Control with Piecewise Constant Dynamics

Peter R. Wolenski

We consider a control system in which the state space is partitioned into polytopes, each endowed with a constant convex velocity set. The Lipschitz assumption invoked in optimal control theory is therefore not globally present, and a well-developed theory for the minimal time problem, for example, remains problematic. If it is known in advance that every state trajectory must pursue a particular ordered path of polytopes, then solving a convex math programming program provides the answer. The optimal solution is piecewise linear in which the "switches" obey a generalized form of Snell's Law. However, determining an optimal path is a discrete problem apparently not analyzable by variational techniques. We shall discuss our attempts at characterizing the reachable set.