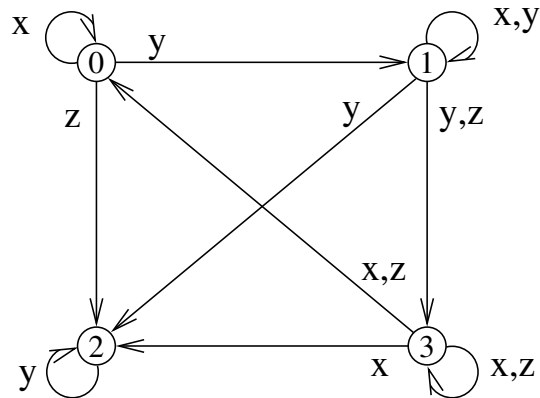# Formal Models SS 2016: Assignment 7

Institute for Formal Models and Verification, JKU Linz

Due 12.05.2016

Exercise 25

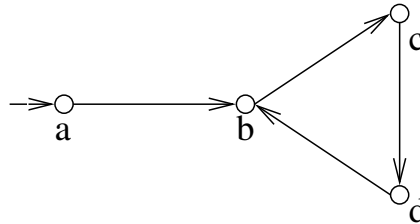Given the LTS L shown in the figure below.

Decide for which states of L the following HML expressions hold.

- $\langle x \rangle\, 1$

- $\langle x \rangle ([y]\, 0 \vee \langle z \rangle\, 1)$

- $([y]\, [x]\, 1) \vee (\langle x \rangle\, \langle y \rangle\, 0)$

- $\langle z \rangle\, 1 \wedge \langle z \rangle\, [y]\, 0$

- $([y]\, \langle x \rangle\, 1) \vee ([x]\, \langle y \rangle\, 1)$
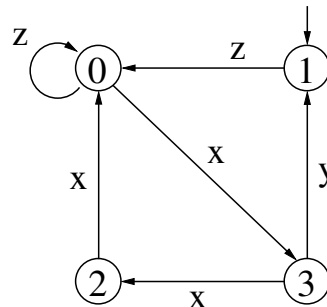
Exercise 26

Given LTS L as shown below.

a) List all different infinite traces in L, using ω-notation, e.g. $ababab\cdots = (ab)^{\omega}$.

b) Find 6 equivalences between traces from part a), using notation π^i, e.g. $\pi_2 = \pi_1^1$ for $\pi_1 = xyz$ and $\pi_2 = yz$.

Exercise 27

Given LTS L and CTL/HML formulae 1 to 6 as shown below. For each state s of L, determine which of formulae 1 to 6 hold in s.

1. $\mathbf{AX}(\langle x \rangle 1)$
2. $\mathbf{EX}([y]0)$
3. $\mathbf{AG}(\langle z \rangle 1 \leftrightarrow \langle y \rangle 1)$
4. $\mathbf{E}[\langle x \rangle 1 \ \mathbf{U} \ \langle z \rangle 1]$
5. $\mathbf{EG}(\langle z \rangle 1)$
6. $\mathbf{EF}(\mathbf{EG} \langle x \rangle 1)$

Exercise 28

Reconsider the LTS A and B from Exercise 13. Specify 4 properties in CTL/HML. One property of them should be satisfied both, one should be satisfied by none, and two should be satisfied either by A or either by B. Additionally, find one which contains G and which is not unsatisfiable. Also find one with U.