Concurrency Theory

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Sheet 10

Due: Monday, 2026-01-26

Exercise 10.1 (Categorical Properties of Net Homomorphisms)

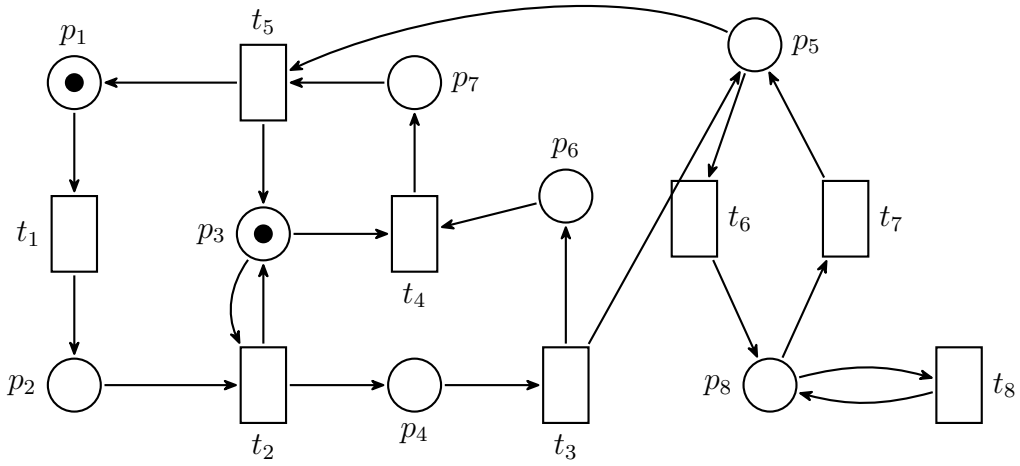
Let $N_i = (P_i, T_i, F_i, M_i)$ be nets. Based on Definition 16.1, check that net homomorphisms satisfy the following properties:

(a) Identity: Show that for any net N, the identity mapping $id_N : P \cup T \to P \cup T$ is a net homomorphism from N to itself.

(b) Composition: Let $h : N_1 \to N_2$ and $g : N_2 \to N_3$ be net homomorphisms. Prove that their functional composition $(g \circ h) : N_1 \to N_3$ is also a net homomorphism.

Exercise 10.2 (Branching Processes)

Consider the Petri Net N below.



- Give the marking graph of N.
- Provide three non-isomorphic branching processes B_1, B_2, B_3 of N such that $B_1 \sqsubseteq B_2$ and $B_2 \not\sqsubseteq B_3 \not\sqsubseteq B_1$.

Exercise 10.3 (True Concurrency Semantics for CSS)

Translate the CCS process $P = z.\text{nil} + y.(x.\text{nil} \parallel \overline{x}.\text{nil})$ into a Petri Net.

If you have questions, please post a message in the dedicated chat.