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Type: Talk

Singular and regular operator port Hamiltonian pencils

Tuesday 27 May 2025 09:30 (30 minutes)

We provide a systematic theory of singular pencils $\lambda E - A$, with (possibly unbounded) operator coefficients in a Hilbert space.

Apparently, the situation is more complicated than in the finite dimensional case. Several equivalent statements connected to the Kronecker canonical form become essentially different when the dimension is infinite. We show the relation of these concepts to solvability of the corresponding (infinite dimensional) differential-algebraic equations $E\dot{x} = Ax$.

While the general theory is rather complicated, it essentially simplifies for the operator pencils of type $\lambda E - (J - R)$, where E, R are positive semidefinite, J is skew-symmetric. Here the results are analogous to the finite dimensional situation. In particular we give necessary and sufficient conditions for uniqueness of solutions of the corresponding Cauchy problem.

The talk is based on:

C. Mehl, V. Mehrmann, M. Wojtylak, Spectral theory of infinite dimensional dissipative Hamiltonian systems, arXiv preprint arXiv:2405.11634.

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