Probabilistic Time Integration for Semi-explicit PDAEs

Afsaneh Moradi (Otto-von-Guericke Universität Magdeburg), Robert Altmann

This talk is about the application of probabilistic time integration methods to semi-explicit partial differential–algebraic equations of parabolic type and its semi-discrete counterparts, namely semi-explicit differential–algebraic equations of index 2. The proposed methods iteratively construct a probability distribution over the solution of deterministic problems, enhancing the information obtained from the numerical simulation. The efficacy of the randomized versions of the implicit Euler method, the midpoint scheme, and exponential integrators of first and second order are examined. By demonstrating the consistency and convergence properties of these solvers, their utility in capturing the sensitivity of the solution to numerical errors is illustrated. Our analysis establishes the theoretical validity of randomized time integration for constrained systems and offers insights into the calibration of probabilistic integrators for practical applications.

[link to pdf] [back to Numdiff-17]