

# Abstract

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## **Stability Analysis of Interconnected Dynamical Systems: Hybrid Systems Involving Operators and Difference Equations**

We address the stability analysis of interconnected feedback systems, which consists of a linear interconnection of subsystems. Each subsystem is a feedback system, consisting of a local plant &#97;&#110;&#100; a digital controller which is described by a system of difference equations &#97;&#110;&#100; which includes A/D &#97;&#110;&#100; D/A converters. We establish conditions for attractivity, asymptotic stability, asymptotic stability in the large, &#97;&#110;&#100; boundedness of solutions for such systems. The hypotheses of our results are phrased in terms of the I/O properties of the local plant &#97;&#110;&#100; in terms of the Lyapunov stability properties of the digital controller. In all cases, our results allow a stability analysis of complex interconnected systems in terms of the qualitative properties of the simpler free subsystems &#97;&#110;&#100; in terms of the properties of the system interconnecting structure. The applicability of our results is illustrated by an example.