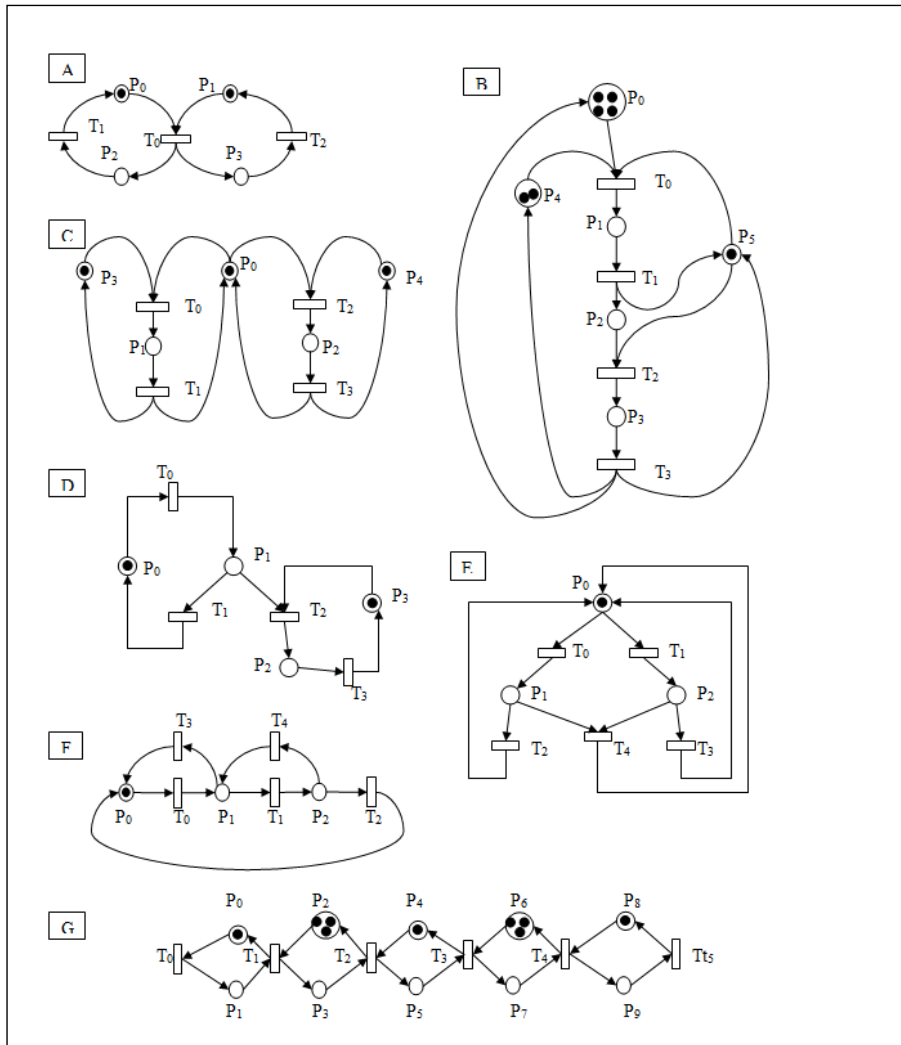


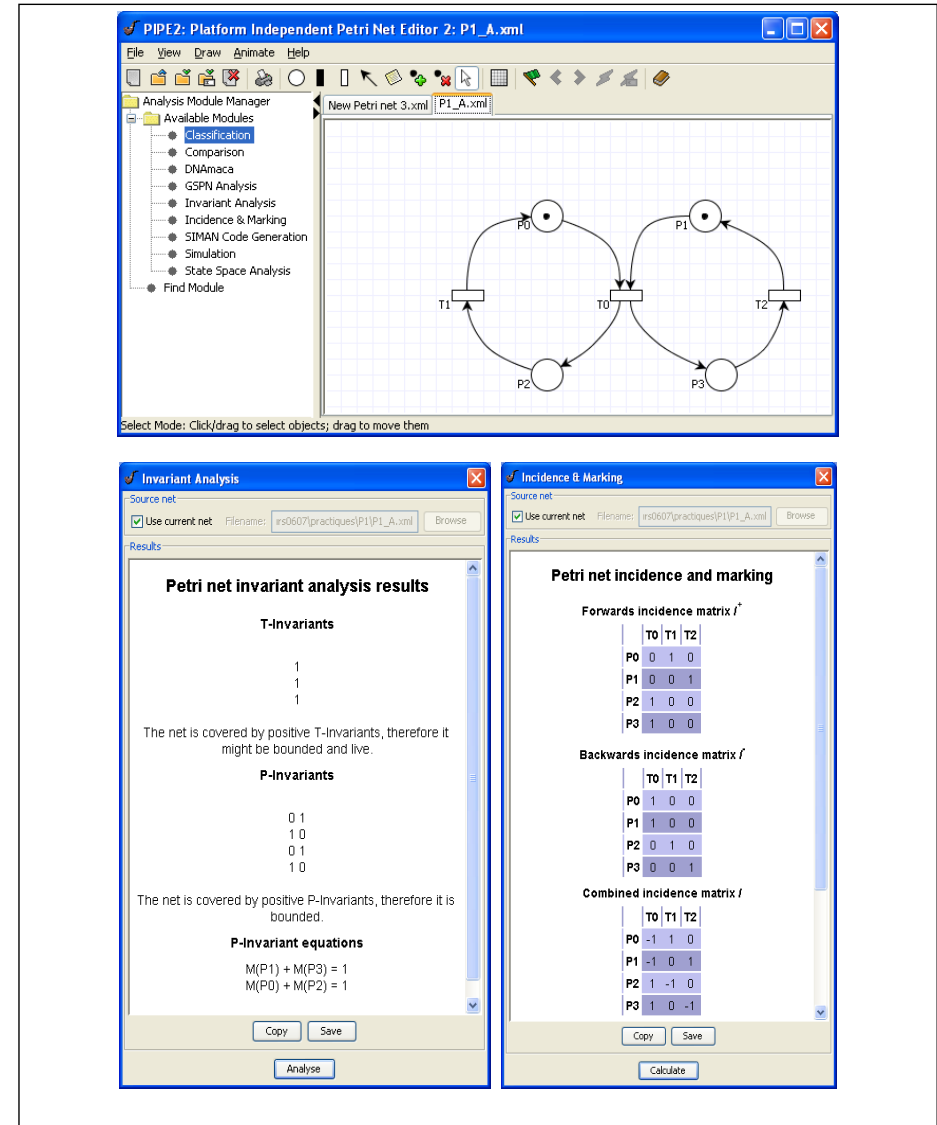
TUTORIAL

Modeling and qualitative analysis using Petri Nets

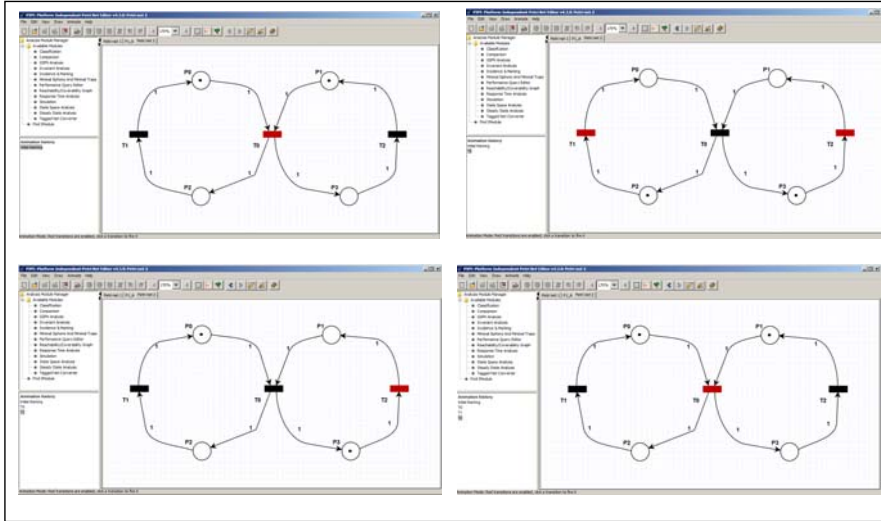
1. Use the edition and animation capabilities of PIPE and the *Incidence & Marking* and *Invariant Analysis* modules to:
 - a) Compute incidence matrices Pre, Post, C and the initial marking M_0 .
 - b) Compute the P-invariants and verify that the number of tokens in the associated places keep unchanged.
 - c) Compute the T-invariants and verify that they correspond to cyclic behaviors.



Petri Net A



The T-invariant $[1,1,1,]$ defines a cyclic behavior. It can be seen that by firing the sequence T_0, T_1, T_2 the initial marking is reached:

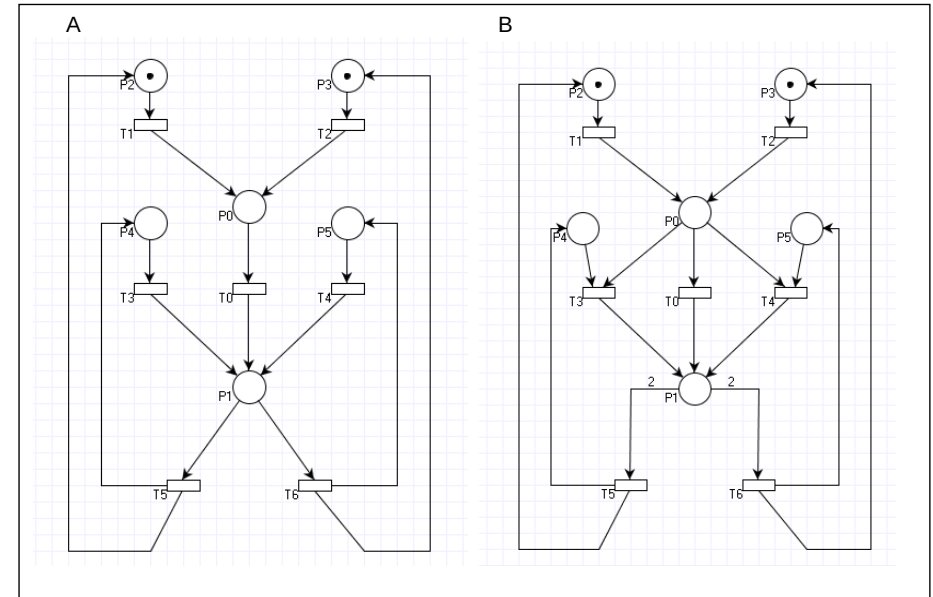


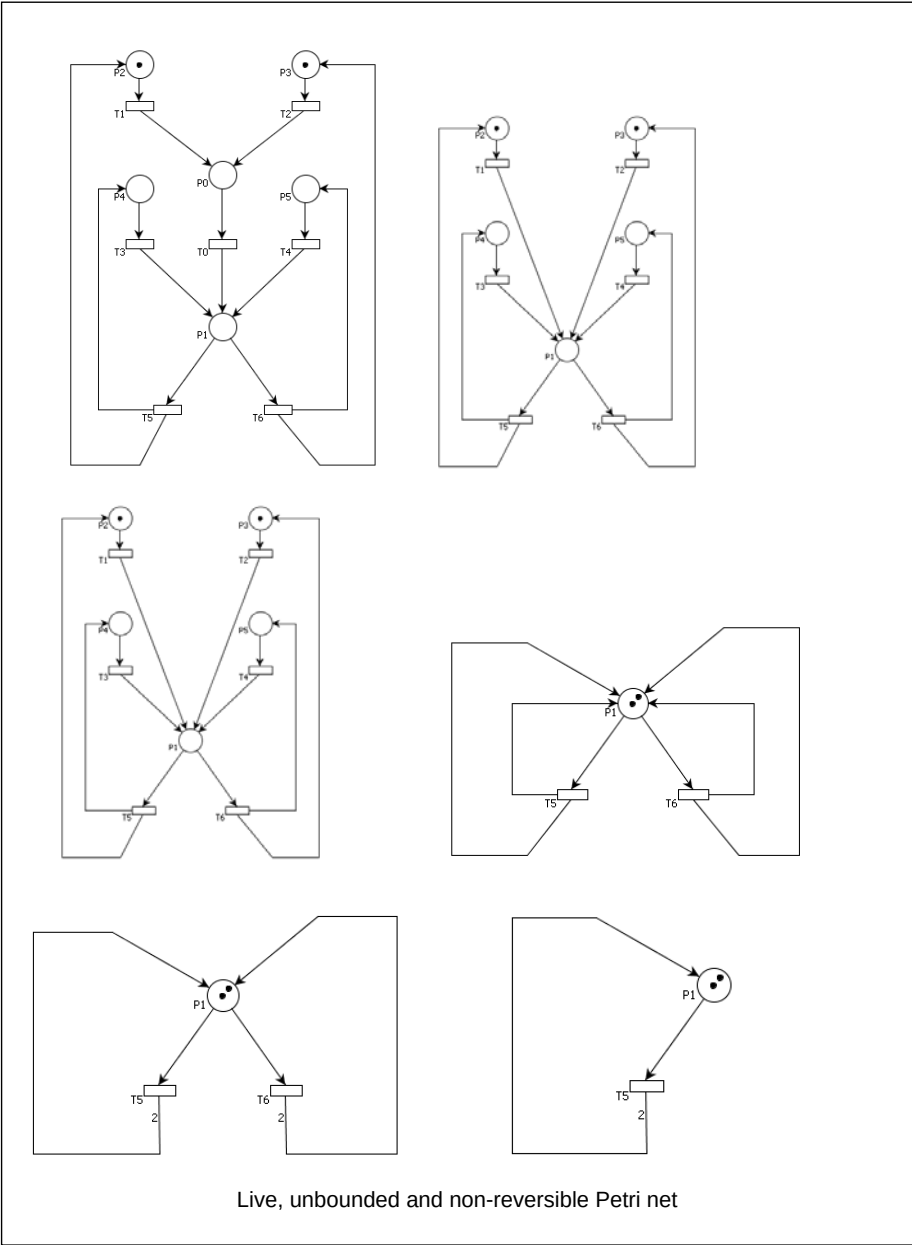
It can also be seen that the number of marks in the set $\{P_0, P_2\}$ and in the set $\{P_1, P_3\}$ remains constant along all the states, i.e. the P-invariants $[1,0,1,0]$ and $[0,1,0,1]$ describe the mark conservation law.

Exercise:

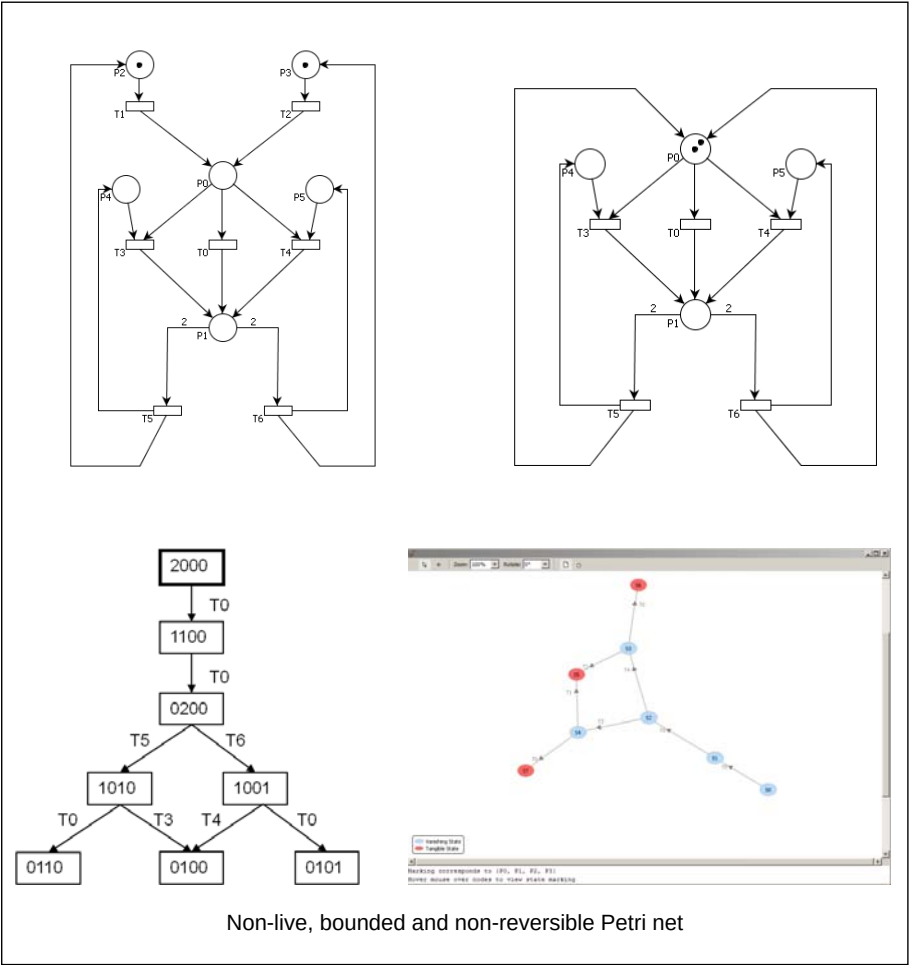
1. Repeat for all the other nets.

2. Analyze the qualitative properties of the following two Petri nets. Use the reduction technique and the reachability graph.





Live, unbounded and non-reversible Petri net



Non-live, bounded and non-reversible Petri net

Exercise:
2. Repeat for the following net:

