On the Metric Regularity of Affine Optimal Control Problems

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The paper establishes properties of the type of (strong) metric regularity of the set-valued map associated with the system of necessary optimality conditions for optimal control problems that are affine with respect to the control (shortly, *affine problems*). It is shown that for such problems it is reasonable to extend the standard notions of metric regularity by involving two metrics in the image space of the map. This is done by introducing (following an earlier paper by the first and the third named author) the concept of (strong) *bi-metric* regularity in a general space setting. Lyusternik-Graves-type theorems are proved for (strongly) bi-metrically regular maps, which claim stability of these regularity properties with respect to "appropriately small" perturbations. Based on that, it is proved that in the case of a map associated with affine optimal control problems, the strong bi-metric regularity is invariant with respect to linearization. This result is complemented with a sufficient condition for strong bi-metric regularity for linear-quadratic affine optimal control problems, which applies to the "linearization" of a nonlinear affine problem. Thus the same conditions are also sufficient for strong bi-metric regularity in the nonlinear affine problem.

Keywords: Optimal control, affine problems, metric regularity, solution stability, perturbed control problems.

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