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Tutorial for Cyber-Physical Systems - Discrete Models
Exercise Sheet 13

Exercise 1: Positive normal form   1 Point

Transform the following LTL formula into an equivalent LTL formula in PNF.

$$\neg\Big((\Box a) \to \big((a \wedge \neg c) \ \mathsf{U} \ \neg(\bigcirc b)\big)\Big)$$

Exercise 2: From LTL to NBA   3 Points

Provide an NBA for each of the following LTL formulas:

    (a) $\Box(a \vee \neg \bigcirc b)$ (b) $\Diamond a \vee \Box \Diamond (a \leftrightarrow b)$ (c) $\bigcirc \bigcirc (a \vee \Diamond \Box b)$

You do not have to apply the algorithm from the lecture (which often produces large automata).

Exercise 3: From LTL to GNBA using elementary sets   3 Points

Consider the LTL formula $\varphi := \neg a \ \mathsf{U} \ a$ over the set of atomic propositions $AP = \{a, b\}$. Apply the algorithm from the lecture to obtain a GNBA $\mathcal{G}_\varphi$ whose language is $Words(\varphi)$ by executing the following steps.

(a) Construct $closure(\varphi)$.

(b) Construct the elementary sets w.r.t. $closure(\varphi)$.

(c) Construct the GNBA $\mathcal{G}_\varphi$.