

EE – 368 Project Proposal

October 28, 2015

PCA and LDA for Iris Recognition

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Project Description:

The aim of this project is to use Principal Component Analysis (PCA) and Fisher Linear Discriminant Analysis (LDA) methods for iris recognition. Daugman's algorithm [1] from 1993 is the foundation for many modern iris recognition techniques with very low, unmatched, error rates. However, this method is computationally expensive [2], thus other mathematical models have been pursued.

Using the PCA and LDA methods for iris recognition has shown promising results with fast computation times [3]. These methods would train an algorithm from a large dataset of irises, available from the CASIA Iris Image Database Version 4, which has a range of different classes (twins, iris-at-a-distance, glasses, etc.). The rough outline of the algorithm would include:

- Image segmentation to identify iris and pupil
- Occlusion removal, such as eyelashes
- Eigenvector decomposition using PCA method
- Fisher LDA on a low-dimensional PCA eigenvector space
- Correlation with Fisher vector to test images for identification

The Fisher LDA method should be well suited to perform iris recognition for person identification, as it should accentuate the different iris features, compared to the rest of the set. Using the PCA eigenvector space for the Fisher LDA greatly reduces computational times, as well. Some of the challenges identified in previous works, such as image segmentation and occlusion removal, will be emphasized to improve upon established algorithms.

Implementation:

I do not plan to use an android phone for this project, but plan to use MATLAB.

References:

[1] Daugman, J.G., "High confidence visual recognition of persons by a test of statistical independence," in *Pattern Analysis and Machine Intelligence, IEEE Transactions on* , vol.15, no.11, pp.1148-1161, Nov 1993

[2] Jin-Xin Shi; Xiao-Feng Gu, "The comparison of iris recognition using principal component analysis, independent component analysis and Gabor wavelets," in *Computer Science and Information Technology (ICCSIT), 2010 3rd IEEE International Conference on* , vol.1, no., pp.61-64, 9-11 July 2010

[3] Emad ul Haq, Q.; Javed, M.Y.; Sami ul Haq, Q., "Efficient and robust approach of iris recognition through Fisher Linear Discriminant Analysis method and Principal Component Analysis method," in *Multitopic Conference, 2008. INMIC 2008. IEEE International* , vol., no., pp.218-225, 23-24 Dec. 2008