A Characterization of Stability and Sensitivity Properties for State-Constrained Optimal Control

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Abstract

The paper concerns parameter dependent nonlinear optimal control problems, subject to state constraints of the first order. In recent papers of the author (see [1, 2, 3, 4]), weakened conditions are derived, under which the solutions and Lagrange multipliers of the problems are locally Lipschitz continuous and directionally differentiable functions of the parameter. The conditions consist of standard constraint qualifications and weakened second order sufficient optimality conditions, which should be satisfied at the reference point. The second order conditions are weakened by taking into account the strongly active state constraints.

In the present paper, it is shown that, in the case of the so called canonical perturbations, those conditions are not only sufficient, but also necessary, for Lipschitz stability and directional differentiability of the solutions and Lagrange multipliers. Thus, they constitute a characterization of those properties.

References


Key Words: Optimal control, nonlinear ODEs, state constraints, parametric problems, stability and sensitivity analysis.