The reachable set of a piecewise-constant control system

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ABSTRACT

We first consider the state space $\mathbb{R}^n$ divided into two half-spaces $\mathbf{M_0}$, $\mathbf{M_1}$ with a common interface $\mathbf{\Sigma}$, all with associated velocity sets, respectively, $\mathbf{F_0}$, $\mathbf{F_1}$, $\mathbf{F_\Sigma}$. A trajectory $\mathbf{x}(\cdot)$ is an arc whose derivative is in the appropriate velocity set while $\mathbf{x}(\cdot)$ is in that region. The reachable set $\mathcal{R}^T(\mathbf{x})$ from a given $\mathbf{x} \in \mathbb{R}^n$ and time $T > 0$ consists of those points $\mathbf{y} \in \mathbb{R}^n$ that are endpoints of trajectories. We discuss conditions on $\mathbf{F_\Sigma}$ which assure $\mathcal{R}^T(\mathbf{x})$ is closed and how one can produce *boundary* trajectories. Finally, we consider generalizations to more than two regions.

This is a joint work with Clinten Graham and Claire Pearson, both from Louisiana State University.