

## ON GLOBAL ERROR ESTIMATION AND CONTROL OF FINITE DIFFERENCE SOLUTIONS FOR PARABOLIC EQUATIONS

K. DEBRABANT<sup>\*</sup> AND J. LANG<sup>†</sup>

<sup>\*</sup> University of Southern Denmark,  
Department of Mathematics and Computer Science

<sup>†</sup> Darmstadt University of Technology,  
Department of Mathematics

**Abstract.** In this talk we will report on some joint activities with Jan Verwer (CWI) regarding efficiency and reliability questions for finite difference approximations of parabolic problems. First, systems of ODEs are considered. We have implemented classical global error estimation based on the first variational equation, and global error control, for which we have used the property of tolerance proportionality. We have found, using the Runge-Kutta-Rosenbrock method ROS3P as example integrator, that the classical approach is remarkably reliable. For finite difference approximations of parabolic PDEs, the ODE approach is combined with estimates for the spatial truncation errors based on Richardson extrapolation. Numerical examples are used to illustrate the reliability of the estimation and control strategies.