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Section:

9. Ordinary Differential Equations and Dynamical Systems

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Orbital Lyapunov functions technique for stability analysis of non-linear stochastic systems

An exponential orbital stability in mean square for periodic motion of stochastic system is considered. Using an *orbital Lyapunov functions* technique the first approximation linear systems are considered and a notion of P-stability (projective) is introduced . A criterion for P-stability is obtained. This criterion reduces a P-stability analysis to decision problem of Lyapunov matrix differential equation. For the last problem an approach connected with a spectral theory of positive operators is suggested . As a result the stability analysis is reduced to the search of some positive operator spectral radius. It is shown that the spectral radius majorants give the sufficient conditions and the minorants give the necessary conditions for stability. Some constructive algorithms both spectral radius and its estimates are obtained. For planar system a parametric criterion (stochastic analogous to Poincare one) is given.

Reference: L. B. Ryashko, The stability of stochastically perturbed orbital motions, *J. Appl. Maths Mechs.* **60** (1996),579-590.