Universität des Saarlandes
FR Informatik

Harald Ganzinger
Uwe Waldmann

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Tutorials for "Logic in Computer Science"
Exercise sheet 12

Exercise 12.1:

(a) Give an example of a finite time structure $M = (S, R, L)$ and a state $s_0 \in S$ such that $M, s_0 \models \mathsf{AG}(\mathsf{EF}\, P)$, but $M, s_0 \not\models \mathsf{AF}\, P$.

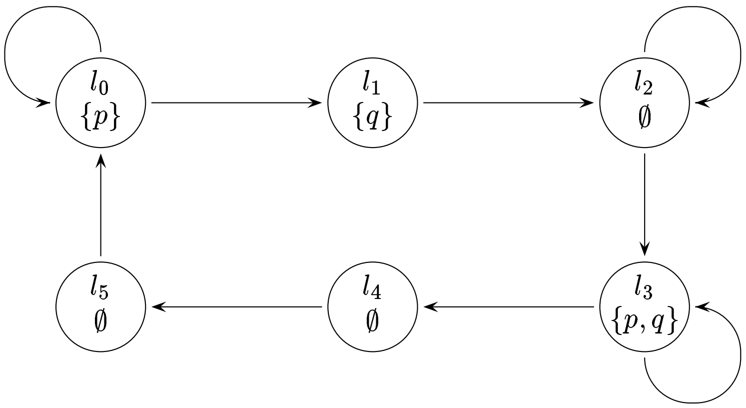
(b) Give an example of a finite time structure $M = (S, R, L)$ and a state $s_0 \in S$ such that $M, s_0 \models \mathsf{EG}(\mathsf{EF}P)$, but $M, s_0 \not\models \mathsf{EGF}P$.

Exercise 12.2:
Express the following statements in CTL:

(a) It is possible that the CD drive of a computer gets into such a state that opening it becomes impossible forever.

(b) A student cannot take the electrical engineering exam more than two times.

Exercise 12.3:
Let $S = \{l_0, l_1, l_2, l_3, l_4, l_5\}$, let $\Pi = \{p, q\}$, and let $M = (S, R, L)$ be the following time structure (where R is represented by $\rightarrow$):



Compute $[\![\mathsf{AX}\,\mathsf{AX}\,\mathsf{E}((\neg q)\mathsf{U}p)]\!]$.

Exercise 12.4:
The syntax of CTL given on slide 20 permits state formulas like $\mathsf{EAX}P$ (for $P \in \Pi$). The simplified definition given on slide 23 and 34 does not permit formulas of this kind. Why is this difference semantically irrelevant?

Exercise 12.5:
Give an example of a Boolean function f with three variables x, y, z, such that the minimal OBDD for f has 5 interior nodes for the variable ordering $x < y < z$ and 4 interior nodes for some other variable ordering.

Exercise 12.6:
Let p be an arbitrary mixed CTL formula such that Z is the only explicit set of states occurring in p. Is the function $\tau : Z \mapsto p$ necessarily monotone?

Put your solution into the mail box at the door of room 627 in the MPI building (46.1) before July 12, 11:00. Don't forget to write your name and the name of your tutorial group (B, C, D) on your solution.