ANDRÉ FORTIN, Université Laval

A discontinuous Galerkin method for stiff ODEs and DDEs

We present a very high order implicit discontinuous Galerkin method for the solution of stiff ordinary differential equations (ODEs) and delay differential equations (DDEs). The proposed method is based on Legendre orthogonal polynomials of degree k and is shown to converge at order $k+1$ in L^2 and sup norms. We show how the error can be estimated allowing a very efficient control of the time step. We also propose a breaking point detection algorithm for DDEs. We will present numerous examples (with $k=10$ and thus converging at order 11) to illustrate the efficiency of the method: stiff ODES with discontinuous right-hand sides, stiff DDEs with discontinuous solutions (breaking points), neutral DDEs, DDEs where classical solutions cease to exist, etc.