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Invertibility of Nice Nonsmooth Maps Arising in Optimal Control

Abstract: Pontryagin Maximum Principle is the fundamental necessary conditions for selecting candidate minimizing trajectories in optimal control problems. An efficient way to prove the strong local optimality of Pontryagin extremals in optimal control problems is given by the Hamiltonian methods. Such methods involve the construction of a field of extremals in the cotangent bundle of the state space and the definition of a smooth Lagrangian manifold such that the projected maximised flow emanating from such manifold is one-to-one onto the graph (if one wants to prove (time, state)-strong local optimality) or the range (if one wants to prove state-strong local optimality) of the reference trajectory. When the reference control is bang-bang the projected maximised flow is a PC^1 map whose invertibility can be exploited via topological methods or via Clarke inversion function theorem.

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