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The Chebyshev-Legendre method: Implementing Legendre methods on Chebyshev points.
(English) [Zbl 0815.65106](#)
SIAM J. Numer. Anal. 31, No. 6, 1519-1534 (1994).

The authors present a new method for the numerical solution of partial differential equations. This method utilizes the Chebyshev collocation points allowing the use of fast Fourier algorithms and avoiding the roundoff error associated with computing the Legendre grid points. The boundary conditions are imposed via a new penalty technique in such a way that the method is stable in the usual L_2 norm. The authors discuss and prove stability of this new method for the heat equation with Robin boundary conditions. Some numerical experimentations are given.

Reviewer: [K.Najzar \(Praha\)](#)

MSC:

- [65M70](#) Spectral, collocation and related methods for initial value and initial-boundary value problems involving PDEs
- [65M12](#) Stability and convergence of numerical methods for initial value and initial-boundary value problems involving PDEs
- [35K05](#) Heat equation

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Keywords:

Chebyshev-Legendre method; penalty method; Chebyshev collocation points; fast Fourier algorithms; stability; heat equation; Robin boundary conditions; numerical experimentations

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