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Exercise 1 (Open a Bank Account)

Exercise 2 (Transition Systems)

a) $TS_1 = \big(\{s_0, s_1, s_2, s_3, s_4\}, \{\alpha, \beta, \gamma\},$
$\{(s_0, \alpha, s_2), (s_0, \gamma, s_1), (s_1, \gamma, s_1), (s_1, \alpha, s_3), (s_1, \beta, s_4), (s_2, \alpha, s_0), (s_2, \beta, s_4), (s_4, \alpha, s_2), (s_4, \gamma, s_3)\},$
$\{s_0\}, \big\{\{a\}, \{b\}, \{a, b\}\big\}, L_1\big)$
with $L_1 : \big\{\{s_0 \mapsto \{a\}, s_1 \mapsto \{a\}, s_2 \mapsto \{a, b\}, s_3 \mapsto \{b\}, s_4 \mapsto \{a, b\}\big\}$.

b) Here is an example for a finite execution: $\rho_{finite} = s_0\gamma s_1\alpha s_3$ and an example for an infinite execution: $\rho_{infinite} = s_0\gamma s_1\gamma s_1\gamma s_1 \dots$.

c) (i) TS_1 is AP-deterministic, because $\mid I \mid = \mid \{s_0\} \mid = 1 \leq 1$ and there are only at most 2 states s and s' for which $L(s) = L(s')$ holds: For these pairs (s_0, s_1) with $L(s_0) = L(s_1) = \{a\}$ and (s_2, s_4) which $L(s_2) = L(s_4) = \{a, b\}$ are never both in $Post(s'')$ for all $s'' \in S$.

(ii) TS_1 is also $action - deterministic$, because both conditions hold:

* $\mid I \mid = \mid \{s_0\} \leq 1$
* $|Post(s_0, \alpha)| = |Post(s_0, \gamma)| = |Post(s_1, \alpha)| = |Post(s_1, \beta)| = |Post(s_1, \gamma)| = |Post(s_2, \alpha)| = |Post(s_2, \beta)| = |Post(s_4, \alpha)| = |Post(s_4, \gamma)| = 1$ and for every other pair (s_i, σ) with $s_i \in \{s_0, s_1, s_2, s_3, s_4\}$ and $\sigma \in \{\alpha, \beta, \gamma\}$ holds $(s_i, \sigma) = 0$.

d) $TS_2 = \big(\{s_0, s_1, s_2, s_3\}, \{\alpha, \beta, \gamma\},$
$\{(s_0, \alpha, s_2), (s_0, \gamma, s_1), (s_1, \gamma, s_1), (s_1, \alpha, s_3), (s_1, \beta, s_2), (s_2, \alpha, s_0), (s_2, \beta, s_1), (s_3, \beta, s_2), (s_3, \beta, s_3)\}$
$\{s_0\}, \big\{\{a\}, \{b\}, \{a, b\}\big\}, L_2\big)$
with $L_2 : \big\{\{s_0 \mapsto \{a\}, s_1 \mapsto \{a\}, s_2 \mapsto \{a, b\}, s_3 \mapsto \{b\}\big\}$.

e) An example for a path in TS_2 is $\pi := (s_0, s_1, s_1, s_1, \dots)$ and therefore $trace(\pi) = \{a\}\{a\}\{a\} \dots$.

f)

Aufgabe 3 (Program Graphs)

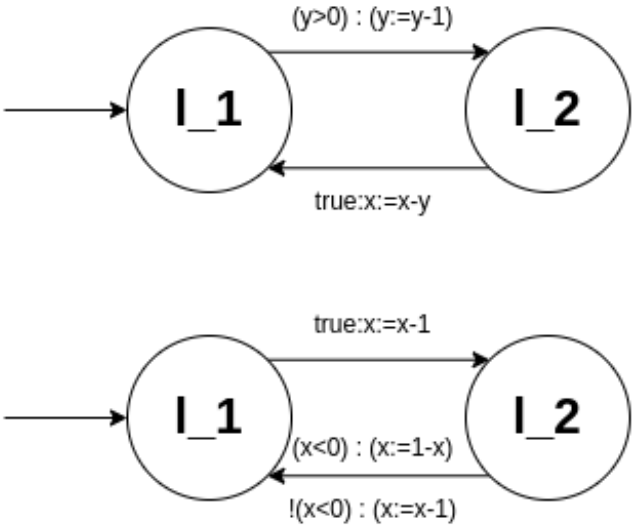

Abbildung 1:

a)

b)

c)

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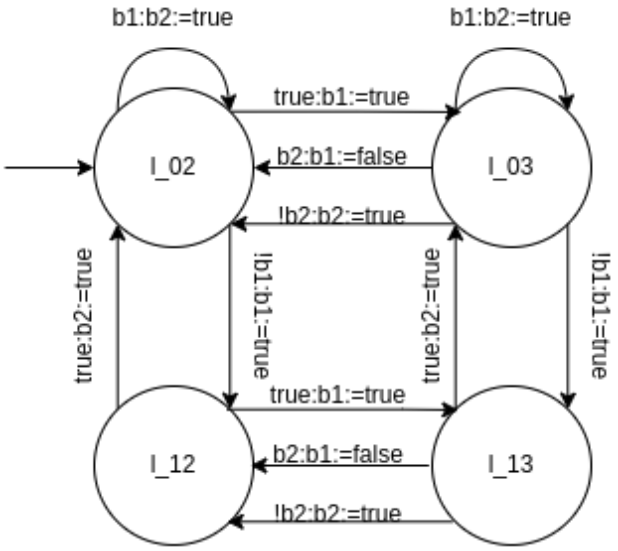

Abbildung 2:

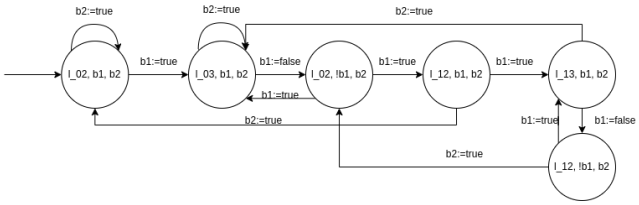

Abbildung 3:

Aufgabe 4 (Handshaking)

a)

b)

c)