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Title: Generalization of Classical Constraint Qualifications in Continuous-Time Non-linear Programming

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Abstract: In the paper [G. J. Zalmay, The Fritz John and Kuhn-Tucker optimality conditions in continuous-time nonlinear programming, J. Math. Anal. Appl. 110, 503–518, 1985], Karush-Kuhn-Tucker (KKT) type necessary optimality conditions for continuous-time nonlinear programming problems are obtained by means of a generalization of the Slater constraint qualification (SCQ). However, to the best of our knowledge, other classical constraint qualifications well known from the nonlinear mathematical programming in finite dimensions were not studied in continuous-time programming. In this work, Mangasarian-Fromovitz (MFCQ) and constant rank (CRCQ) constraint qualifications are generalized from the classical finite dimension setting to the continuous-time framework. We, then, provide KKT type necessary optimality conditions. It is worthy mentioning that MFCQ is less restrictive than SCQ, and that MFCQ and CRCQ are not related to each other. Some special cases of constrained variational and optimal control problems can be handled as continuous-time programming problems.

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