Concurrency theory
Exercise sheet 4

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Out: November 20 Due: November 26

Submit your solutions until Tuesday, November 26, during the lecture. You may submit in groups up to three persons.

Exercise 1: Counter programs

You may use additional counter variables to solve these problems. In each part of this exercise, you may use the previous parts as subroutines.

Let n be some fixed number.

a) Present a counter program $\texttt{Set}_n(x_j)$ that sets the value of counter variable x_j to n.

b) Present a counter program $\texttt{Double}(x_j)$ that doubles the value of counter variable x_j.

c) Present a counter program $\texttt{Power}_n(x_j)$ that sets the value of counter variable x_j to 2^n.

d) Present a counter program $\texttt{Square}(x_j)$ that squares the value of counter variable x_j, i.e. the new value is v^2, where v is the old value.

In each part of this exercise, argue briefly that your program is correct.

Exercise 2

Prove that given a Petrinet $N = (P, T, \text{in}, \text{out})$ and markings M_1 and M_2, if $M_1 \xrightarrow{\sigma} M_2$ for some $\sigma \in T^*$ then

$$\forall p \in P, \quad M_2(p) = M_1(p) + \sum_{t \in T} (\text{out}(t,p) - \text{in}(p,t)) \cdot \Pi_\sigma(t)$$

Exercise 3

Recall the BPP net you obtained in the previous exercise to decide 3-SAT. Using the technique discussed in the class, obtain a system of linear equations for this BPP net. The system of linear equations should have an integer solution iff the final marking of the BPP net is coverable.