

## Concurrency Theory

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### Sheet 7

**Due: Monday, 2025-12-15**

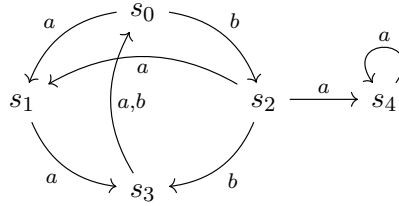
#### Exercise 7.1

Give a (recursive) HML formula for each of the following informal process properties.

- Each computation path eventually reaches an  $a$ .
- Each computation path consisting of only  $a$  and  $b$  ends in an infinit computation path of  $a$ 's.
- Among states visited by a computation path of  $b$ 's, there are only finitely many where an  $a$  is possible.

#### Exercise 7.2

Consider the LTS:



Compute the fixed-point iteration for the following equation system as described in the lecture:

$$\begin{pmatrix} X_1 \stackrel{\min}{=} [a]X_1 \vee \langle b \rangle X_2 \\ X_2 \stackrel{\max}{=} [b]X_2 \wedge \langle b \rangle X_2 \end{pmatrix}.$$

#### Exercise 7.3

Consider the following process definition:

$$\begin{aligned} B_0 &= in.B_1 \\ B_1 &= \overline{out}.B_0 + in.B_2 \\ B_2 &= \overline{out}.B_1 \end{aligned}$$

Compute a (recursive) HML formula  $X$  such that  $P \models X$  is true iff  $B_0 \sim P$  for all processes  $P \in Proc$ .

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If you have questions, please post a message in the dedicated [chat](#).

**Exercise 7.4**

Complete the value passing process definition below such that the process Counter outputs the sequence of natural numbers, i.e.  $\overline{\text{out}}(0), \overline{\text{out}}(1), \overline{\text{out}}(2), \overline{\text{out}}(3), \dots$ , but where arbitrarily many  $\tau$ 's may occur between the outputs.

Counter = ...

Adder = ...

Adder' = ...

Buffer = ...