IMEX-Peer Methods Based on Extrapolation

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In [1], we have investigated a new class of implicit–explicit (IMEX) two-step methods of Peer type for systems of ordinary differential equations with both non-stiff and stiff parts included in the source term. An extrapolation approach based on already computed stage values is applied to construct IMEX methods with favourable stability properties. For equidistant nodes, IMEX-Peer methods are equivalent to the well known IMEX-BDF methods. New optimised IMEX-Peer methods with general nodes of order $p = 2, 3, 4$, are given as result of a search algorithm carefully designed to balance the size of the stability regions and the extrapolation errors. Numerical experiments and a comparison to other implicit–explicit methods will be presented.

[1] J. Lang, W. Hundsdorfer
Extrapolation-based implicit-explicit Peer methods with optimised stability regions,
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