How Eigenface Facial Recognition Works

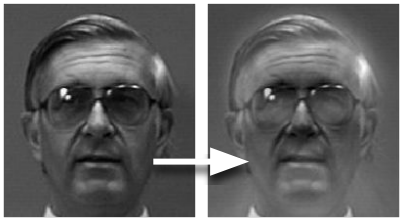
Facial recognition is a powerful tool that can be implemented in a variety of ways. The eigenface method is efficient and simple to implement and understand.

[1] We begin with a database of aligned face photographs.

Mean Face

[2] Each photograph is a digital grid of pixels with numeric values. We take the mean of each pixel and get "the mean face."

[3] Each face is shifted by the mean to exaggerate its differences from the others.



A Shifted Face

[4] Taking the Singular Value Decomposition (SVD) of the shifted faces yields the eigenfaces or building blocks of the dataset.

A Couple Eigenfaces

[5] The eigenfaces can be used to approximate any one of the original faces but with less data than the original. This makes it faster to compare images.

Reconstructions from Eigenfaces

[6] We take a target image, shift it by the mean, and build it out of our eigenfaces to compare it to the other faces in the dataset.

Target Image

Closest Match

[7] We search the database until we find an image close enough to the target by comparing the distance between the grid numbers in the eigenface constructions..

With the eigenface method for facial recognition, we can efficiently and quickly match faces to a database with fairly high accuracy with applications to healthcare, security, law enforcement, and conservation.

Faces From Faces94 Database:http://cswww.essex.ac.uk/mv/allfaces/faces94.html