Laplacian Matrices for Image Compression by Adaptive Thinning

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In previous work, we have proposed a concept for digital image compression. This compression scheme relies on a locally adaptive algorithm, *adaptive thinning*, for sparse approximation of images. It utilizes linear splines over anisotropic Delaunay triangulations.

For further improvement on this concept, we want to improve the image quality on some triangles of the triangulation. But this requires a technique which allows us to work with irregular data domains. To this end, we apply signal processing on graphs, which merges algebraic and spectral graph theoretic concepts with computational harmonic analysis.

We interpret the given data as a graph signal on a graph given over each triangle and apply the graph Fourier transform. In the graph spectral domain we are then able to apply filtering methods on the data. To achieve an efficient compression, special care should be taken when selecting each graph, so that it adapts to the given data.

In this talk, we will show how to choose the optimal edge weight of the Laplacian matrix, and thus for the graph, by approximating the Karhunen-Loève Transform.

This talk is based on joint work with Armin Iske.