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Title:

Lyapunov theorems for infinite-dimensional systems

Abstract:

For large classes of infinite-dimensional systems a Lyapunov theory can be developed following closely the finite-dimensional model to obtain the expected results in the sense that no specific infinite-dimensional phenomena appear. One of the standard properties of Lyapunov functions in this approach is that Lyapunov functions are coercive in the fixed point, i.e. the Lyapunov function is lower bounded by a continuous positive definite function of the norm. While this property is automatic (at least locally) in finite dimensions, it is by no means natural to assume coercivity. Indeed, for C_0-semigroups on Hilbert spaces it may very well happen that no coercive quadratic Lyapunov function exists. Similarly, Yoshizawa constructions of Lyapunov functions frequently do not result in coercive functions.

In this talk we will show that the assumption of coercivity is not essential in the application of Lyapunov arguments. We will discuss Lyapunov theorems and converse Lyapunov theorems for families of abstract infinite-dimensional systems. Some special cases are discussed, such as parametrized families of time-varying systems, infinite-dimensional switched linear systems and systems with uncertain feedback.