

Metric regularity theorems and applications to state constrained optimal control

RICHARD VINTER

Imperial College London

Abstract

Take a state trajectory that violates the state constraint of a state constrained control system. Under what conditions does there exist a state trajectory satisfying the state constraint which is, in some sense close, to original state trajectory? Answers to this question have been referred to as metric regularity theorems. It turns out the determination of unrestrictive conditions for metric regularity is the key to resolving a number of important issues in state constrained optimal control theory. We trace the history of metric regularity theorems, including a number of recent developments. We then show how they can be used to obtain simple, verifiable criteria for the validity of a non-degenerate form of the Maximum Principle for state constraints, to characterise the value function as a generalized solution of the Hamilton Jacobi equation of optimal control, and to establish sensitivity relations interpreting co-state trajectories as sub-gradients of the value function.