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A COST-BASED APPROACH TO SWEEPING PROCESSES

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Moreau's sweeping process is a well known first-order differential inclusion, involving the normal cone to a time-dependent moving set. This differential inclusion can be solved using the *catching-up algorithm*, an iterative scheme based on successive projections. In this work, we propose a modified version of Moreau's catching-up algorithm, where the projection step is replaced by the minimization of a prescribed *cost function* $c : H \times H \to [0, \infty)$. In other words, this new algorithm yields sequences of points $(x_i)_{i=0}^N$ satisfying the state constraint, and such that x_{i+1} minimizes the cost $c(x_i, \cdot)$. We show that under reasonable assumptions on the cost function c, the sequences given by the algorithm converge to a trajectory $x(t)$ satisfying a differential inclusion of the form

$$Q(x(t))\dot{x}(t) \in -N_{K(t)}(x(t)) \quad \text{a.e in } [0, T],$$

where $Q : H \to \mathcal{B}(H)$ is determined by the cost function c. This cost-based approach offers a flexible modeling framework, allowing the cost function to promote or penalize specific trajectory behaviors. This talk is based on a joint work Emilio Vilches.

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