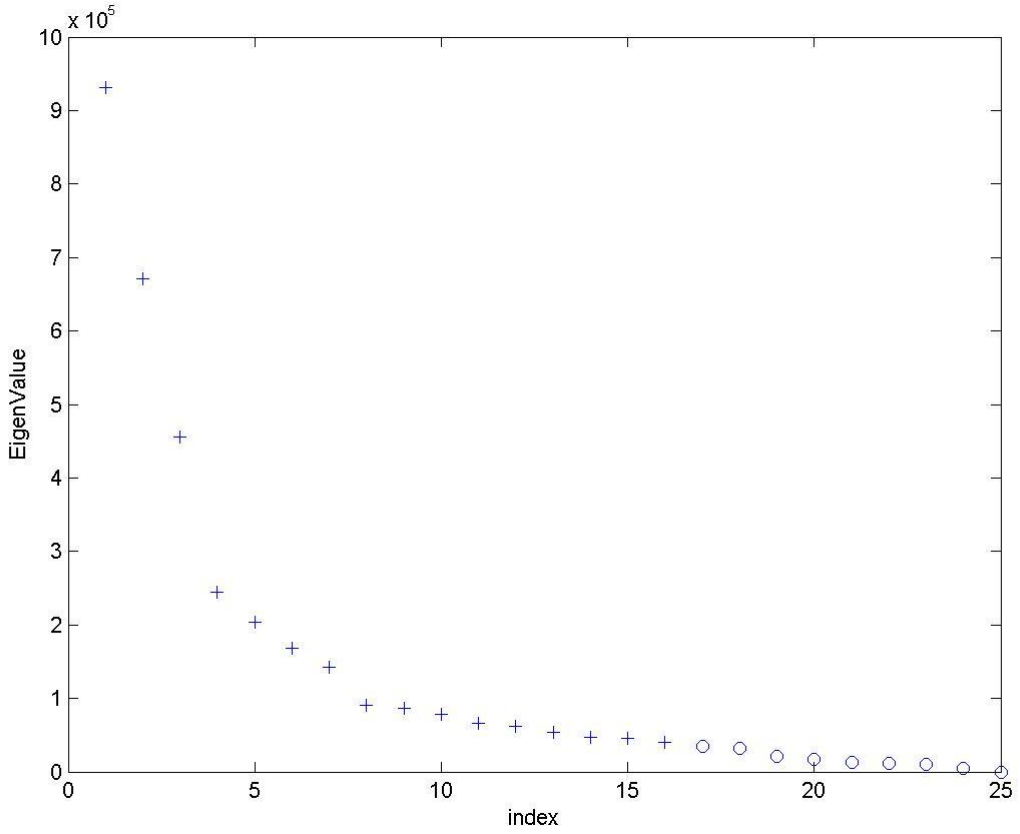


Eigen Images 1 to 10:

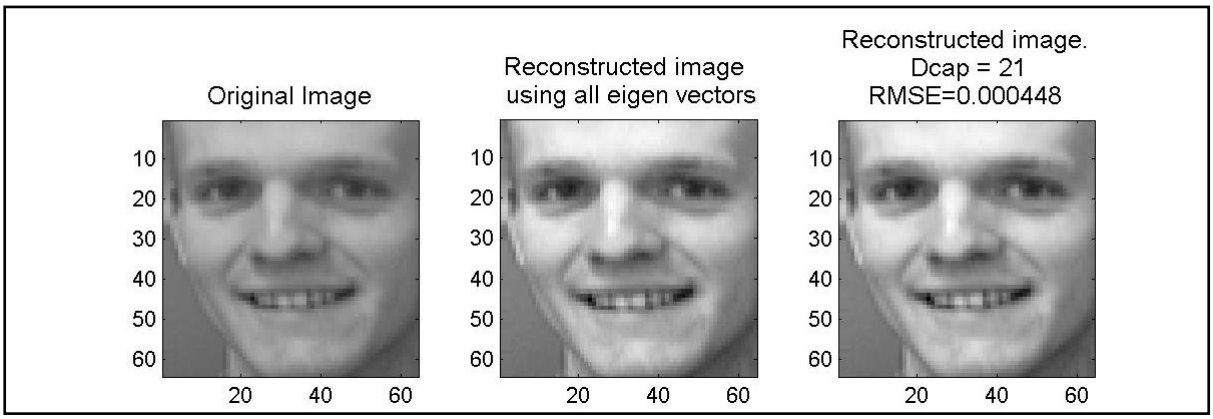


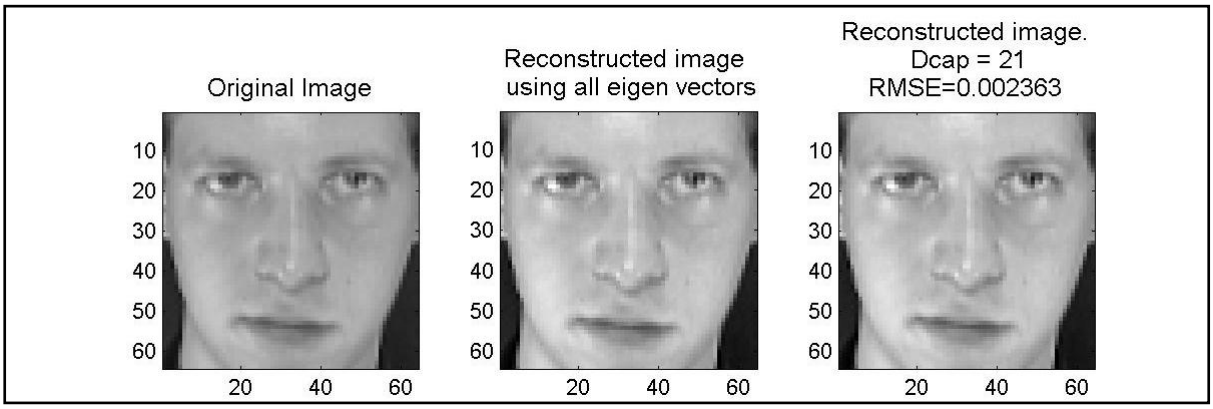
The plot of Eigen Values in decreasing order is given below. The '+' symbols correspond to the significant values that are used to reduce the dimensions. The 'o' symbols correspond to the insignificant Eigen Images which are ignored.

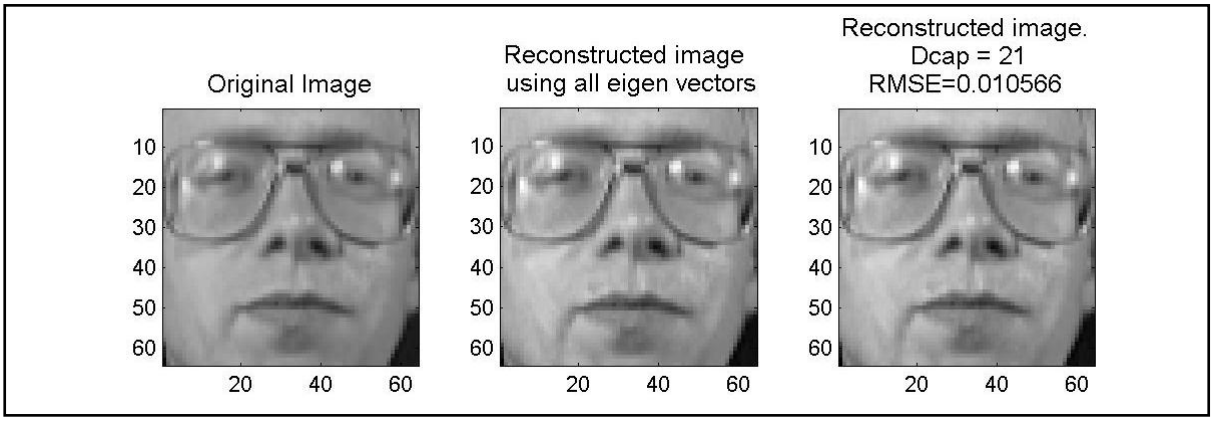
For a tolerance of 5%, the reduced dimensions is 16 for a set of 25 images.



Reconstructed Image of the Image set used to perform PCA. These are some of the samples. The entire set is in the zip file along with the soft copy.



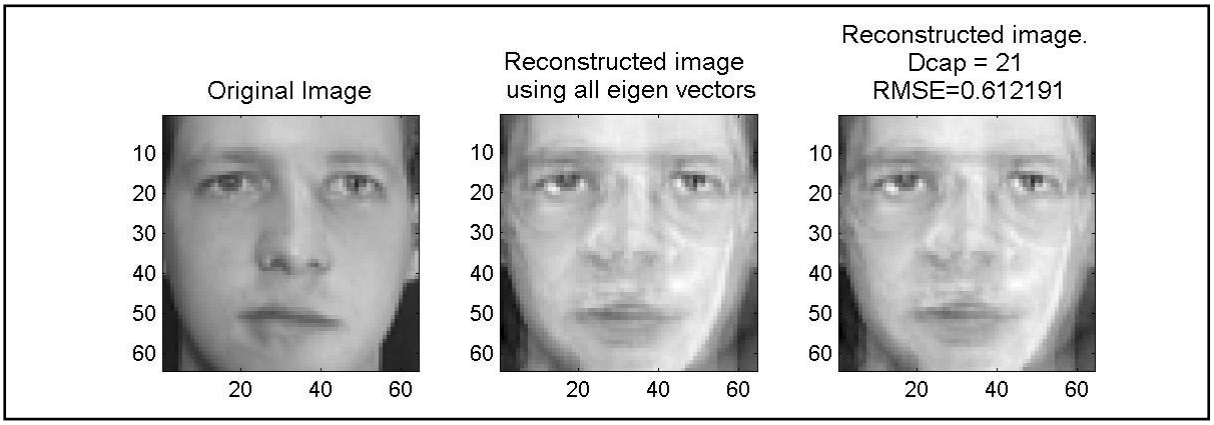


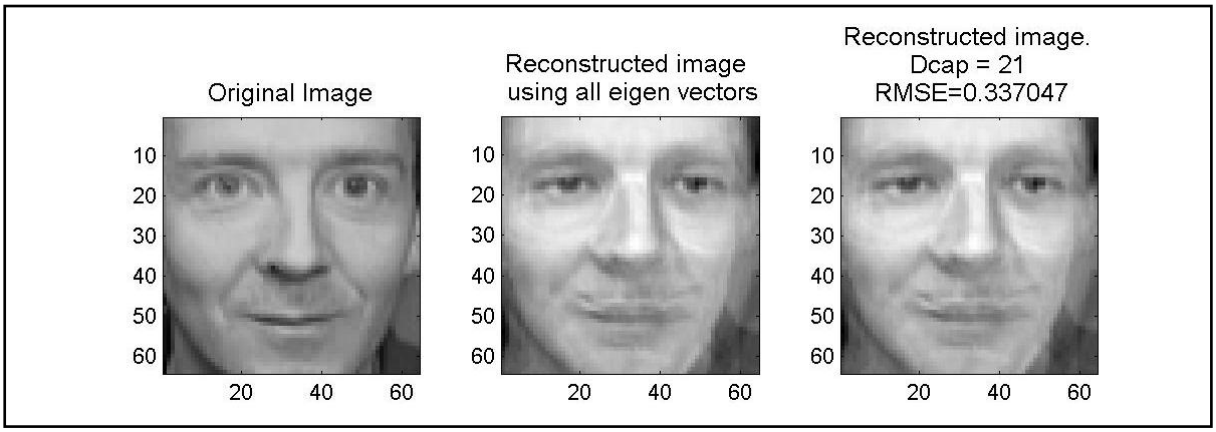


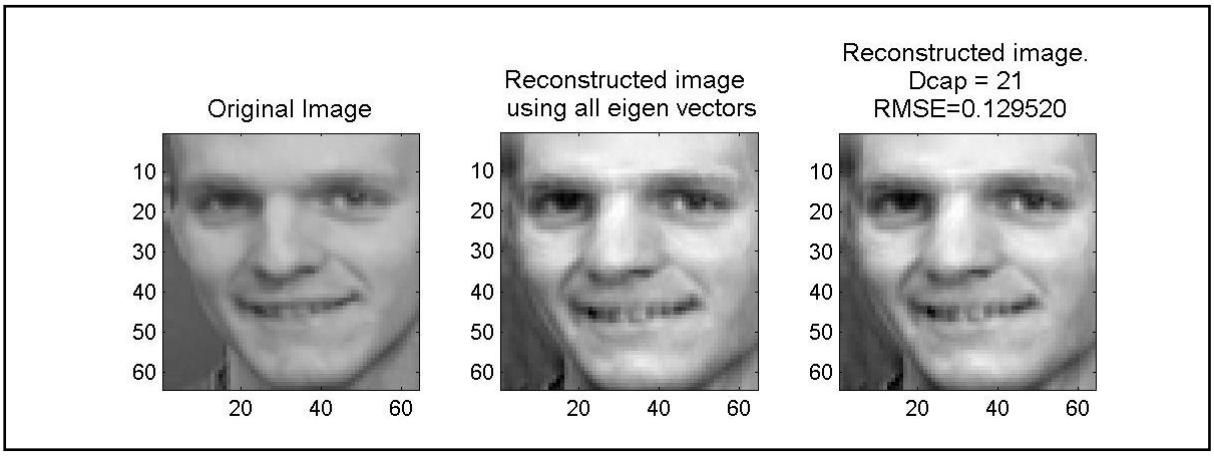
Details about the RMSE values:

Mean RMSE:	0.0081
Standard Deviation of RMSE values:	0.0067
Maximum RMSE:	0.0272
Minimum RMSE:	4.4843e-04

Reconstructed Images of the same individuals but of different images than those used to perform PCA



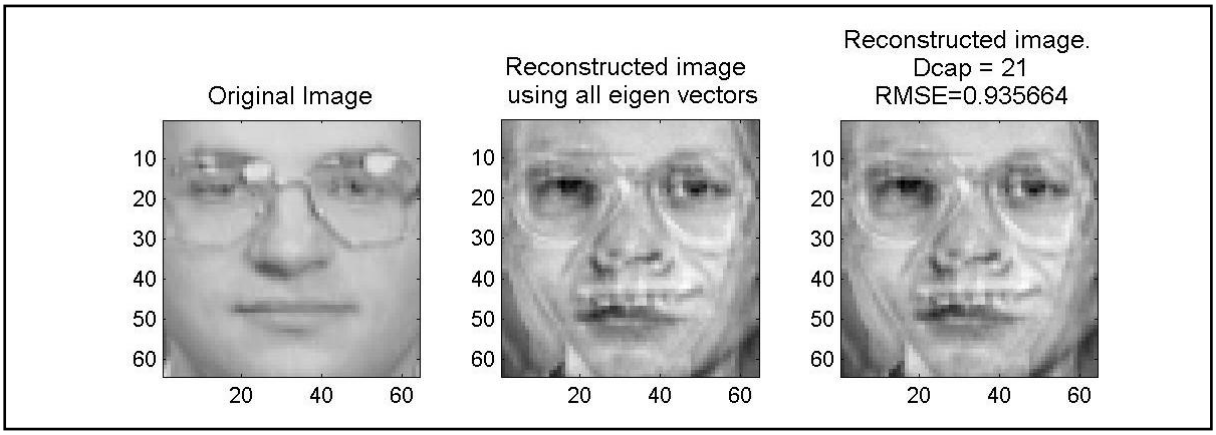


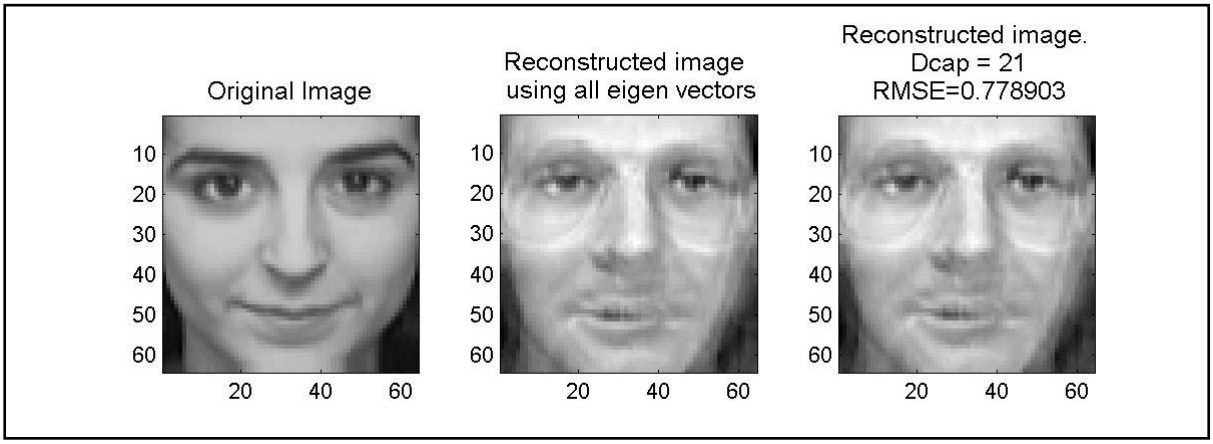


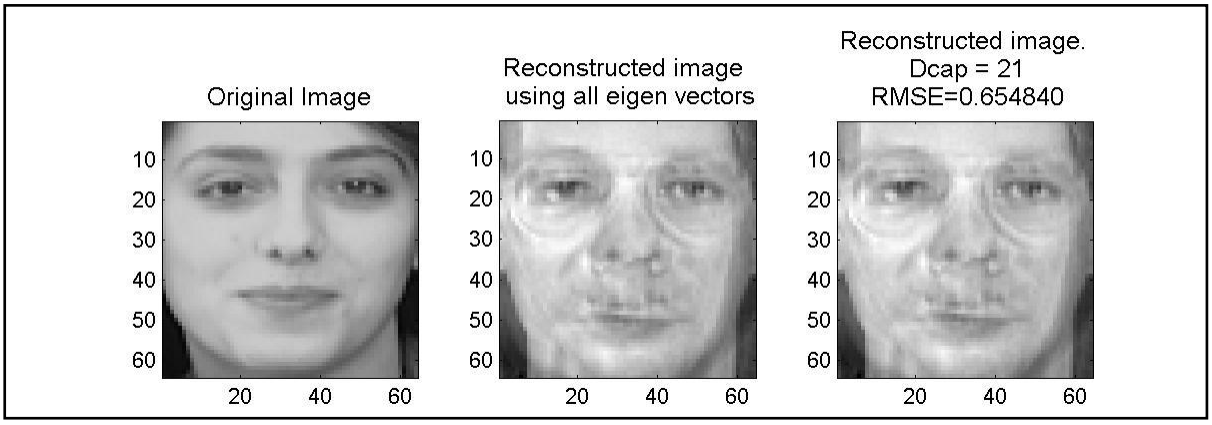
Details about the RMSE values:

Mean RMSE:	0.3007
Standard Deviation of RMSE values:	0.2326
Maximum RMSE:	0.6711
Minimum RMSE:	0.0029

Reconstruction of Images of individuals whose images where not considered to perform PCA.



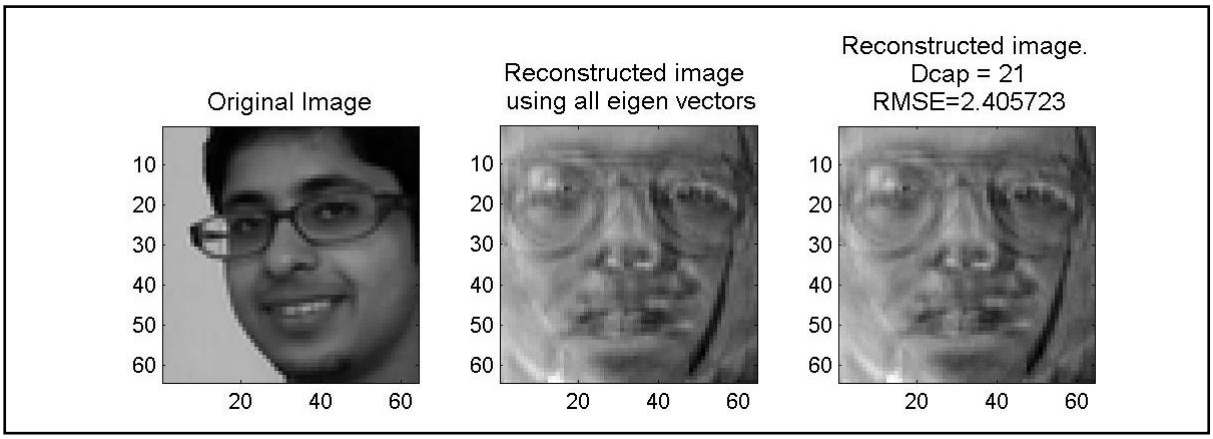


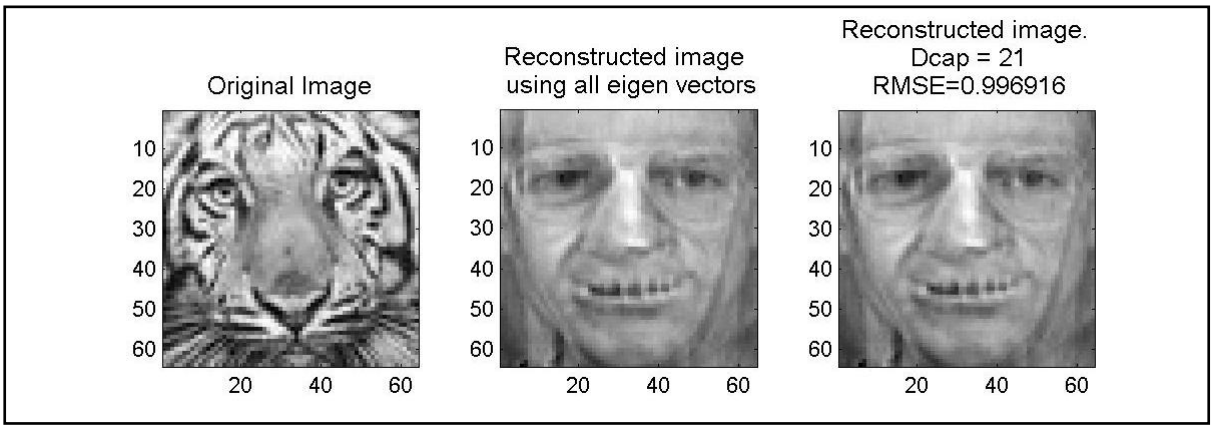


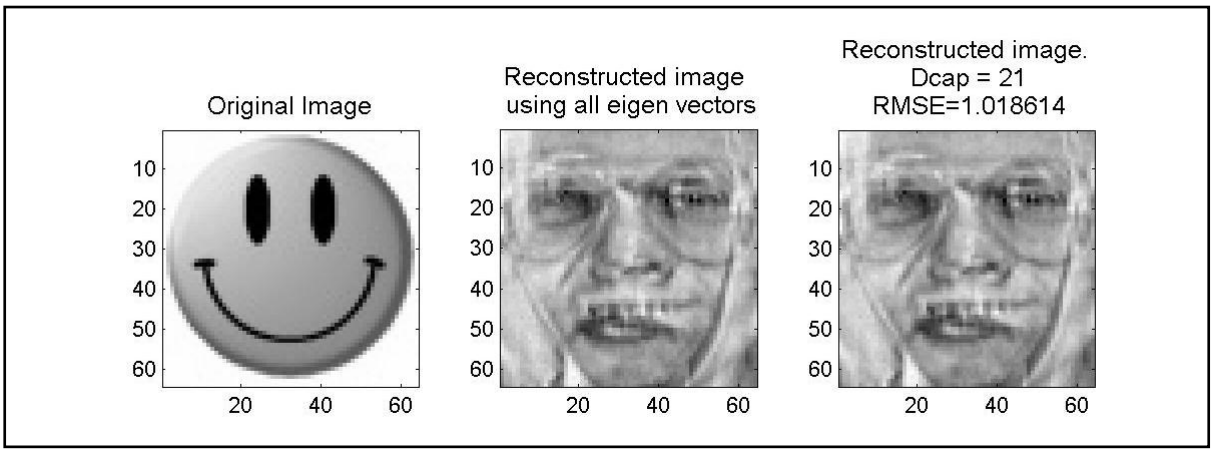
Details about the RMSE values:

Mean RMSE:	0.3579
Standard Deviation of RMSE values:	0.3238
Maximum RMSE:	1.2531
Minimum RMSE:	0.0023

Analysis of Non Face Images:







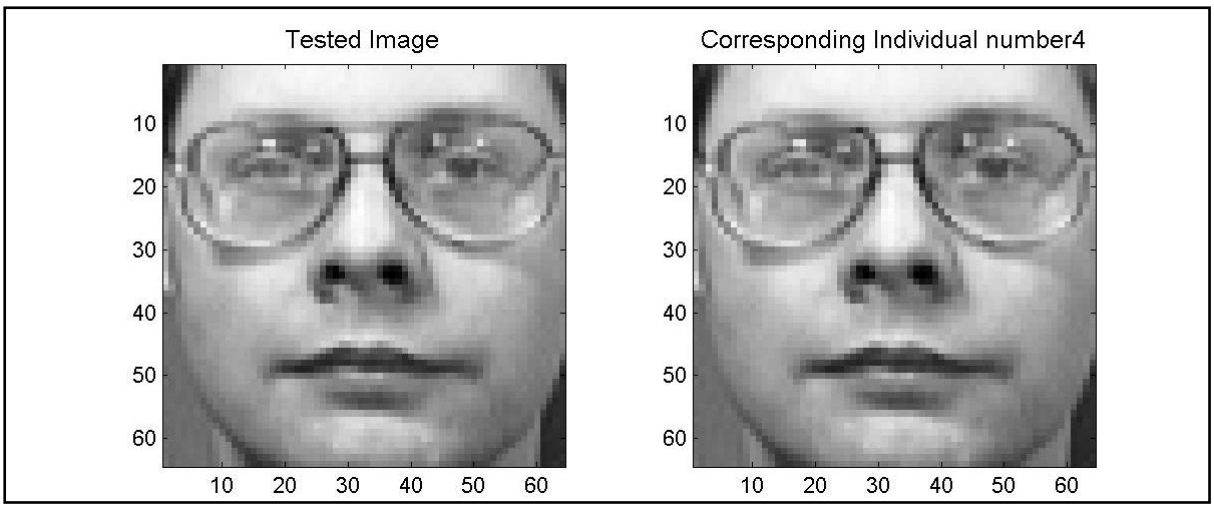
Details about the RMSE values:

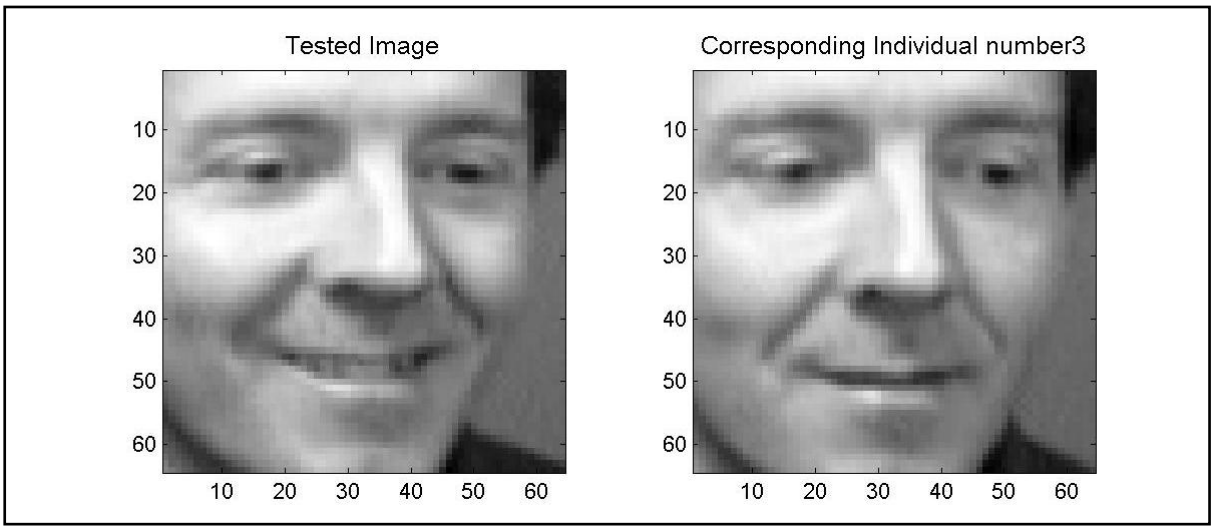
Mean RMSE:	1.1481
Standard Deviation of RMSE values:	0.9266
Maximum RMSE:	2.4057
Minimum RMSE:	0.1749

Can we use the PCA to reject a given image which is a face or not?

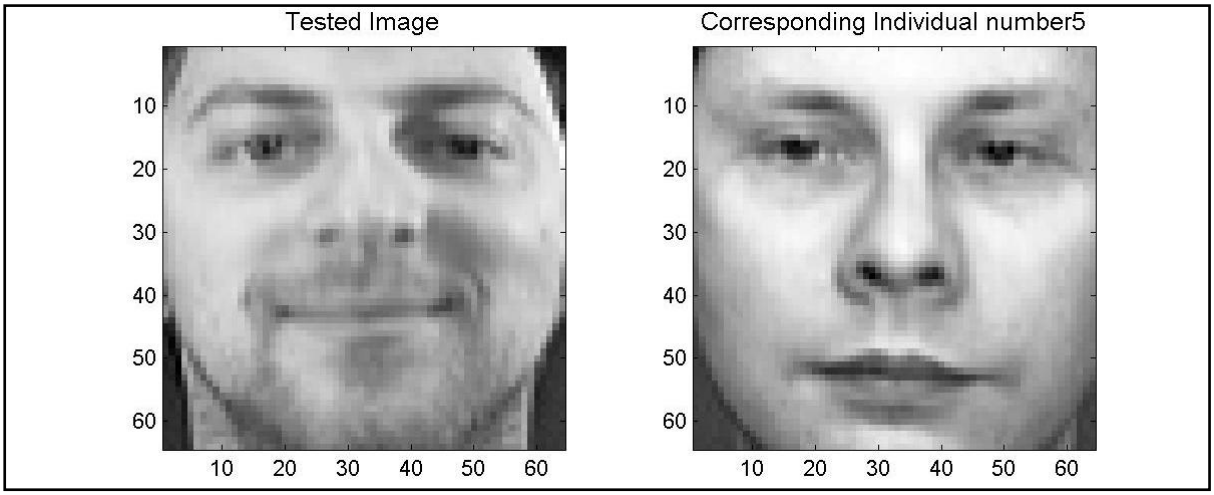
Well, the answer to this should be gotten by observing the RMSE values. Clearly for images which are not faces, we get a large RMSE compared to images which are faces. Hence, the answer is yes and the threshold of RMSE to decide whether or not an image is a face or not can be set.

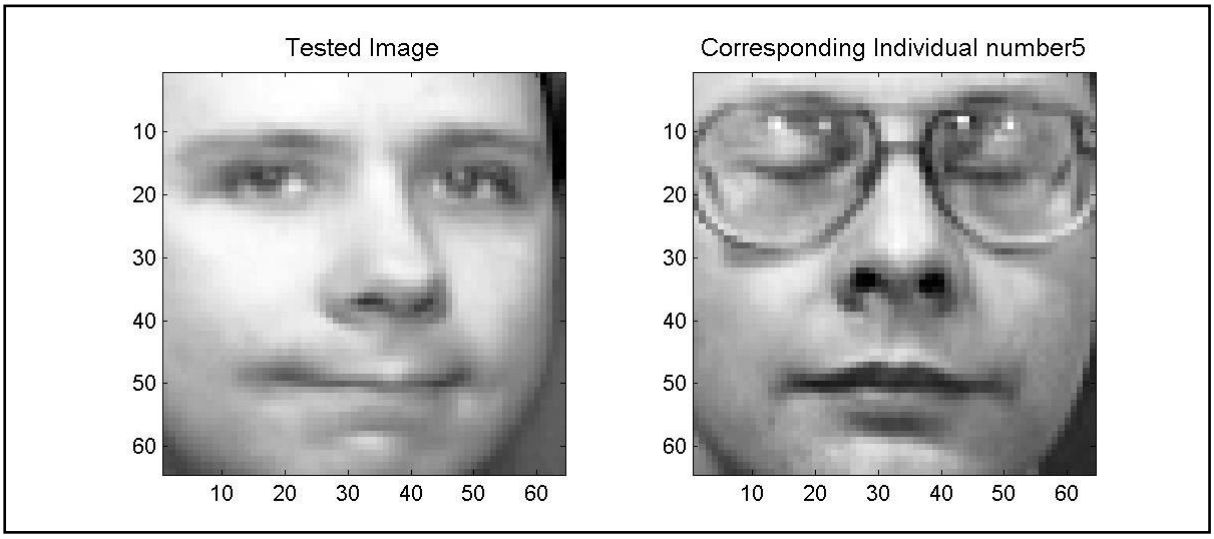
Nearest Neighbor Prediction of Images used for PCA calculation:



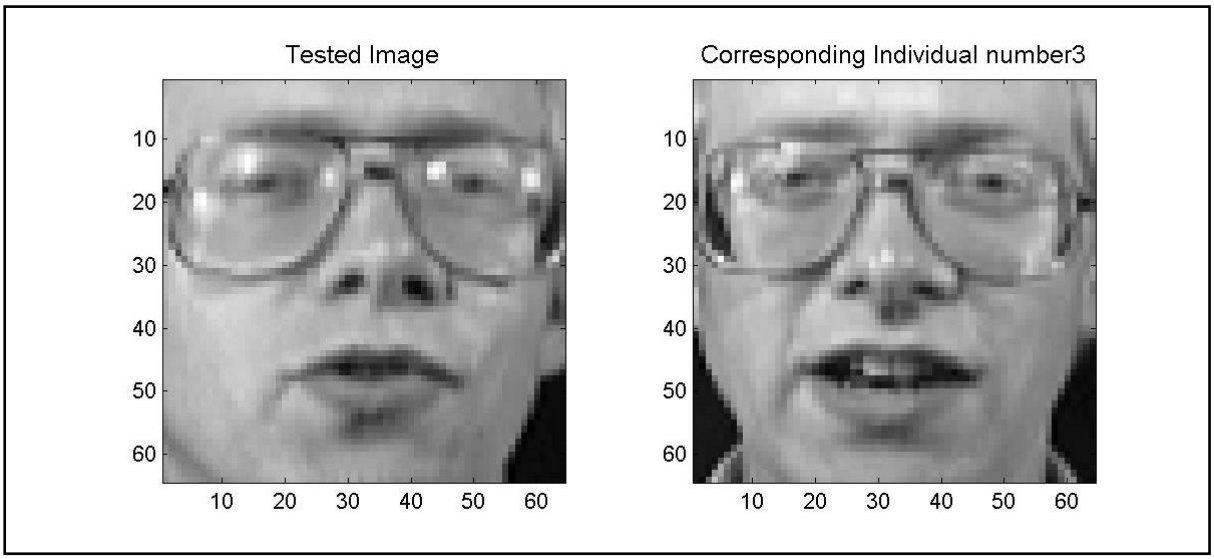


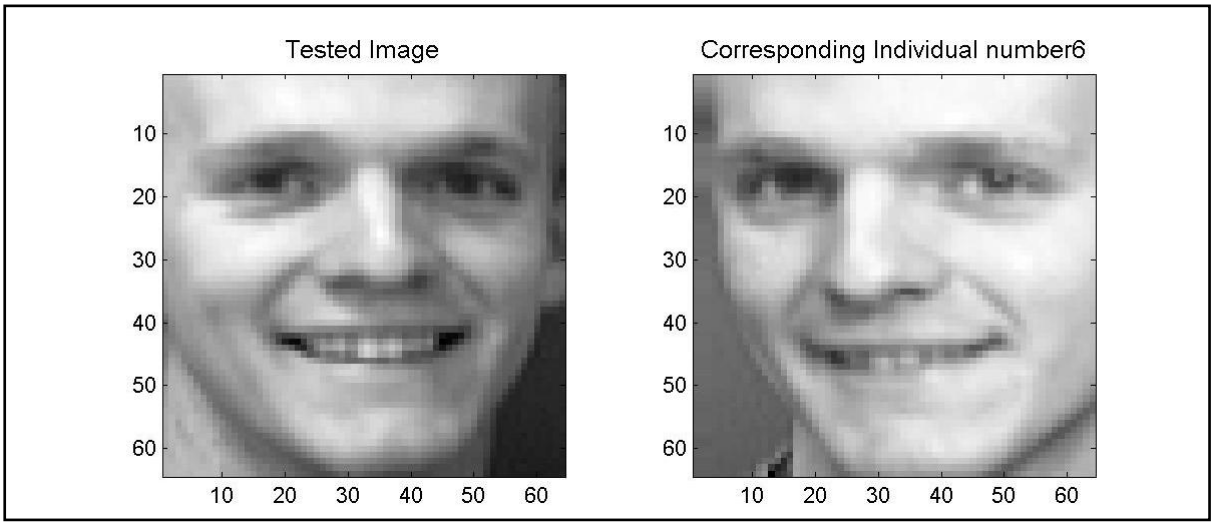
Nearest Neighbour Prediction of Images not used for PCA calculation:





Nearest Neighbour Prediction of Individuals used for PCA but not the same images:





Hence it can clearly been seen that for the individuals whose images were used in the calculation of PCA, we can recognize the person to a very good accuracy. But of individuals whose images were not used to calculate the PCA, we get very bad results.