Hélène Frankowska, Université Pierre et Marie Curie (Paris 6)

Pointwise second order optimality conditions in optimal control

Authors: H. Frankowska and D. Hoehener

This talk is devoted to the pointwise second-order necessary optimality conditions for the Mayer problem arising in optimal control theory. The control system under consideration involves arbitrary closed, time dependent control sets $U(t)$ and arbitrary closed sets of initial conditions. Optimal controls are supposed to be merely measurable. The first result says that with every optimal trajectory it is possible to associate a solution $p(\cdot)$ of the adjoint system (as in the Pontryagin maximum principle) and a matrix solution $W(\cdot)$ of an adjoint matrix differential equation that satisfy a second-order transversality condition and a second-order maximality condition. These conditions seem to be a natural second-order extension of the maximum principle of optimal control. Then the second-order necessary optimality conditions in integral form are stated and applied to derive pointwise Jacobson like necessary optimality conditions for general control systems and optimal controls that may be only "partially singular" and may take values on the boundary of control constraints. Finally I will discuss the second-order sensitivity relations along optimal trajectories involving both $p(\cdot)$ and $W(\cdot)$.

[1] H. Frankowska and N. Osmolovskii, Second-order necessary optimality conditions for the Mayer problem subject to a general control constraint, in Analysis and Geometry in Control Theory and its Applications, vol. 12 of Springer INDAM series, Springer Verlag, 2015.

[2] H. Frankowska and D. Hoehener, submitted, Pointwise Second-Order Necessary Optimality Conditions and Second-Order Sensitivity Relations in Optimal Control.