

A positivity preservation property of Runge-Kutta based convolution quadratures

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Recently the two authors together with F.-J. Sayas have used a positivity preservation property of low order convolution quadratures to analyse a fully discrete FEM/BEM coupling in the time domain. Here we extend this positivity property to A-stable Runge-Kutta based methods, hence allowing for higher order approximations. The proof requires an adaptation of M. Crouzeix's proof of von Neumann's theorem as given in E. Hairer, G. Wanner, *Solving Ordinary Differential Equations, II*.

As an application of the result we consider a boundary integral formulation of a scattering problem with a non-linear impedance boundary condition and its Radau IIA based time-discretization.