

A Geometrical Framework for Modeling and Simulation of Nonholonomic Mechanical Systems

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Many studies on dynamics of nonholonomic (NH) systems are strongly influenced by various historical approaches and the mathematical description which are rather arduous in practical/computer applications. A large variety of formulations for NH systems may also be misleading, causing possible difficulties in choosing the proper/best method when solving a given problem. A frequent belief is also that disparate approaches to H and NH should be used, while a unified treatment of systems subject to H and/or NH is possible. The aim of this contribution is to present a systematic geometrical framework for effective modeling and simulation of NH systems. Different types of equations of motion in dependent and independent variables are obtained in compact matrix forms. Some relevant aspects – the constraint violation problem, the involvement of independent velocities, and the determination of constraint reactions – are also addressed. Two classical examples of NH systems are reported.

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