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Title: Feedback stabilization of bilinear systems in Banach spaces.

Abstract: Bilinear systems arise naturally in the modeling of many physical and engineering processes, in which the control acts multiplicatively on the state. This course is devoted to the analysis and design of feedback laws for the stabilization of bilinear control systems evolving in infinite-dimensional spaces. First, the existence of a weakly stabilizing feedback law is investigated under an approximate observability assumption. Then, sufficient conditions ensuring strong stability are presented, based on appropriate observability estimate, together with feedback strategies leading to polynomial decay rates of the system trajectories. A central part of the course is devoted to the exponential stabilization of bilinear systems. Techniques that allow the recovery of exponential decay under a normalized feedback law are developed. Particular attention is paid to the additional difficulties arising in this setting due to the lack of a Hilbertian structure, which implies that the differentiability of the state norm is no longer guaranteed; an essential property for the derivation of energy estimates. Finally, the course introduces the concept of finite-time stabilization of bilinear systems. This part highlights recent results and open problems related to finite-time convergence and places finite-time stabilization within the broader framework of nonlinear and infinite-dimensional control theory.