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Factored-form matrix sign iteration via principal pivot transforms

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We describe a way to implement the matrix sign iteration $H_{k+1} = \frac{1}{2}(H_k + H_k^{-1})$ on a dense Hamiltonian matrix of the form

$$\mathrm{H}_k = \begin{bmatrix} A_k & B_k B_k^T \\ C_k^T C_k & -A_k^T \end{bmatrix}$$

in such a way that the blocks in positions $(1,2)$ and $(2,1)$ are kept in low-rank factored form. The algorithm operates on their generators B_k and C_k directly, and relies on principal pivot transforms (PPTs) as its main building block; more specifically it makes use of the framework for factored-form PPTs in [Poloni, Strabic 2016]. We discuss the stability properties of the resulting algorithm, as well as applications that make use of the low-rank factors directly.

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