SECOND-ORDER OPTIMALITY CONDITIONS FOR STATE-CONSTRAINED OPTIMAL CONTROL PROBLEMS

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We will discuss optimal control problem of an ordinary differential equation with several pure state constraints, of arbitrary orders, as well as mixed control-state constraints. We assume (i) the Hamiltonian to be strongly convex and the mixed constraints to be convex w.r.t. the control variable, and (ii) a linear independence condition of the active constraints at their respective order to hold. We give a complete analysis of the smoothness and junction conditions of the control and of the constraints multipliers. This allow us to obtain, when there are finitely many nontangential junction points, a theory of no-gap second-order optimality conditions and a characterization of the well-posedness of the shooting algorithm. These results generalize those obtained in the case of a scalar-valued state constraint and a scalar-valued control.

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