

Constructing a Basis for Image Reconstruction and Noise Reduction using Principal Component Analysis

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Principal component analysis (PCA) can be used to generate an orthogonal set of principal components, or an orthogonal basis, which can be used to reconstruct elements within and outside of the test set. In this project, a set of images was used to create a set of principal component images (or “eigenimages”), each of which accounts for a certain percent variation (first eigenimage accounting for most variation). The experiment involved taking images of atoms, and taking a background image a few seconds later. Both images are noisy, but most of the noise cancels when the images are divided element wise. We attempt to use PCA to reconstruct a “synthetic” background image that could be used in place of the real background image to reduce even more noise in the images. However, the technique was not yet found successful, as the real image worked better than the “synthetic” image reconstructed using PCA. Here, we summarize the various attempts at implementing PCA in MATLAB to accurately synthesize an image from an image set.

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