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# Polynomial eigenvalue solver based on tropically scaled Lagrange linearization

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## Abstract

We propose an algorithm to solve polynomial eigenvalue problems via linearization combining several ingredients: a specific choice of linearization, which is constructed using input from tropical algebra and the notion of well-separated tropical roots, an appropriate scaling applied to the linearization and a modified stopping criterion for the  $QZ$  iterations that takes advantage of the properties of our scaled linearization. Numerical experiments suggest that our polynomial eigensolver computes all the finite and well-conditioned eigenvalues to high relative accuracy even when they are very different in magnitude.

*Keywords:* polynomial eigenvalue problem, linearization, tropical scaling, well-separated tropical roots, block companion linearization, Lagrange-type linearization

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\*Fully documented templates are available in the elsarticle package on CTAN.

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