Generalized oscillations for linear Hamiltonian systems via Maslov index theory

Roman Šimon Hilscher
Masaryk University, Czechia

This is a joint work with Peter Šepitka (Masaryk University, Brno, Czech Republic).

We present a generalized oscillation theory for linear Hamiltonian systems, also called canonical systems of differential equations, without assuming the Legendre condition. We show that this theory can be effectively developed via the comparative index of two Lagrangian planes. We present a connection of the comparative index with the Maslov index or the Hörmander index or the triple index, for which we use the Lidskii angles of a symplectic fundamental matrix of the system. We analyze and explain the exact role of the Legendre condition and the role of the minimal multiplicities of focal points in the (generalized) oscillation theory.

[1] O. Došlý, J. V. Elyseeva, R. Šimon Hilscher, Symplectic Difference Systems: Oscillation and Spectral Theory. Pathways in Mathematics, Birkhäuser/Springer, Cham, 2019.

[2] J. Elyseeva, P. Šepitka, R. Šimon Hilscher, *Oscillation numbers for continuous Lagrangian paths and Maslov index*, J. Dynam. Differential Equations **35** (2023), no. 3, 2589–2620.

[3] J. Elyseeva, P. Šepitka, R. Šimon Hilscher, *Comparative index and Hörmander index in finite dimension and their connections*, Filomat **37** (2023), no. 16, 5243–5257.

[4] P. Šepitka, R. Šimon Hilscher, *Comparative index and Sturmian theory for linear Hamiltonian systems*, J. Differential Equations **262** (2017), no. 2, 914–944.

[5] P. Šepitka, R. Šimon Hilscher, *Comparative index and Lidskii angles for symplectic matrices*, Linear Algebra Appl. **624** (2021), 174–197.

[6] P. Šepitka, R. Šimon Hilscher, *Generalized focal points and local Sturmian theory for linear Hamiltonian systems*, Discrete Contin. Dyn. Syst. **43** (2023), no. 12, 4139–4173.