Highly stable multivalue numerical methods

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Abstract

The numerical solution of partial differential equations discretized along the space variables requires the employ of highly stable methods, due to their intrisic multiscale (thus stiff) nature. The purpose of this paper is then the introduction of some building blocks leading to an efficient and accurate treatment of such stiff problems through highly stable multivalue numerical methods. We present a strategy based on a suitable modification of collocation technique which avoids, unlike classical collocation based Runge-Kutta methods, the order reduction phenomenon. Some novel issues on the error analysis, in view of a combined variable stepsize-variable order implementation, are here presented.