Single Image Super-Resolution using Transformed Self-Exemplars
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Goal:
Recover high-res image from low-res observation

Method
Nearest neighbor field (NNF) estimation
Objective function
\[
\min_{\{\theta_i\}} \sum_{i \in \Omega} E_{\text{app}}(t_i, \theta_i) + E_{\text{plane}}(t_i, \theta_i) + E_{\text{scale}}(t_i, \theta_i)
\]

Patch transformation
\[
T_i(\theta_i) = H(t_i, s_i^t, s_i^p, m_i) \cdot S(s_i^t, s_i^p) \cdot A(s_i^c, s_i^c)
\]

Inference: PatchMatch algorithm [Barnes et al. SIGGRAPH 09, ECCV 10]

Coarse-to-fine reconstruction
- Each level, perform NNF
- Reconstruct current level via voting
- Run iterative back-projection algorithm to ensure consistency of HR-LR

Quantitative evaluation

Contributions:
1. Increase the size of internal dictionary using transformed patches
2. Decomposition of perspective and affine transformation.
3. New dataset of urban images

Results on Urban 100 (4x)
Results on Sun-Hays 80 (8x)