

Eigenfaces Implementation Issues

Eigenfaces are the most basic method implemented by Face Recognition due to their speed and efficiency. An efficient algorithm and database which consists of face images are required to solve face recognition. One such technique is eigenfaces. During the recognition process, an eigenface is produced for each image, and the Euclidean distances between the previous eigenfaces and the new eigenface are calculated. The eigenface with the smallest Euclidean distance is the one that resembles the person closely, but if the distance is too large, then the image is regarded as one belonging to an individual for which the system has been trained. The Eigenfaces method works by first extracting features on the face and then representing the face as a linear combination of ‘eigenfaces’ obtained from the feature extraction process.

The following are the implementation issues associated with Eigenfaces:

- Eigenfaces are very sensitive to light intensity. They operate on grey-scale pixels which are encoded as decomposition coefficients by comparing distances between the vectors, and therefore images with similar light intensities may be misclassified (Foggia, Sansone, Vento, 2009).
- Eigenfaces are very sensitive to scale and translation. Their performance depends on the presence of a highly controlled environment.
- The Eigenface method does not work well under realistic conditions due to presence of dynamic factors. This is because images may contain complex occlusions and backgrounds (Foggia,

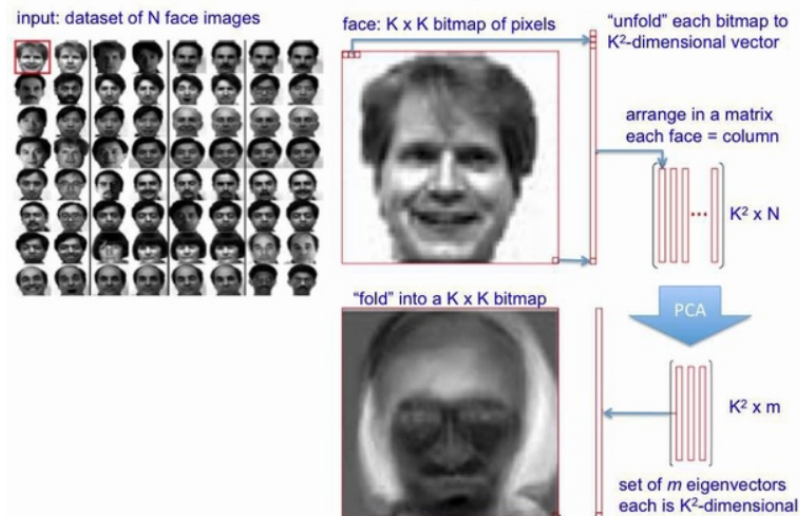
Sansone, Vento, 2009).



In the above figure, the leftmost image in the top row depicts the mean/ average face, while the other two in the same row depict eigenfaces. The bottom row shows eigenfaces with at least three eigenvalues

- Eigenfaces find it hard to capture alterations in facial expressions.
- Eigenfaces are sensitive to pose changes since global features are highly sensitive to translation and rotation of the face (Tolba, El-Baz, El-Harby, 2008).
- Finding eigenvalues and eigenvectors are time consuming on (Product-processing-chain) PPC. The size and location of each face image must remain similar. Eigenface approach maps features to principle subspaces that contain most energy (Patel, Yagnik, 2013).
- Eigenfaces are an efficient recognition system only when the face space is smaller than the number of face classes.
- During the Eigenface method, training the data is a very lengthy process. This makes updating the database really time

consuming.



The figure above depicts the process of reconstructing a face using Eigenfaces method

- The most significant eigenfaces are focused on illumination coding and do not provide useful information on the actual face (Jadhav, Malpani, Rathod, Suryawanshi, 2016).

Foggia, P. Sansone, C. Vento, M. Image Analysis and Processing – ICIAP 2009. Retrieved from: <https://books.google.co.in>

Tolba, A. El-Baz, A. El-Harby, A. Face Recognition: A Literature Review. 2008. Retrieved from: <http://citeseerx.ist.psu.edu>

Patel, R. Yagnik, S. A Literature Survey on Face Recognition Techniques. 2013. Retrieved from: <http://ijcttjournal.org>

Jadhav, K. Malpani, K. Rathod, R. Suryanwanshi, D. Smart Surveillance System. 2016. Retrieved from: <http://ijesc.org>