

MAE 286: Hybrid Systems (F10)

Homework #6

Due on 11/18/10

1. (1 point) Consider the hybrid system with data $C = \mathbb{R}, D = \emptyset$,

$$F(x) = \begin{cases} 1 & x < 0 \\ 2 & x \geq 0 \end{cases}$$

and any G you want. Does this system satisfy the basic assumptions? Is it nominally well-posed? Is it well-posed?

2. (3 points) Consider the hybrid system \mathcal{H} with state $x \in \mathbb{R}^2$ and data

$$\begin{aligned} C &:= \{x \in \mathbb{R}^2 \mid \|x\| < 1\}, & f(x) &:= \begin{pmatrix} -x_2 \\ x_1 \end{pmatrix} \\ D &:= \{x \in \mathbb{R}^2 \mid x_1 = 0, x_2 \in (-\frac{1}{2}, 0]\}, & g(x) &:= \frac{1}{2}x \end{aligned}$$

Do the following:

- (a) Compute the reachable set from $S = \{0\} \times [0, \frac{1}{2})$
 - (b) What is the ω -limit set of S ?
 - (c) Is the set $\{0\} \times (-\frac{1}{2}, 0]$ weakly forward invariant? Is it strong forward pre-invariant?
3. (extra 1 points) Give an example of a nominally well-posed system whose solutions are different from the solutions of its Krasovskii regularization