Metric Regularity of Mayer's Problems for Affine Control Systems

M. Quincampoix [*], T. Scarinci [†], V. Veliov [‡]

We investigate stability properties of the solutions of Mayer's optimal control problems for nonlinear systems which are affine with respect to the control variable

$$\begin{array}{ll} \text{minimize} & \ell(x(T)) \\ \text{subject to} & \dot{x}(t) = f(t,x(t)) + g(t,x(t))u(t), \quad \text{a.e. on } [0,T], \\ & u(t) \in U := [0,1]^m,\ x(0) = x_0, \end{array}$$

where $\ell : R^n \to R$, $f : [0,T] \times R^n \to R^n$, $g : [0,T] \times R^n \to R^{n\times m}$ are given functions. Our goal is to give a precise description of the effect of perturbations on the optimal solutions in terms of a Lipschitz-like estimate. This study is done thanks to a new Lyusternik-Graves-type Theorem for a suitably defined strong bi-metric regularity of the set-valued map associated with the Pontryagin maximum principle.

References

[1] A. L. Dontchev, R. T. Rockafellar, Implicit Functions and Solution Mappings: A View from Variational Analysis. Second edition. Springer, 2014.

[2] M. Quincampoix, V.V Veliov, Metric Regularity and Stability of Optimal Control Problems for Linear Systems. SIAM J. Control Optim., 51(5), p.4118-4137 (2013)

[3] M. Quincampoix, T. Scarinci and V.M. Veliov Metric Regularity of Affine Control Systems. (in progress).

[*]Laboratoire de Mathématiques de Bretagne Atlantique, unité CNRS UMR6205, Université de Brest, France, marc.quincampoix@univ-brest.fr.

[†]Dept. of Statistics and Operations Research, University of Vienna, Austria, teresa.scarinci@univie.ac.at.

[‡]Institute of Statistics and Mathematical Methods in Economics, Vienna University of Technology, Austria, vladimir.veliov@tuwien.ac.at.