Technische Universität München, I7 | Summer Term 2020
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Petri nets — Exercise sheet 1

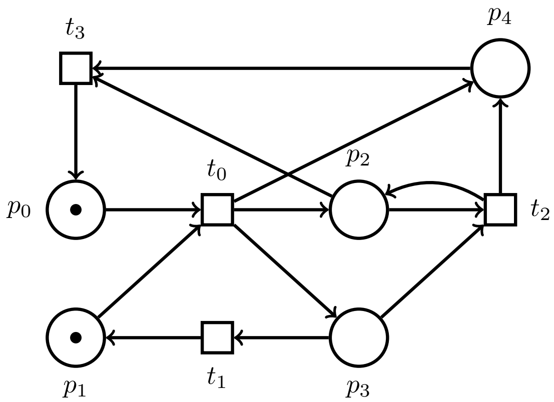
Exercise 1.1
For Petri net $(\mathcal{N}, M_0)$ below:

(a) Construct the reachability graph of $(\mathcal{N}, M_0)$.

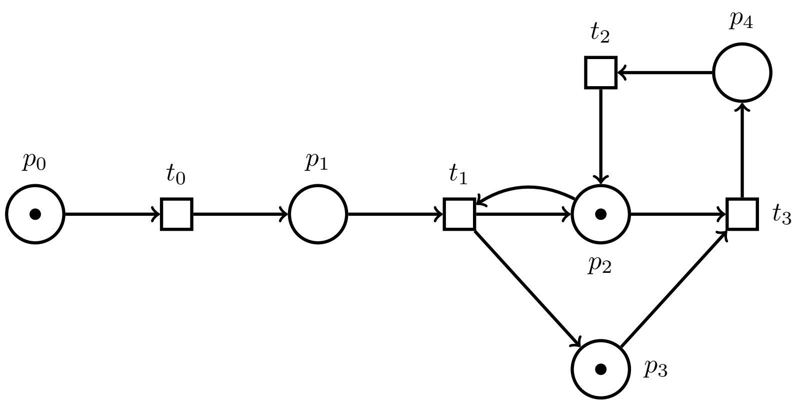
(b) Give the subnet $\mathcal{N}' = (P', T', F')$ of $\mathcal{N}$ such that $P' = \{p_0, p_1, p_2, p_4\}$ and $T' = T$.

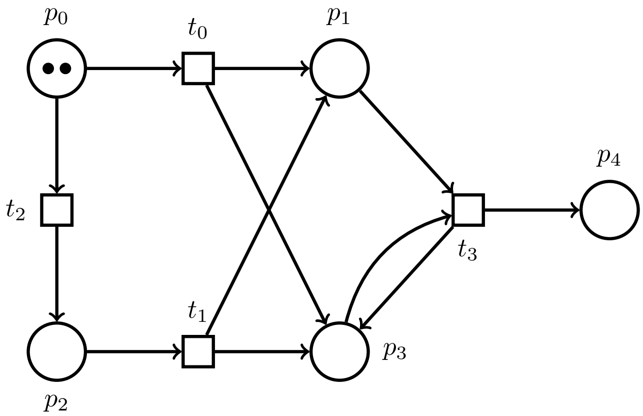
(c) Is there a reachable marking of $(\mathcal{N}, M_0)$ that does not enable any transition?

(d) Is there a firing sequence in which transition t_3 is fired infinitely often? Is there a firing sequence in which transition t_2 is enabled infinitely often?



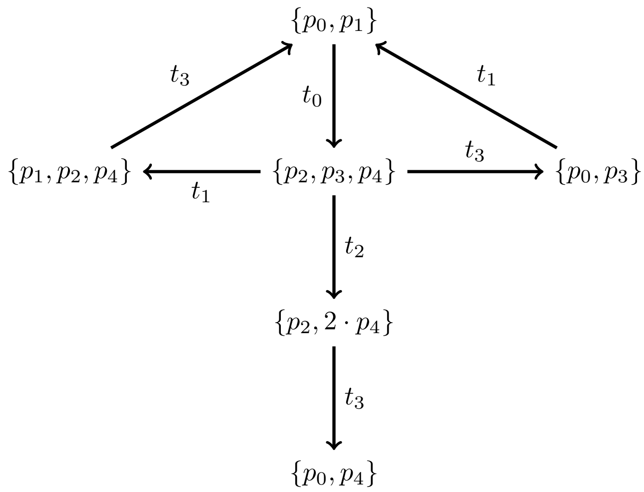
Exercise 1.2
For this exercise, you need to install `PIPE` (see the Moodle website for links to the version needed, as well as a video "Introduction to Pipe"). Use `PIPE` to compute the number of reachable states, that is the number of states of the reachability graph, of each Petri net $(\mathcal{N}, M_0)$ below. The `PIPE` file "pn_1-2-1.xml" for the first Petri net is provided in the folder for this exercise; you must create the file for the second Petri net.



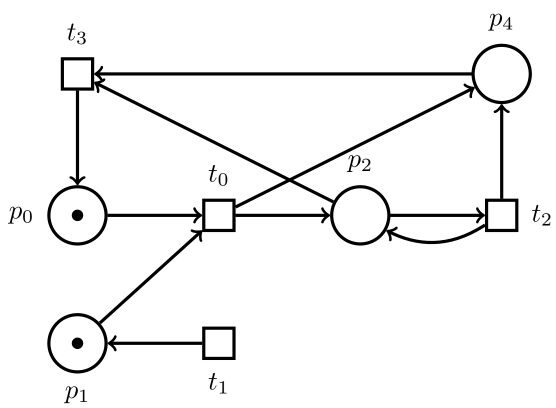

p_0
t_0
p_1
p_4
t_2
t_3
t_1
p_3
p_2

Solution 1.1

1.



2.



3. Marking $\{p_0, p_4\}$ is a reachable marking of $(\mathcal{N}, M_0)$ that does not enable any transition - it has no outgoing edge in the reachability graph. It is the only such marking.

4. By observing the reachability graph, we can see that $\{p_0, p_1\} \xrightarrow{t_0} \{p_2, p_3, p_4\} \xrightarrow{t_3} \{p_0, p_3\} \xrightarrow{t_1} \{p_0, p_1\} \xrightarrow{t_0 t_3 t_1} \dots$ is an example of a firing sequence in which t_3 is fired infinitely often.

   The same firing sequence enables t_2 infinitely often (in marking $\{p_2, p_3, p_4\}$).

Solution 1.2

(a) The reachability graph has 11 reachable states.

(b) The reachability graph has 10 reachable states.