Feedback limitations in nonlinear discrete-time control

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An interesting phenomenon occurs when one attempts to control systems with output nonlinearity growing faster than linearity, where similarities between the continuous- and discrete-time cases of adaptive control no longer exist. It is generally known that a large class of continuous-time nonlinear parametric systems, regardless of how fast the growth rate is, can be globally stabilized by the nonlinear damping or back-stepping approach in adaptive control. However, fundamental difficulties arise for the discrete-time case. These difficulties are caused by the inherent limitations of the feedback principle in dealing with uncertainties, which means that systems with uncertainties beyond the feedback capability cannot be stabilized by any discrete-time feedback control law. This talk studies the stabilizability of discrete-time nonlinear parametric systems and tries to give an appropriate characterization of feedback limitations.

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