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Stability analysis of large scale systems whose subsystems may be unstable. (English)

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Large Scale Syst. 5, 255-262 (1983).

A method is proposed for studying the stability of nonlinear, stationary, interconnected systems. In particular the case is considered of two interconnected systems in the form $\dot{x}_i = f_i(x_i) + g_i(x_i, x_2), \quad i = 1, 2$. Lyapunov functions are constructed for the individual systems (i.e. with $g_i = 0$), together with a function $v_{12}(x_1, x_2)$ representing "energy coupling" between the subsystems. A weighted sum of these functions is taken as a candidate for a Lyapunov function for the full system, and a sufficient condition is obtained for system stability. A method for constructing v_{12} is suggested and the technique is illustrated with two examples.

Reviewer: D.A.Wilson

MSC:

93D05	Lyapunov and other classical stabilities (Lagrange, Poisson, L^p, l^p, etc.) in control theory
93A15	Large-scale systems
93C10	Nonlinear systems in control theory
93C15	Control/observation systems governed by ordinary differential equations
34D20	Stability of solutions to ordinary differential equations

Keywords:

nonlinear, stationary, interconnected systems; Lyapunov functions