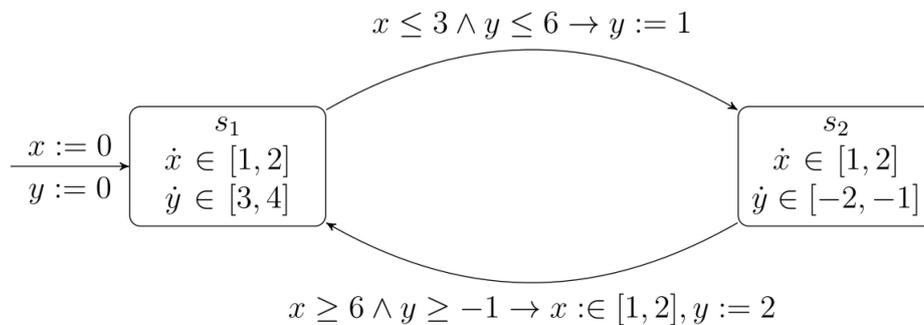




**Tutorials for Cyber-Physical Systems - Hybrid Models**  
**Exercise sheet 4**

**Exercise 1: Rectangular automaton**

Consider the following initialized rectangular automaton  $\mathcal{A}$ :



- Construct an initialized singular automaton  $\mathcal{A}_1$  which is equivalent to  $\mathcal{A}$ , i.e.  $\mathcal{A}$  and  $\mathcal{A}_1$  accept the same language.
- Construct an initialized stopwatch automaton  $\mathcal{A}_2$  which is equivalent to  $\mathcal{A}_1$ .
- Construct a timed automaton  $\mathcal{A}_3$  which is equivalent to  $\mathcal{A}_2$ . (Note that we can only reset clocks to zero in a timed automaton.)