
**Abstract:** We use Lagrangian formalism and jet spaces to derive a computational model to simulate multibody dynamics with holonomic constraints. Our approach avoids the traditional problems of drift-off and spurious oscillations. Hence even long simulations remain physically relevant. We illustrate our method with several numerical examples.

**AMS subject classifications:** primary 65L80, 70E55 secondary 34A26, 65L05

**Keywords:** differential algebraic equations, multibody systems, Runge-Kutta methods, lagrangian mechanics

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