Week 7 Hybrid system

1. Time-based vs Event sequences
2. Embedding event sequences into time-based signals
3. Mixed systems
4. Modal models

Examples
1. Timed automata
2. Internet Protocol (IP)
3. Internet Protocol stack
4. Bouncing ball

Time-based vs Event sequences
Notes/hybrid/time

Embedding event sequences into time-based signals

Mixed systems

Modal models
topics/hybrid systems/timed automata
topics/hybrid systems/internet
A ball is dropped at time $t = 0$ from height $y(0) = \text{initialHeight}$ m. It produces a bump event when it hits the ground at time $t_1$, and bounces back with velocity $-ay(t_1)$.

The equation of motion is $\ddot{y}(t) = -g$.

Let

$$s(t) = \begin{bmatrix} y(t) \\ \dot{y}(t) \end{bmatrix}$$

$$\begin{bmatrix} \dot{s}_1(t) \\ \dot{s}_2(t) \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} s_1(t) \\ s_2(t) \end{bmatrix} + \begin{bmatrix} 0 \\ -1 \end{bmatrix} g$$