The computation of isotropic vectors

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We show how to compute isotropic vectors for matrices with real or complex entries. These are unit vectors b satisfying $b^*Ab = 0$ where the $*$ denotes the conjugate transpose. For real matrices, the algorithm uses only the eigenvectors of the symmetric part of A corresponding to the extreme eigenvalues. For complex matrices, we first use the eigenvalues and eigenvectors of the Hermitian matrix $K = (A - A^*)/2i$. This works in many cases. In case of failure, we use the eigenvectors of the Hermitian part H or a combination of eigenvectors of H and K. We give some numerical experiments comparing our algorithm with those proposed in [2] and [1]. In many cases our algorithm use only one computation of eigenvectors whence the other algorithms use at least two computations of eigenvectors.

References

[1] R. Carden, *A simple algorithm for the inverse field of values problem*, Inverse Problems, v 25 (2009), pp. 1–9.

[2] C. Chorianopoulos, P. Psarrakos and F. Uhlig, *A method for the inverse numerical range problem*, Elec. J. Linear Alg., v 20 (2010), pp. 198–206.