Nonlinear Dynamics and Systems Theory, **11** (1) (2011) 53–64

Stability of Hybrid Mechanical Systems with Switching Linear Force Fields

A.Yu. Aleksandrov [1*], Y. Chen [2], A.A. Kosov [3] and L. Zhang [2]

[1] *St. Petersburg State University, 35 Universitetskij Pr., Petrodvorets, St. Petersburg, 198504, Russia*
[2] *Beijing University of Technology, 100 Pingleyuan, Chaoyang, Beijing 100124, China*
[3] *Institute of System Dynamics and Control Theory, SB of RAS, 134 Lermontova Str., Irkutsk, 664033, Russia*

Received: August 26, 2010; Revised: January 24, 2011

Abstract: Linear hybrid mechanical systems with switchings of force fields are studied. Some sufficient conditions are brought forward for the switched systems being asymptotically stable for any switched law. The results are obtained based on two approaches. The first one is called as the decomposition method, and the second one consists in an explicit construction of the common Lyapunov functions for the families of systems corresponding to the switched systems. Different cases of domination concerning one of the force field components (e.g., velocity, gyroscopic, dissipative, potential) are considered.

Keywords: *hybrid mechanical systems; switched systems; stability; decomposition; common Lyapunov functions.*

Mathematics Subject Classification (2000): 34A38, 34D20, 70H14.