Compressed Sensing for Image Recovery
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Motivation: Compressed sensing (CS) is a technique allows for the reconstruction of signals sampled under the Nyquist rate without aliasing artifacts. In order to recover the undersampled signals with CS, the signals have to satisfy all three following conditions: (1) The signals must have a sparse representation in a transform domain, (2) The aliasing artifacts must be incoherent in that domain, (3) There are a nonlinear reconstruction to enforce both sparsity of the image representation and data fidelity. In this project, our signals will be images. We assume all of our signals have a sparse representation in discrete cosine transform (DCT) or discrete wavelet transform (DWT) domain. In other words, our signals are compressible. To achieve incoherent aliasing artifact, we assume our signals are randomly undersampled. Since the main idea of CS is suppressing the incoherent (noise-like) aliasing artifacts in the sparse domain, we can apply this technique for image denoising.

Objectives: We will not use Android devices for this project.

1. Apply CS to image denoising. Since the energy of the noise spreads out while the energy of signals is compressed in some sparse domain like DWT, we can use CS to suppress the noise in that domain.

2. Compare our CS denoising with other state-of-the-art techniques.

3. Extend our CS method to recover images distorted by noise from their undersampled data.

References


