



Modeling and Analysis of Hybrid Systems

Series 7

Exercise 1

Which operations on state set representations are required for the computation of the reachable states of a linear hybrid automaton, and what are they used for?

Solution:

- Convex hull of the union: Used in the computation of the first flowpipe segment (applied to the initial state sets and its bloated linear transformation).
- Intersection: Used to compute which part of a set satisfies guards and invariants.
- Linear transformation: Used to compute the first flowpipe segment and successors of flowpipe segments.
- Minkowski sum: Used for bloating in the flowpipe computation to assure safe over-approximation.

Exercise 2

Given the linear hybrid automaton \mathcal{A} (see below), please sketch the set of reachable states as computed by a reachability analysis algorithm as presented in the lecture. Please use a new plot for every operation including *time step*, *discrete step*, *invariant intersection*, *guard intersection* as already prepared.











