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FAKULTÄT FÜR MATHEMATIK
Dekan:
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Einladung zur öffentlichen Defensio von

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Thema der Dissertation:

Optimization Techniques for Error Bounds of ODES

Abstract:

Error bounds of initial value problems with uncertain initial conditions are traditionally computed by using interval analysis but with limited success. Traditional analysis only leads to asymptotic error estimates valid when the maximal step size tends to zero, while efficiency in the approximation requires that step sizes are as large as possible without compromising accuracy. Recent progress in global optimization makes it feasible to treat the error bounding problem as a global optimization problem. This is particularly important in the case where the differential equations or the initial conditions contain significant uncertainties. A new solver DIVIS (Differential Inequality based Validated IVP Solver) has been developed to compute the error bounds of initial value problems by using defect estimates and optimization techniques. The basic idea is to compute the defect estimates of initial value problems by using outer ellipsoidal approximation. The validated state enclosures are computed by applying differential inequalities. Convergence of the method depends upon a suitable choice of preconditioner. The scheme is implemented in MATLAB and AMPL and the resulting enclosures are compared with VALENCIA-IVP, VNODE-LP and VSPODE

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