

Stability Analysis of Optimal Control Problems with a Second-order State Constraint

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Abstract

In this talk, we give stability results for nonlinear optimal control problems subject to a regular state constraint of second-order. The strengthened Legendre-Clebsch condition is assumed to hold, and no assumption on the structure of the contact set is made. Under a weak second-order sufficient condition (taking into account the active constraints), we show that the solutions are Lipschitz continuous w.r.t. the perturbation parameter in the L^2 norm, and Hölder continuous in the L^∞ norm. We use a generalized implicit function theorem in metric spaces by Dontchev and Hager [SIAM J. Control Optim., 36 (1998), pp. 698–718]. The difficulty is that multipliers associated with second-order state constraints have a low regularity (they are only bounded measures). We obtain Lipschitz stability of a “primitive” of the state constraint multiplier.

Key Words: Optimal control, second-order state constraint, stability analysis, alternative formulation, sufficient second-order optimality condition, uniform quadratic growth, strong regularity.