A Combined Error Control with Forward Euler Method for Dynamical Systems

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Abstract : Variable time-stepping algorithms for solving dynamical systems performed poorly for long time computations which pass close to a fixed point. To overcome this difficulty, several authors considered phase space error controls for numerical simulation of dynamical systems. In one generalized phase space error control, a step-size selection scheme was proposed, which allows this error control to be incorporated into the standard adaptive algorithm as an extra constraint at negligible extra computational cost. For this generalized error control, it was already analyzed the forward Euler method applied to the linear system whose coefficient matrix has real and negative eigenvalues. In this paper, this result was extended to the linear system whose coefficient matrix has complex eigenvalues with negative real parts. Some theoretical results were obtained and numerical experiments were carried out to support the theoretical results.

Keywords : adaptivity, fixed point, long time simulations, stability, linear system
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