



# Asymptotic Stability Conditions for Some Classes of Mechanical Systems with Switched Nonlinear Force Fields

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**Abstract:** Certain classes of switched mechanical systems with nonlinear potential and dissipative forces are studied. By the use of the differential inequalities method and multiple Lyapunov functions, conditions on switching law guaranteeing the asymptotic stability of the trivial equilibrium position of the considered systems are obtained. An example and the results of a computer simulation are presented to demonstrate the effectiveness of the proposed approaches.

**Keywords:** *mechanical systems; switched force fields; asymptotic stability; multiple Lyapunov functions; differential inequalities; dwell-time.*

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## 1 Introduction

Stability of switched systems has attracted an increasing attention during last decades, mainly due to the numerous applications of these systems in engineering, technological processes, mechanics, population dynamics, chemistry and economics, see, e.g., [1, 7, 9, 10, 12, 16, 17, 20] and the references cited therein. A switched system is a particular kind of hybrid dynamical system that consists of a family of subsystems and a switching law determining at each time instant which subsystem is active.

There are two principal approaches to the stability analysis of switched systems. The first one is based on the constructing of a common Lyapunov function for the family of

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