Weak and Pontryagin minima of optimal control problems

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Abstract

We will analyse second-order necessary or sufficient optimality conditions for the problem of minimizing

$$J(u,y) := \int_0^T \ell(u(t),y(t))\mathrm{d}\,t + \phi(y_0,y(T)),$$

where $\ell : I\!R^m \times I\!R^n \to I\!R$ (*running cost*) and $\phi : I\!R^n \times I\!R^n \to I\!R$ (*initial-final cost*) are twice continuously differentiable (C^2) mappings, and (u,y) satisfies the state equation

$$\dot{y}(t) = f(u(t),y(t)) \quad \text{for a.a. } t \in [0,T];$$

where $f : I\!R^m \times I\!R^n \to I\!R^n$ is a Lipschitz and C^2 mapping, as well as control constraints

$$u(t) \in U, \quad \text{for a.a. } t \in (0,T),$$

where U is a closed subset of $I\!R^m$, and initial-final state constraints of the form

$$\Phi(y(0),y(T)) \in K,$$

where $\Phi : I\!R^{2n} \to I\!R^r$, $r = r_1 + r_2$, r_1 and r_2 are nonnegative integers, and $K := \{0\}_{I\!R^{r_1}} \times I\!R^{r_2}_-$.

The talk will be based on a joint work with N. Osmolovskii [1].

Key Words: Optimal control, weak and strong solutions, second order analysis

References

[1] J.F. Bonnans and N. Osmolovskii, *Second-order analysis of optimal control problems with control and initial-final state constraints*, INRIA Report, to appear.