

Advanced Model Checking Summer term 2012

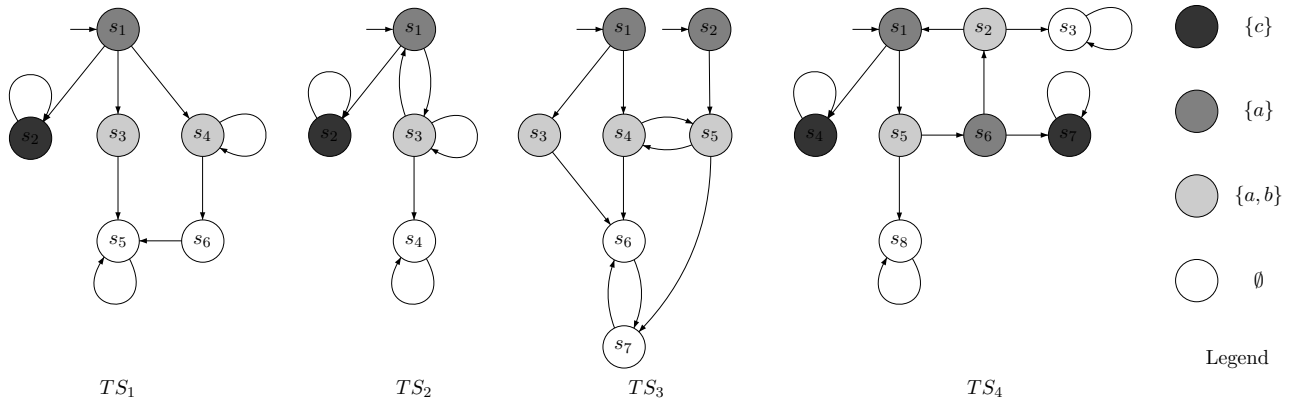
– Assignment 1 –

Hand in on April 18'th before the exercise class.

Exercise 1

(3 points)

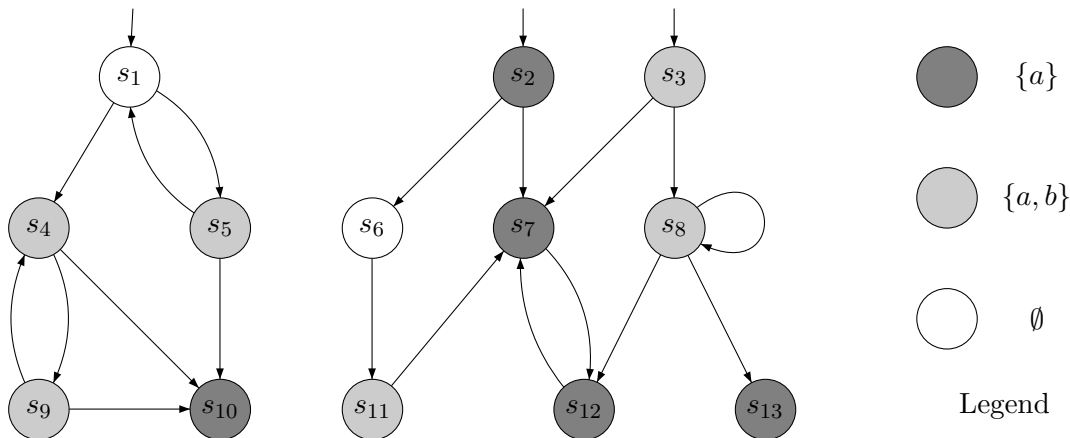
Which of the following transition systems are bisimulation equivalent? Justify your answers by either providing a bisimulation relation or a CTL* formula that distinguishes the considered transition systems.



Exercise 2

(2 + 2 points)

Consider the single transition system TS over $AP = \{a, b\}$ shown below:



Questions:

- (i) Determine the bisimulation equivalence \sim_{TS} and depict the bisimulation quotient system TS/\sim .
- (ii) Provide CTL master formulae Φ_C for each bisimulation equivalence class.

Exercise 3**(2 + 1 points)**

Let $TS = (S, Act, \rightarrow, I, AP, L)$ be a transition system. The relations $\sim_n \subseteq S \times S$, with $n \in \mathbb{N}$, are inductively defined by:

- $s_1 \sim_0 s_2$ iff $L(s_1) = L(s_2)$.
- $s_1 \sim_{n+1} s_2$ iff:
 - $L(s_1) = L(s_2)$,
 - for all $s'_1 \in Post(s_1)$ there exists $s'_2 \in Post(s_2)$ with $s'_1 \sim_n s'_2$,
 - for all $s'_2 \in Post(s_2)$ there exists $s'_1 \in Post(s_1)$ with $s'_1 \sim_n s'_2$.

Questions:

- (i) Show that for *finite* TS it holds that $\sim_{TS} = \bigcap_{n \geq 0} \sim_n$, i.e.,

$$s_1 \sim_{TS} s_2 \text{ iff } (s_1 \sim_n s_2 \text{ for all } n \geq 0)$$

- (ii) Does this also hold for infinite transition systems (provide either a proof or a counterexample)?