Title: Extrapolation of symmetrized Runge-Kutta methods

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Symmetric methods such as those of the Gauss and Lobatto IIIA families of high order are of special interest because their numerical solutions possess asymptotic error expansions in even powers of the stepsize. This property can therefore be exploited by acceleration techniques such as extrapolation to increase the order by two at a time. Although symmetric methods can have high classical order and can be A-stable, their order is often observed to be lower when applied to stiff problems. This order reduction phenomenon will weaken the advantage of performing extrapolation because of the uncertainty in choosing the correct extrapolation formula. In addition to this difficulty, the weak damping property of symmetric methods may cause extrapolation of symmetric methods to be inefficient. However, these issues had been overcome by a technique known as symmetrization. Symmetrization is carried out by a symmetrizer which is constructed by taking the composition of two symmetric Runge-Kutta methods but with different weights. In this talk, we present numerical results in the variable stepsize setting that show that symmetrization is more efficient when performed with extrapolation for mildly stiff and stiff linear and nonlinear problems. We also present results that show the most efficient strategy is to combine passive symmmetrization with passive extrapolation.