

Project 8 (Denoising):

The basic idea behind this project is the estimation of the uncorrupted image from the distorted or noisy image, and is also referred to as image “denoising”. There are various methods to help restore an image from noisy distortions. Selecting the appropriate method plays a major role in getting the desired image. The denoising methods tend to be problem specific. For example, a method that is used to denoise astronomical images may not be suitable for denoising medical images. In this project the student will study the current state of art denoising algorithms namely the BM3D and the KSVD, in the context of astronomical image processing. The BM3D approaches the theoretical Cramer-Rao Bound -meaning it is nearly impossible to do better. The underlying idea behind these methods is that signal can be sparsely represented in some domain. This project requires a good mathematical background and knowledge of some mathematical packages e.g. MATLAB or Mathematica.

References:

1. DIGITAL IMAGE RECONSTRUCTION: Deblurring and Denoising, Annual Review of Astronomy and Astrophysics, Vol. 43: 139-194 (Volume publication date August 2005)
2. K. Dabov, A. Foi, V. Katkovnik, and K. Egiazarian, image denoising with block-matching and 3D filtering, Proc. SPIE El. Imaging 2006, Image Process.: Algorithms and Systems V, no. 6064A-30, San Jose (CA), USA, Jan. 2006.
3. Image denoising by sparse 3D transform-domain collaborative filtering, IEEE Trans. Image Process., vol. 16, no. 8, pp. 2080-2095, Aug. 2007.
4. www.soe.ucsc.edu/~priyam/ksvd_report.pdf

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