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Multi-rate time integration for large scale multibody system models. In: P. Eberhard, editor, *IUTAM Symposium on Multiscale Problems in Multibody System Contacts*, pages 1–10. – Springer–Verlag, Dordrecht, 2007.

Abstract. In industrial applications of multibody dynamics the standard time integration methods are implicit. They are tailored to small and medium-sized nonlinear differential-algebraic equations of motion that may contain stiff components resulting from stiff force elements [1]. In high-end applications with thousands of degrees of freedom these implicit solvers show a dramatical loss of efficiency. Typical examples are multibody system models of vehicles that move along large elastic structures [3] and the dynamical simulation of combustion engines with chain drives [2].

Large scale problems that are composed of subsystems with different time scales may be handled efficiently by *multi-rate* methods that use different time stepsizes in different subsystems. In the present paper, we consider theoretical and practical aspects of multi-rate time integration in multibody dynamics.

References

- [1] E. Hairer and G. Wanner. *Solving Ordinary Differential Equations. II. Stiff and Differential-Algebraic Problems*. Springer–Verlag, Berlin, 2nd edition, 1996.
- [2] G. Hippmann, M. Arnold, and M. Schittenhelm. Efficient simulation of bush and roller chain drives. In J.M. Goicolea, J. Cuadrado, and J.C. García Orden, editors, *Proc. of Multibody Dynamics 2005 (ECCOMAS Thematic Conference)*, Madrid, Spain, 2005.
- [3] A. Veitl and M. Arnold. Coupled simulation of multibody systems and elastic structures. In J.A.C. Ambrósio and W.O. Schiehlen, editors, *Advances in Computational Multibody Dynamics*, pages 635–644, IDMEC/IST Lisbon, 1999.

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