

High Order Adaptive Time Integration Methods and Application Through the SUNDIALS Library

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The SUNDIALS library of time integrators and nonlinear solvers has long provided adaptive step and order linear multistep time integration methods. Several years ago, the ARKODE package of additive multistage methods allowing for high order, adaptive diagonally implicit, explicit, and implicit/explicit (ImEx) methods was added to SUNDIALS. Recently, we have released new implementations of multirate methods which allow for advancing partitions of the differential equation right-hand-side function with a small time step and other partitions with a large time step, yet still retaining high order accuracy. I will overview the SUNDIALS library, including its high order, adaptive implementations of multistep, multistage, and multirate methods then show examples of their use within several scientific applications.

Prepared by LLNL under Contract DE-AC52-07NA27344. LLNL-ABS-860407.