Discrete and Continuous Dynamical Systems

Tutorial, 2018.04.11.

1. Let $E = \{a, b, g\}$ and consider the two languages $L_1 = \{\varepsilon, a, abb\}$ and $L_4 = \{g\}$. Neither L_1nor L_4 are prefix-closed, since $ab \notin L_1$ and $\varepsilon \notin L_4$

$$\begin{aligned} L_1L_4 &= \{g, ag, abg\} \\ \overline{L_1} &= \{\varepsilon, a, ab, abb\} \\ \overline{L_4} &= \{\varepsilon, g\} \\ L_1\overline{L_4} &= \{\varepsilon, a, abb, g, ag, abbg\} \\ L_4^* &= \{\varepsilon, g, gg, ggg, \dots\} \\ L_1^* &= \{\varepsilon, a, abb, aa, aabb, abba, abbabb, \dots\} \end{aligned}$$

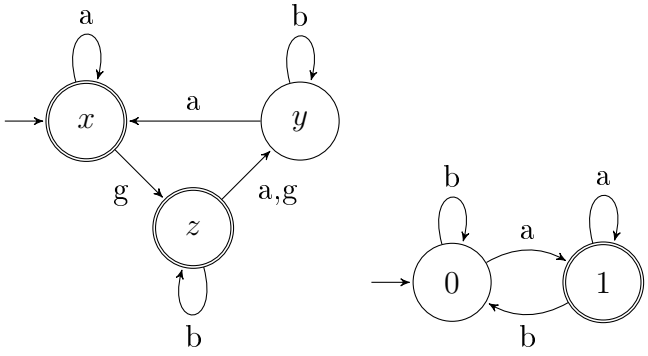
2. Let $E_l = \{a, b, c\}$ and consider two proper subsets $E_1 = \{a, b\}$ and $E_2 = \{b, c\}$. Take

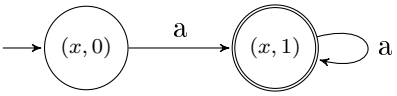
$$L = \{c, ccb, abc, cacb, cabcbbca\} \subset E_l^*$$

Consider the projections $P_i : E_l^* \to E_i^*,\ i = 1, 2.$

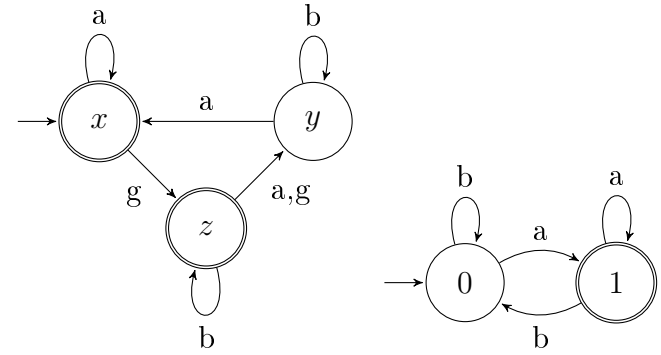
$$\begin{aligned} P_1(L) &= \{\varepsilon, b, ab, abbba\} \\ P_2(L) &= \{c, ccb, bc, cbcbbc\} \\ P_1^{-1}(\{\varepsilon\}) &= \{c\}^* \\ P_1^{-1}(\{b\}) &= \{c\}^*\{b\}\{c\}^* \\ P_1^{-1}(\{ab\}) &= \{c\}^*\{a\}\{c\}^*\{b\}\{c\}^* \end{aligned}$$

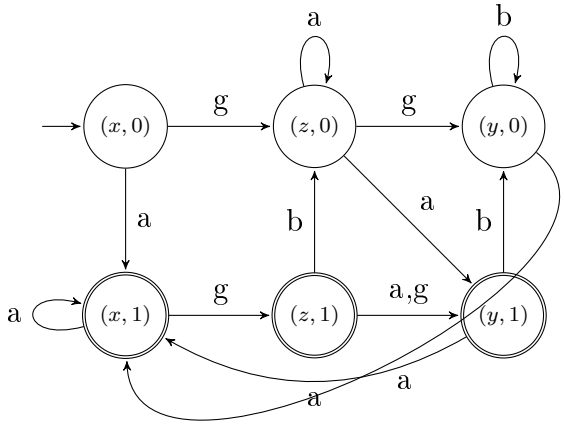
3. Give the product of the following automata:



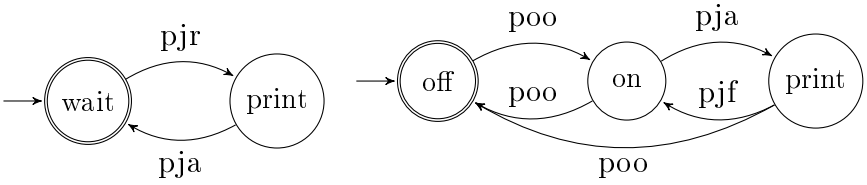


4. Give the parallel composition of the following two automata:





5. **Homework:** Given the following two automata model of a computer and a printer



The event set of the computer is

pja Print job accepted

pjr Print job received

The event set of the printer is

pja Print job accepted

pjf Print job finished

poo Printer on/off

(a) Give the parallel composition of the two automata in both graph form and formally defined!

Deadline of submission: 2018.03.10. 8am
(Submit your homework in the moodle course in a hand written scanned pdf format! Please, write your name and neptun ID on the paper!)