IMPLICIT-EXPLICT GENERAL LINEAR METHODS WITH INHERENT RUNGE-KUTTA STABILITY

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We investigate implicit-explicit (IMEX) general linear methods (GLMs) with inherent Runge-Kutta stability (IRKS) for differential systems with non-stiff and stiff processes. The construction of such formulas start with implicit GLMs with IRKS which are A- and L-stable, and then we 'remove' implicitness in non-stiff terms by extrapolating unknown stage derivatives by stage derivatives which are already computed by the method. Then we search for IMEX schemes with large regions of absolute stability of the 'explicit part' of the method assuming that the 'implicit part' of the scheme is $A(\alpha)$-stable for some $\alpha \in (0, \pi/2]$. Examples of highly stable IMEX GLMs are provided of order $1 \le p \le 5$. Numerical examples are also given which illustrate good performance of these schemes. This is a joint work with M. Braś and G. Izzo.