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Stepsize control versus fixed stepsize time integration: Theory and practical experience. In C.L. Bottasso, P. Masarati, L. Trainelli, (eds.): Proc. of Multibody Dynamics 2007 (ECCOMAS Thematic Conference). - Milan, Italy, 25-28 June, 2007.

Abstract. In system dynamics, higher order time integration methods with stepsize and order control are the methods of choice for the time integration of nonlinear small and medium-sized systems. These methods have originally been developed for the time integration of ordinary differential equations (ODEs). In the 1990's, they were extended to special types of differential-algebraic equations (DAEs) like the equations of motion of constrained mechanical systems. Practical experience from the dynamical simulation of complex multibody system models including strong nonlinearities shows, however, surprisingly good results for low order fixed stepsize methods that prove to be much more robust than the sophisticated higher order methods. The present paper contributes to a better understanding of this practically observed behaviour and studies some algorithmic modifications to improve the performance of higher order standard methods.

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