

# First Joint Meeting Brazil Italy of Mathematics

## Special Session: Optimal Control

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**Title:** Geometric optimality conditions for trajectories containing a singular arc, Part II.

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**Abstract:** Motivated by examples in the literature, we study sufficient conditions for strong local optimality of trajectories containing two bang arcs and a singular arc in an optimal control problem of the following kind

$$\begin{aligned} & \text{minimize } C(\xi) = c(\xi(T)) \text{ subject to} \\ & \dot{\xi}(t) = \sum_{i=1}^m u_i X_i(\xi(t)) \quad \text{q.o. } t \in [0, T], \\ & u \in L^\infty([0, T], \Delta), \\ & \xi(0) = x_0, \quad \xi(T) \in N. \end{aligned}$$

where  $\Delta := \{u = (u_1, \dots, u_m) \in \mathbb{R}^m : u_i \geq 0 \forall i = 1, \dots, m, \sum_{i=1}^m u_i = 1\}$  and  $N$  is a submanifold of the state space, a finite dimensional manifold.

The sufficient conditions which sum up to some regularity conditions and to the coercivity of the second variation of a certain subproblem lead to strong local optimality via Hamiltonian methods. As a byproduct we find conditions also in the case of a Bolza problem.