Another Take on Patch-Based Image Processing

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What if we take all the overlapping patches from a given image and organize them to form the shortest path by using their mutual distances? This suggests a reordering of the image pixels in a way that creates a maximal 1D regularity. Could we repeat this process in several scales ? What could we do with such a construction? In this talk we consider a wider perspective of the above line of questions: We introduce a wavelet transform that is meant for data organized as a connected-graph or as a cloud of high-dimensional points. The proposed transform constructs a tree that applies a 1D wavelet decomposition filters, coupled with a pre-reordering of the input, so as to best sparsify the given data. We adopt this transform to image processing tasks by considering the image as a graph, where every patch is a node, and vertices are obtained by Euclidean distances between corresponding patches. We show three ways to use the above ideas in practice - adopt only the patch-reordering, use the obtained wavelet transform as a sparsifying process, and a third approach were this transform is used as a regularizer. State of- the-art image denoising, deblurring, and inpainting results are obtained with the proposed schemes.

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