Explicit peer methods with variable nodes
Marcel Klinge (Martin Luther University Halle-Wittenberg), R. Weiner

We consider a special class of explicit general linear methods, explicit peer methods with $s$ stages as introduced in [2] of the form

$$U_{m,i} = \sum_{j=1}^{s} b_{ij} U_{m-1,j} + h_m \sum_{j=1}^{s} a_{ij} f(t_{m-1,j}, U_{m-1,j}) + h_m \sum_{j=1}^{i-1} r_{ij} f(t_{m,j}, U_{m,j}),$$

for $i = 1, \ldots, s$

for the solution of nonstiff initial value problems. In general, these methods require $s$ function calls per step. By using a special structure of the coefficients of the explicit peer method [1], we say an explicit peer method has $n_s$ shifted stages and $s_e = s - n_s$ effective stages, it is possible to reduce the number of function evaluations per step to $s_e$. This implies for variable step sizes variable nodes, which depend on the step size ratio and the nodes of the previous step. In this talk we present methods with $s = 4, 5, 6$ stages and $n_s = 2, 3$ shifted stages of order $p = s$ (for constant step sizes superconvergent of order $p = s + 1$) which are tested in MATLAB and compared with ode23 and ode45.

References
