Abstract

We present a GPU based implementation of a face recognition solution using PCA with Eigenfaces algorithm. We explore a strategy for parallelizing and optimizing this computationally intensive, yet well-known algorithm and show the immense speedups that can be achieved by porting the algorithm to the GPU.

Algorithm

- Improved PCA with Eigenfaces
- Training set grouped into classes containing images with different expression, angle, lighting etc.
- Training process is highly computationally intensive and time consuming.
- Testing process becomes time consuming as number of images in training set increases.

Implementation

- Extraction of feature vectors in training process is parallelized to process multiple training images concurrently.
- Extraction of feature vector testing process is parallelized to concurrently compute each element.
- Computation of Euclidean Distances is parallelized to concurrently process multiple feature vectors.

Results

- Highest speedups achieved on GeForce GTX 480 for database for 15,000 images
- 207x speedup for extraction of feature vectors in training process
- 330x speedup for recognition pipeline
- 165x speedup for overall testing process (testing 40 images)