

**Krivodonova, Lilia; Qin, Ruibin**

**An analysis of the spectrum of the discontinuous Galerkin method.** (English) Zbl 1255.65166

Appl. Numer. Math. 64, 1-18 (2013).

Summary: We derive explicit expressions for the eigenvalues (spectrum) of the discontinuous Galerkin spatial discretization applied to the linear advection equation. We show that the eigenvalues are related to the subdiagonal  $[p/p+1]$  Padé approximation of  $\exp(-z)$  when  $p$ th degree basis functions are used. We derive an upper bound on the eigenvalue with the largest magnitude as  $(p+1)(p+2)$ . We demonstrate that this bound is not tight and prove that the asymptotic growth rate of the spectral radius is slower than quadratic in  $p$ . We also analyze the behavior of the spectrum near the imaginary axis to demonstrate that the spectral curves approach the imaginary axis although there are no purely imaginary eigenvalues.

**MSC:**

**65M20** Method of lines for initial value and initial-boundary value problems involving PDEs

**65M70** Spectral, collocation and related methods for initial value and initial-boundary value problems involving PDEs

Cited in **1** Review  
Cited in **17** Documents

**Keywords:**

discontinuous Galerkin method; hyperbolic equations; linear stability; eigenvalues; CFL condition; Padé approximants

**Full Text:** [DOI](#)