Title: Using Hankel low-rank approximation for sparse signal recovery

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Abstract: Structured low-rank approximation is used in model reduction, system
identification, and signal processing to find low-complexity models from data [1]. The rank constraint imposes the condition that the approximation has bounded complexity and the optimization criterion aims to find the best match between the data and the approximation. In some applications, however, the data
is sub-sampled from a trajectory, which poses the problem of sparse approximation using the the low-rank prior.

In [2], we consider a modified structured low-rank approximation problem, where
the observed data is a linear transformation of a system's trajectory with reduced dimension. We reformulate this problem as a structured low-rank approximation problem with missing data and propose a solution methods based on
the variable projections principle. A comparison of the structured low-rank approximation approach with the classical sparsity inducing method of 1-norm regularization is also presented. The 1-norm regularization method is effective for sum-of-exponentials modeling with a large number of samples, however, it is
not suitable for identification of systems with damping.

References:

[1] I. Markovsky. Low-Rank Approximation: Algorithms, Implementation, Applications. Springer, second edition, 2018.

[2] I. Markovsky and P.-L. Dragotti. Using structured low-rank approximation for
sparse signal recovery. In Latent Variable Analysis and Signal Separation, Lecture Notes in Computer Science, pages 479-487. Springer, 2018. URL: http://homepages.vub.ac.be/~imarkovs/publications/ica18b.pdf