Asymptotic Methods for Stability Analysis of Markov Impulse Dynamical Systems

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Abstract: The paper deals with n-dimensional dynamical system of impulse type whose dynamical characteristics are dependent on the step Markov process with rapid switchings. The phase motion has small jumps at the moments of switchings and satisfies the ordinary differential equation in the intervals of constancy of the Markov process. The intensity of switchings, the quantities of jumps and the vector field of the differential equation are dependent on the phase coordinates and Markov process. Under some assumptions the limit averaged ordinary differential equation, the limit differential equation switched by the merged Markov process, the diffusion approximation and the limit stochastic differential equation of Ornstein-Uhlenbeck type for normalized deviations are constructed. It is proved that one can use the limit equations for stability analysis of an initial impulse dynamical system.

Keywords: *Stability analysis; impulsive dynamical systems; Markov process.*

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