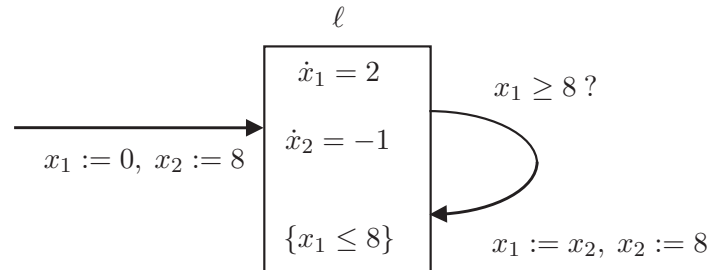


Analysis and Control of Cyber-Physical Systems

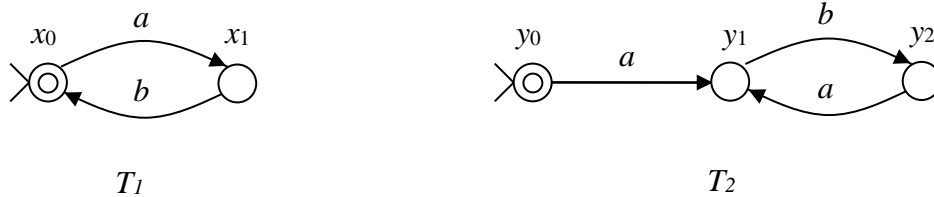
Homework 6 — 23 May 2024

Problem 1. Consider the hybrid automaton H shown below.



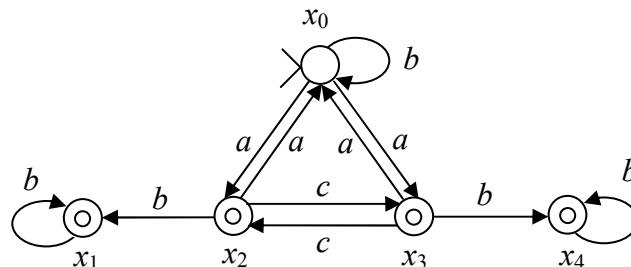
- Determine the time-abstract state transition system T that describes H .
- Discuss if it is possible to compute the reachability set $Reach(T)$ using the procedure discussed in class.

Problem 2. Consider the state transition systems T_1 and T_2 described by the automata in figure.



- Are T_1 and T_2 language equivalent?
- Discuss if each system simulates the other one, providing a simulation relation between their states.
- If the two systems are not bisimilar, discuss if one could change T_2 — by either adding a new transition or changing one state from final to non-final or viceversa — to make them bisimilar.

Problem 3. Consider the state transition system T described by the automaton in figure.



- Compute the set $Pre_b(\{x_0, x_1\})$.
- Consider the following partition: $\Pi = \{\pi_1, \pi_2, \pi_3\}$ with $\pi_1 = \{x_0\}$, $\pi_2 = \{x_1, x_2\}$ and $\pi_3 = \{x_3, x_4\}$. Is the corresponding equivalence relation a bisimulation over the states of T ? Justify your answer.
- Determine a minimal bisimulation over the states of T and the corresponding quotient state transition system, showing the steps of the procedure you have used.