O. Brüls, A. Cardona, M. Arnold

Abstract. This paper studies a family of Lie group time integrators for the simulation of flexible multibody systems. The method provides an elegant solution to the rotation parameterization problem and, as an extension of the classical generalized-α method for dynamic systems, it can deal with constrained equations of motion. Here, second-order accuracy of the Lie group method is demonstrated for constrained problems. The convergence analysis explicitly accounts for the nonlinear geometric structure of the Lie group. The performance is illustrated on two critical benchmarks of rigid and flexible systems with large rotation amplitudes. Second-order accuracy is evidenced in both of them. The remarkable simplicity of the new algorithms opens some interesting perspectives for real-time applications, model-based control and optimization of multibody systems.

Contact: `o.bruls@ulg.ac.be`, `martin.arnold@mathematik.uni-halle.de`