

Software Validation and Verification

Fifth Exercise Sheet

Exercise 1

Consider the following CTL formulas:

$$\Phi_1 = \forall \Diamond(a \wedge \exists \bigcirc a) \quad \Phi_2 = \forall \Diamond \exists \bigcirc \forall \Diamond \neg a$$

For each of them, check whether there exists an equivalent LTL-formula.

Exercise 2

Decide whether the following predicate us true.

$$s \models_{fair} \forall(b \mathbf{U} a) \quad \text{if and only if} \quad s \models \forall(b \mathbf{U}(a_{fair} \rightarrow a))$$

Exercise 3

Consider the following CTL* formula:

$$\Phi = (\forall \Diamond \Box a) \vee (\forall \Diamond \Box b)$$

1. Check whether some LTL formula ϕ exists that is equivalent to Φ ;
2. Check whether some CTL formula Ψ exists that is equivalent to Φ .

Exercise 4

Consider the following transition system \mathcal{T} , the CTL formula $\Phi = \forall \Box(a \rightarrow \forall \Diamond(b \wedge \neg a))$, and the CTL fairness assumption $fair = \Box \Diamond \forall \bigcirc(a \wedge \neg b) \rightarrow \Box \Diamond \forall \bigcirc(b \wedge \neg a)$. Check whether $\mathcal{T} \models_{fair} \Phi$.

