

## A NONHOLONOMIC NEWMARK METHOD

**Sebastián José Ferraro**

Inst. de Matemática (INMABB), Depto. de Matemática, Univ. Nac. del Sur (UNS) - CONICET, Bahía Blanca, Argentina  
sferraro@uns.edu.ar

Using the nonholonomic exponential map, we obtain a new version of Newmark-type methods for non-holonomic systems (see also [1] for a different extension). We give numerical examples including a test problem where the structure of reversible integrability responsible for good energy behavior as described in [2] is lost. We observe that the composition of two Newmark methods is able to nevertheless produce good energy behaviour on this test problem.

*Trabajo en conjunto con Alexandre Anahory Simoes (Instituto de Ciencias Matemáticas, ICMAT c/ Nicolás Cabrera, no 13-15, Campus Cantoblanco, UAM 28049 Madrid, Spain), Juan Carlos Marrero (ULL-CSIC Geometría Diferencial y Mecánica Geométrica, Departamento de Matemáticas, Estadística e IO, Instituto Universitario de Matemáticas y Aplicaciones de la ULL, IMAULL, Tenerife, Canary Islands, Spain) y David Martín de Diego (Instituto de Ciencias Matemáticas, ICMAT c/ Nicolás Cabrera, no 13-15, Campus Cantoblanco, UAM 28049 Madrid, Spain).*

### Referencias

- [1] L. O. Jay and D. Negrut. A second order extension of the generalized- $\alpha$  method for constrained systems in mechanics. In *Multibody dynamics*, volume 12 of *Comput. Methods Appl. Sci.*, pages 143-158. Springer, Berlin, 2009.
- [2] K. Modin and O. Verdier. What makes nonholonomic integrators work? *Numer. Math.*, 145:405-435, 2020.