Exponential Stabilty of Functional Differential Equations and Applications in Control Theory

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Abstract: The problem of Lyapunov stability for functional differential equations is studied. The system to be considered is non-autonomous and the delay is time-varying. Known results on this problem are based on the Gronwall inequality yielding relative conservative bounds on nonlinear perturbations. In this paper, using more general Lyapunov-Krasovskii functional, neither model variable transformation nor bounding restriction on nonlinear perturbations is required to obtain improved conditions for the global exponential stability of the system. The conditions given in terms of the solution of standard Riccati differential equations allow to compute simultaneously the two bounds that characterize the stability rate of the solution. The proposed method can be easily applied to some control problems of nonlinear non-autonomous control time-delay systems.

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