Antonovskaya, O. G.

On the maximum possible negativity margin for the first derivative (first difference) of a quadratic Lyapunov function. (English. Russian original) Zbl 1065.93030

Differ. Equ. 39, No. 11, 1645-1647 (2003); translation from Differ. Uravn. 39, No. 11, 1562-1563 (2003).

Consider the linear system

$$\dot{x} = Ax$$

and the quadratic Lyapunov function

$$V(x) = x^T Px$$

such that A is Hurwitz and $P > 0$. If the derivative of V along the system, i.e. $W(x) = x^T(A^TP + PA)x$, is considered, it is stated that its maximal value on the level surface $V(x) = V_0$ is not less than $2(\max_i\{\text{Re } \lambda_i\})V_0$ where λ_i are the eigenvalues of A. A discrete-time analogue is also stated.

Reviewer: Vladimir Răsvan (Compiègne)

MSC:

93D30	Lyapunov and storage functions
93D05	Lyapunov and other classical stabilities (Lagrange, Poisson, L^p, l^p, etc.) in control theory
15A06	Linear equations (linear algebraic aspects)
15A18	Eigenvalues, singular values, and eigenvectors
34D08	Characteristic and Lyapunov exponents of ordinary differential equations

Keywords:

linear system; quadratic Lyapunov function; negativity margin; level surface; eigenvalues

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