

THE MS2DISCOVERY INTERDISCIPLINARY RESEARCH INSTITUTE

WATERLOO | CANADA

Noisy rolling ball: non-holonomic constraints perturbed by the noise, conservation of integrals of motion and rolling friction

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We will discuss some examples of mechanical systems with non-holonomic constraints are modified by the presence of noise. The modification introduces an interesting type of stochasticity in the equations of motion, which will be illustrated on the example of a Routh (Chaplygin) sphere rolling on a flat surface. This is a classical example of a non-holonomic system possessing three integrals of motion, namely the energy, Jellet and Routh. We will show that depending on the type of noise introduced in the rolling constraint, one can either preserve either energy only, both energy and Jellet, or only Jellet integrals. We also derive the general theory of motion of non-holonomic systems of the semidirect product type, and discuss general results on energy preservation. We conclude with a discussion of the relevance of this work for rolling friction in dynamics due to random slipping as originally suggested by Reynolds (1876).

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Dr. Putkaradze is the Centennial Professor of Mathematics at the University of Alberta. He obtained his PhD from the University of Copenhagen in 1997. Since then, he has held academic positions at the universities of Chicago, New Mexico and Colorado State (mathematics and biomedical engineering). In 2012 he has moved to the University of Alberta and is affiliated with Departments of Mathematics and Chemical Engineering. In 2006 he was awarded a Humboldt Fellowship. His research spans a diverse number of areas, including geometric and variational methods in continuous media, mechanical resonator-based sensors and renewable energy.

Contact at the MS2Discovery Research Institute: Cristina Stoica (Host of the speaker, Tectons 3 & 5)

Refreshments will be provided

October 28, 2015

4-5pm | Location: Arts 1C16

The MS2Discovery Seminar Series: www.ms2discovery.wlu.ca/seminar
Wilfrid Laurier University, 75 University Avenue West, Waterloo

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