Recent Advances in Efficient Numerical ODE Solution in Maple

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Abstract

Over the last year there have been significant advances to the numerical ODE sector in Maple. These include the integration of the numerical IVP solution package of Dr. L. Shampine and Dr. R. Corless (NODES) into Maple, joint work with Dr. J. Verner on enhancement of Maple's high-accuracy numerical IVP solver dverk78, and the addition of a general purpose numerical BVP solver, all available in Maple 7.

In addition, the Differential Numerical Algorithms (DNA) package co-developed with Dr. Cheb-Terrab, provides tools for efficient solution and visualization of numerical ODE IVP solutions, as well as visualization of exact ODE solutions in Maple. The DNA package is available as an add-on package to Maple 6 and Maple 7.

All codes above represent significant enhancements to existing functionality, additional functionality, or a tremendous speedup of existing codes. Many of these codes have been made efficient through use of a hybrid model, where the control code is written in interpreted Maple, with the core workhorse routines written in compiled C, and used via external library calls.

I will discuss and demonstrate these enhancements, the advantages and disadvantages of the hybrid model, and ongoing research in this area.