Stability of Delay Systems with Quadratic Nonlinearities

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Abstract: In this paper differential systems with delay and quadratic nonlinear terms are considered. Sufficient stability conditions, estimations of the stability domain and estimations of the convergence rate are derived.

Keywords: Systems of differential equations with delay; stability of zero solution; estimates on the stability domain; rate of convergence.

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1 Introduction

Two modifications are typically used when differential delay systems are studied by using the second Liapunov method [9 – 11]. The first one is the Liapunov–Krasovsky method. In this case, a segment of the trajectory is identified with a point in Banach space. Also, the main ideas of the Liapunov functions method are carried over to this case of functionals, and the stability theorems usually contain the necessary and sufficient conditions [9, 11]. The second modification uses the finite-dimensional Liapunov functions. In this case the derivative of the solution is estimated under the assumption that the solution remains inside the level surface of the Liapunov function. This assumption is called the Razumikhin condition [10].

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