Face Recognition Using Fourier Transform

Algorithm:

1. store all photos in a image datastore
2. take 5 photos for each of 40 subjects as training sets, total of 200 photos
3. padding on every image so the size will be power of 2
4. 2D fast fourier transform on every image
5. calculate the variance of frequency across all 200 photos
6. get 22 frequencies with maximum variance
7. extract 22 real frequencies and 8 imaginary frequencies
8. get a random image as a model image from the database
9. repeat 3-7 on model image and get 22 real frequencies and 8 imaginary frequencies
10. calculate the euclidean distance between training set frequencies and model image frequencies
11. calculate the mean of euclidean distance for each subject
12. find the subject with minimum euclidean distance
13. draw a rectangle around the subject's image

Method:

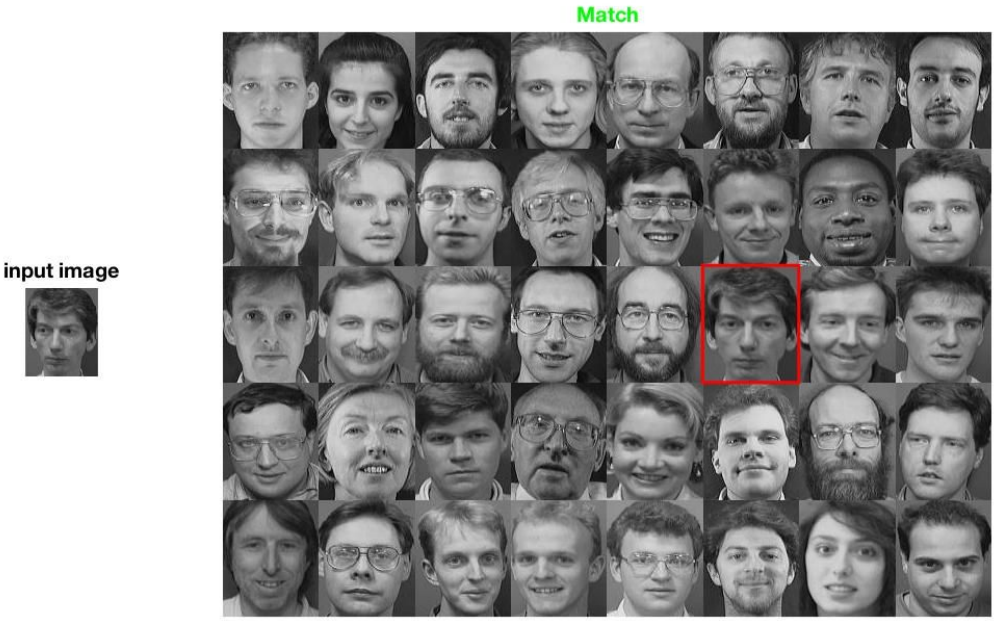
- The method used is following the given paper "Face Recognition in Fourier Space" with variance-based arrangement on selecting frequencies.
- The lower-quadrant method was tested but have a lower recognition rate, so switched to variance-based.

Result:

- For total of 400 photos, 5 photos for each subject are used as training sets and test on all 400 photos, and the recognition rate is 362/400 = 90.5%
- By tilting the photos by 10 degrees, the recognition rate is 30.75%
- By tilting the photos by 90 degrees, the recognition rate is 15.25%
- By tilting the photos by 180 degrees, the recognition rate is 26.5%
- By comparing just the magnitude component, the recognition rate is 87.5%

Sample Output:

Matching result -



Match

input image

Not matching result -

NO match

input image

Tilt by 10 degree match

input image

Match

input image

Match

Rotate 90 degree match

input image

Match

input image

Match

Rotate 180 degree match

input image

Match

input image

Match

Reference:
Hagen S. (May 2000). Face Recognition in Fourier Space