

Modified exponential Rosenbrock methods to increase their accuracy

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A technique will be described to avoid order reduction with exponential Rosenbrock methods when integrating initial boundary value problems with time-dependent boundary conditions. That requires to calculate some information on the boundary from the given data. We have proved that, under some assumptions on the coefficients of the method which are mainly always satisfied, no numerical differentiation is required to approximate that information in order to achieve order 4 for parabolic problems with Dirichlet boundary conditions. With Robin/Neumann ones, just numerical differentiation in time may be necessary for order 4, but none for order ≤ 3 . Furthermore, as with this technique it is not necessary to impose any stiff order conditions, in search of efficiency, we recommend some methods of classical orders 2, 3 and 4 and some comparisons with several methods in the literature, with the corresponding stiff order, will be shown.

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