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The generalized- $\alpha$  method in industrial multibody system simulation. In K. Arczewski, J. Fraćzek, M. Wojtyra (eds.): Proc. of Multibody Dynamics 2009 (ECCOMAS Thematic Conference). - Warsaw, Poland, 29 June – 2 July 2009.

**Abstract.** Most state-of-the-art solvers for time integration in industrial multibody system simulation packages are based on classical methods for first order ordinary differential equations (ODEs) like BDF or Runge–Kutta methods. Recently, the extension of Newmark like time integration methods from structural dynamics to constrained mechanical systems in multibody dynamics found much interest.

Further attempts will be necessary to make Newmark like integrators fully competitive to standard BDF and (implicit) Runge–Kutta solvers in industrial multibody system simulation. In the present paper, we discuss the application of the generalized- $\alpha$  method of Chung and Hulbert to the Gear–Gupta–Leimkuhler formulation of the equations of motion.

The structure of model equations in industrial applications is often more complex than in a textbook presentation. A Gear–Gupta–Leimkuhler like index reduced formulation of the model equations is constructed for DAE models with auxiliary algebraic variables that describe, e.g., the location of contact points. In the application to these more complex model equations, the generalized- $\alpha$  method is again shown to converge with order  $p = 2$  in all solution components.

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