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The origin and nature of spurious eigenvalues in the spectral tau method. (English)

Zbl 0924.65077

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The tau method, first proposed by Lanczos, is a means of solving boundary value problems for ordinary differential equations using truncated series expansions in a complete set of orthogonal functions. From the author's summary: 'The Chebyshev-tau spectral method for approximating eigenvalues of boundary value problems may produce spurious eigenvalues with large positive real parts, even when all true eigenvalues of the problem are known to have negative real parts. We explain the origin and nature of the 'spurious eigenvalues' in an example problem. The explanation will demonstrate that the large positive eigenvalues are an approximation of infinite eigenvalues in a nearby generalized eigenvalue problem'.

Reviewer: [W.Velte \(Würzburg\)](#)

MSC:

- [65L15](#) Numerical solution of eigenvalue problems involving ordinary differential equations
- [65L10](#) Numerical solution of boundary value problems involving ordinary differential equations
- [34L15](#) Eigenvalues, estimation of eigenvalues, upper and lower bounds of ordinary differential operators
- [65L60](#) Finite element, Rayleigh-Ritz, Galerkin and collocation methods for ordinary differential equations
- [34B05](#) Linear boundary value problems for ordinary differential equations

Cited in **8** Documents

Keywords:

Lanczos tau method; series expansions; orthogonal functions; Chebyshev-tau spectral method; spurious eigenvalues; generalized eigenvalue problem

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