

Numerical ODE Project List

1. Tony and Joe's Dreidel project.
2. Elaheh, Chad, and Jane: Restricted Memory RK Schemes

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Low-storage, explicit Runge–Kutta schemes for the compressible Navier–Stokes equations

Christopher A. Kennedy a; Mark H. Carpenter b, R. Michael Lewis
Applied Numerical Mathematics 35 (2000) 177–219

3. Jason and Rich: High-Order RK schemes
4. Nikhil and Chuck. Customized Explicit RK schemes as "scheme accurate" predictors for implicit schemes.
5. Improving Jacobian recomputation using Broyden like updates.
6. Waveform Relaxation:
 - 6.1. Stationary Schemes: Low-order composite quadrature schemes (Trap, Mid, Simp, etc.). Convergence and accuracy.
 - 6.2. Stationary Schemes: High-order non-composite quadrature schemes (Newton-Cotes, Gauss-Konrod, Clenshaw-Curtis etc.). Convergence and accuracy.
 - 6.3. Non-stationary schemes interpreted as GLM methods: Variable stepsize schemes, variable advancement, and step-size control.
 - 6.4. Starting Methods for WR schemes. Scaling schemes.
 $\{t_0 + h_1, \dots, t_0 + h_m\} \rightarrow \{t_0 + \alpha h_1, \dots, t_0 + \alpha h_m\}$ with $\alpha > 1$ for starting methods and $\alpha < 0$ if we need to shrink.
7. Taylor/Rosenbrock Like Schemes with Broyden like updates.
8. Extrapolation Schemes.