

*On tight stepsize restrictions for monotonicity and positivity of
Runge-Kutta methods*

Inmaculada Higuera (Public University of Navarre), Teo Roldan

We consider differential problems whose solutions have qualitative properties that are relevant in the context of the problem. When these problems are solved numerically, the preservation of these qualitative properties is crucial to obtain physically meaningful numerical solutions. Strong Stability Preservation (SSP) theory can be used to obtain time step bounds that ensure this preservation. However, it is well known that, for many problems, the step-size restrictions obtained with this approach are not sharp, and some robust non-SSP methods performs well. Sharper step size restrictions can be obtained by taking into account the structure of the differential problem. In this talk, we show some results on the numerical preservation of monotonicity and positivity of Runge-Kutta methods for some classes of problems.

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