



Tutorials for Cyber-Physical Systems I - Model Checking

Exercise sheet 8

Exercise 1: Büchi Automata

Consider NBA \mathcal{A}_1 and \mathcal{A}_2 depicted in Figure 1 below. Show that both accept the same regular language when viewed as NFA (Hint: They yield the same DFA, it can be obtained by, e.g., the powerset construction) while $\mathcal{L}_\omega(\mathcal{A}_1) \neq \mathcal{L}_\omega(\mathcal{A}_2)$.

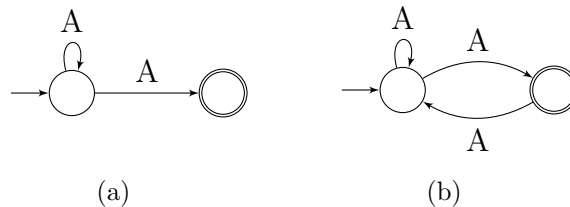


Figure 1: NBA \mathcal{A}_1 (a) and \mathcal{A}_2 (b)

Exercise 2: Checking ω -regular properties

Consider the transition system TS_{Sem} for mutual exclusion with a semaphore (See Figure 2). Let P_{live} be the following ω -regular property over $AP = \{wait_1, crit_1\}$:

“whenever process 1 is in its waiting location then it will eventually enter its critical section”

- (a) Depict an NBA \mathcal{A} for P_{live} and an NBA $\bar{\mathcal{A}}$ for the complement property $\bar{P}_{live} = (2^{AP})^\omega \setminus P_{live}$.
- (b) Show that $TS_{Sem} \not\models P_{live}$ by doing the following:
 - (i) Depict the reachable fragment of the product $TS_{Sem} \otimes \bar{\mathcal{A}}$
 - (ii) Give a path in the product transition system that violates P_{live}

Exercise 3: Lecture Evaluation (optional)

We would like to make sure you are following the lecture and having fun at the same time.

- (a) What can we improve about the lecture?
- (b) Briefly name the main concepts that you have found interesting and what you have learned about them during the last lectures.

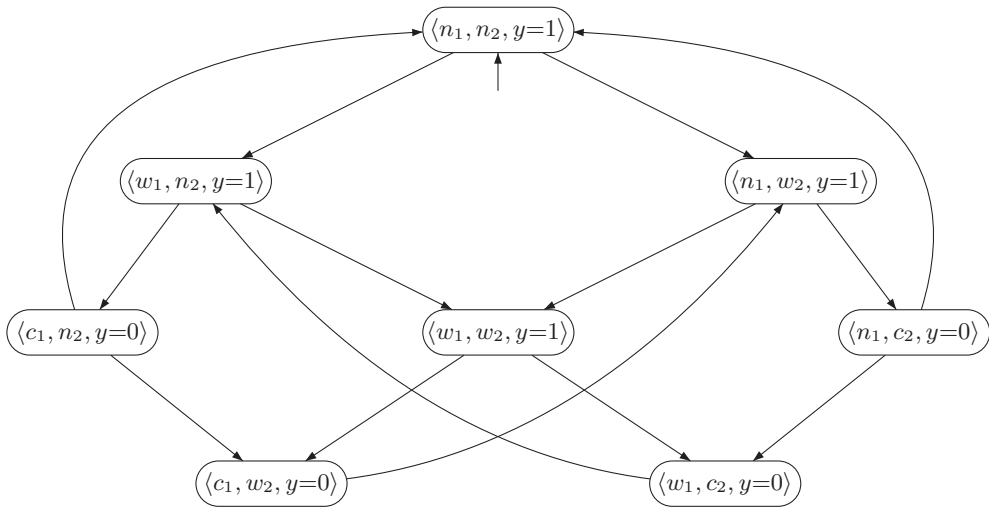


Figure 2: Transition System TS_{Sem}