EE367 Project: Implementation of the weighted nuclear norm minimization for image denoising

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Motivation

- Image denoising is an important part of the image processing pipeline
- Foundational to other tools
- Gain insight by implementing a state of the art technique based on weighted nuclear norm minimization (WNNM)

Method

- WNNM denoising relies on the assumption that the structure in the image can be identified among the noise using a matrix low rank approximation

![Diagram showing the denoising process]

Related Work

- Numerous techniques available from simple Gaussian and median filters to denoising convolutional neural networks (DnCNN)
- Non-local approaches have superior performance [1], especially Block matching and 3D filtering (BM3D) [2], WNNM [3], and DnCNN

Experimental Results

- Compare to other denoising techniques

<table>
<thead>
<tr>
<th>Clean</th>
<th>Noisy</th>
<th>Gaussian</th>
<th>Bilateral</th>
<th>NLM</th>
<th>WNNM</th>
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<td>0.39</td>
<td>0.81</td>
<td>0.88</td>
<td>0.93</td>
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</table>

- Averages across 15 grayscale images:

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<tbody>
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References