UFPR - Universidade Federal do Paraná
Bachelor of Computer Science - Topics in Computer Vision - CI-396
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Problem 01: Face Identification

How to execute

python <path to main.py>
If you are in the project root directory execute: python main.py

Code Organization

The code is organized in the following way:

- Databases (folder): Place where the test databases are located.
    - Orl_faces (folder): ORL (AT&T) Faces database. The original can be found in here.
    - Yalefaces (folder): Yale Faces database. The original can be found in here (the original link was broken at the moment of the writing, so I used the web archive link).

- Eigenface.py: Implementation of the Eigenface method. The code is modular, so it can be easily used in other places, as the constructor of the eigenface class takes only two parameters, the array of images and an array that is the identificator of each image (that can be anything, a database id, the name of the person, ...).

- Main.py: Where the tests are done:
    1. Firstly the Yalefaces database is tested with a cross-validation scheme of leave-one “expression or lightning” for every expression or lightning that exists in the database, and presenting the accuracy of each test.
    2. Secondly the ORLFaces database is tested variating the number of eigenfaces in the training part, and for each number of eigenfaces a ten-fold cross-validation scheme is used to test the database presenting at the end the accuracy and standard deviation of each test.

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Results

The tests were executed inside macalan, using python 2.7.12

Yale Faces Database

Using 60 eigenfaces:

Expression or Lightning	Accuracy(%)
Centerlight	86.6
Glasses	86.6
Happy	100.0
Leftlight	20.0
Noglasses	93.3
Normal	100.0
Rightlight	53.3
Sad	93.3
Sleepy	100.0
Surprised	93.3
Wink	93.3

Taking the results in consideration, one possible conclusion is that light makes a huge difference in the accuracy of the tests, mainly left and right light. However expressions don't present a big difference.

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ORL Faces Database

Number of Eigenfaces	Accuracy(%)	Standard Deviation
5	86.00	0.037
10	95.00	0.035
50	97.25	0.026
100	98.00	0.015
200	96.25	0.016
300	97.00	0.024

Based on the results it is possible to conclude that after 50 eigenfaces the accuracy stabilize around 97.00% with a standard deviation with no more than 0.026.