Spectral wavelet packets frames for signals on finite graphs

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Classical transforms, as Fourier, wavelet, wavelet packets and time-frequency dictionaries have been generalized to functions defined on finite, undirected graphs, where the connections between vertices are encoded by the Laplacian matrix. The main goal is to obtain atoms which are jointly localized both in the vertex domain (the analogue of the time domain for signals on the real line) and the graph spectral domain (the analogue of the frequency domain).
Despite working in a finite and discrete environment, many problems arise in applications where the graph is very large, as it is not possible to determine all the eigenvectors of the Laplacian explicitly. For example, in the case of our interest: a voxel-wise brain graph $\mathcal{G}$ with 900760 nodes (representing the brain voxels), and signals given by the fRMI (functional magnetic resonance imaging).
We present a new method to generate frames of wavelet packets defined in the graph spectral domain to represent signals on finite graphs.
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