

Model Checking Homework 8

Deadline: June 1, 2023, 4:00pm

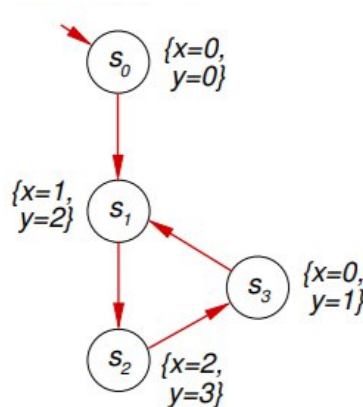
Send solution to: modelchecking@iaik.tugraz.at

LTL Model Checking using Automata

Consider the following LTL properties φ_1 and φ_2 and the Kripke structure M

$$\varphi_1 = F(x = 1 \wedge y = 3)$$

$$\varphi_2 = F(y = 2 \wedge X x = 2)$$



Task a. [5 Points] Check whether it holds that $M \models \varphi_1$.

Task b. [5 Points] Check whether it holds that $M \models \varphi_2$.

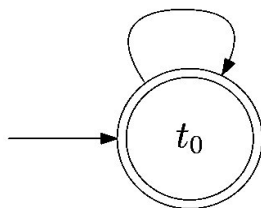
Use the following algorithm that we discussed in the lecture. You also find the algorithm on page 98 (chapter 7) of the Model Checking book. Give (a few) details of your computation.

1. Construct $\neg\varphi$
2. Construct a Büchi automaton* $\mathcal{S}_{\neg\varphi}$
3. Translate M to an automaton \mathcal{A} .
4. Construct the automaton \mathcal{B} with $\mathcal{L}(\mathcal{B}) = \mathcal{L}(\mathcal{A}) \cap \mathcal{L}(\mathcal{S}_{\neg\varphi})$
5. If $\mathcal{L}(\mathcal{B}) = \emptyset \Rightarrow \mathcal{A}$ satisfies φ
6. Otherwise, a word $v \cdot w \in \mathcal{L}(\mathcal{B})$ is a counterexample

*You can skip step 2 and use the Büchi automata given below for $\neg\varphi_1$ and $\neg\varphi_2$.

Automaton for $\neg\varphi_1$:

$$\neg\{x = 1\} \vee \neg\{y = 3\}$$



Automaton for $\neg\varphi_2$:

$$\neg\{y = 2\}$$

