M. Arnold, B. Burgermeister, A. Eichberger
Linearly Implicit Time Integration Methods in Real-time Applications: DAEs and stiff ODEs. - Multibody System Dynamics 17:99–117. - 2007.

Abstract. The methods for the dynamical simulation of multi-body systems in real-time applications have to guarantee that the time integration of the equations of motion is always successfully completed within an a priori fixed sampling time interval, typically in the range of 1.0–10.0 ms. Model structure, model complexity and numerical solution methods have to be adapted to the needs of real-time simulation. Standard solvers for stiff and for constrained mechanical systems are implicit and can not be used straightforwardly in real-time applications because of their iterative strategies to solve the non-linear corrector equations and because of adaptive strategies for stepsize and order selection. As an alternative, we consider in the present paper non-iterative fixed stepsize time integration methods for stiff ordinary differential equations (ODEs) resulting from tree-structured multi-body system models and for differential-algebraic equations (DAEs) that result from multi-body system models with loop-closing constraints.

Contact: martin.arnold@mathematik.uni-halle.de,
bernhard.burgermeister@mathematik.uni-halle.de,
alex.eichberger@simpack.de