Explicit Extended Stability Time Stepping Methods.

We consider explicit methods for systems of ordinary differential equations which have stiffness due to imaginary eigenvalues. We present a cost, stability region, and numerical comparison of super time stepping and dyadic extended time schemes used to overcome the CFL stability condition limitation on time steps. We include a new explicit method that combines dyadic time stepping with a skew-stabilized method that maintains a low computational cost through the method’s ability to maintain a reasonable time step size due to stiffness due to disparate eigenvalue sizes. The skew-stabilization allows a relaxation of the positive definite requirement of the symmetric portion of the Jacobian matrix when the imaginary component of the eigenvalue is large in comparison to the real eigenvalue. (Received September 22, 2011)