

Abstract

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Quantization and Overflow Effects in Digital Implementations of Linear Dynamic Controllers

The stability of a class of single input-single output (SISO) digital feedback control system is investigated. The systems considered consist of a linear dynamic plant, a digital controller, suitable A/D and D/A converters. The design of such systems is usually accomplished by ignoring the nonlinear effects caused by quantization and overflow truncation. Our results establish that quantization in such systems can lead to loss of asymptotic stability of the origin, we proved that when quantization is taken into account (but overflow is neglected), one only has convergence to small neighborhood about the origin. Our results also prove that for initial conditions sufficiently far from the origin, overflow effects can lead to unbounded solutions.