Experiments with a variable-stepsize/variable-order code based on explicit general linear methods

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This talk is about various issues relevant to the development of the code for nonstiff ordinary differential systems based on a class of general linear methods (GLMs) with inherent Runge–Kutta stability (IRKS). These issues include the choice of initial stepsize, computation of the starting vector, construction of continuous interpolants, local error estimation, stepsize and order changing strategies, and updating vectors of external approximations, which propagate from step to step. The resulting experimental code `irks14.m` based on GLMs with IRKS of order $1 \leq p \leq 4$ is tested and compared with the state-of-art code from the MATLAB ODE suite for the numerical solution of nonstiff ODEs, and it is demonstrated that `irks14.m` is more efficient than `ode45.m` for moderate and stringent tolerances.

Keywords: Ordinary differential equations, General linear methods, Inherent Runge–Kutta stability, Adaptive stepsize and order selection.

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