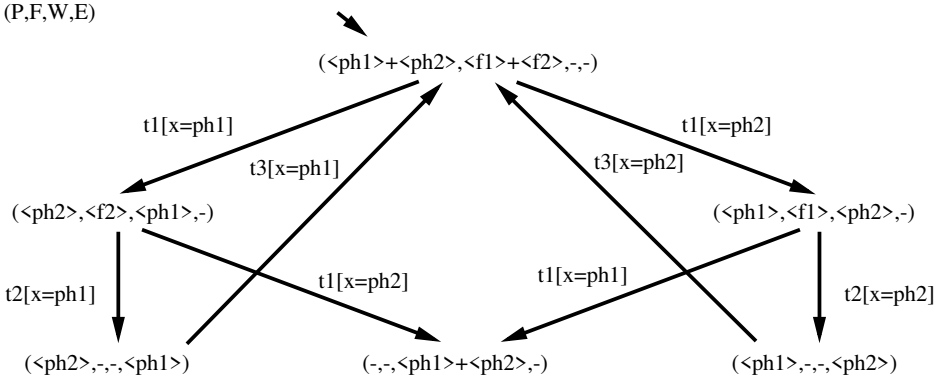
T-79.231 **Autumn 2001**
Parallel and distributed digital systems Answers to Tutorial 3
Oct 9, 2001

1. Both philosophers may starve in the 2 philosophers net in a deadlock which is accomplished by firing the transitions $t_1\,[x \mapsto ph_1]$, and $t_1\,[x \mapsto ph_2]$ consequtively in either order.

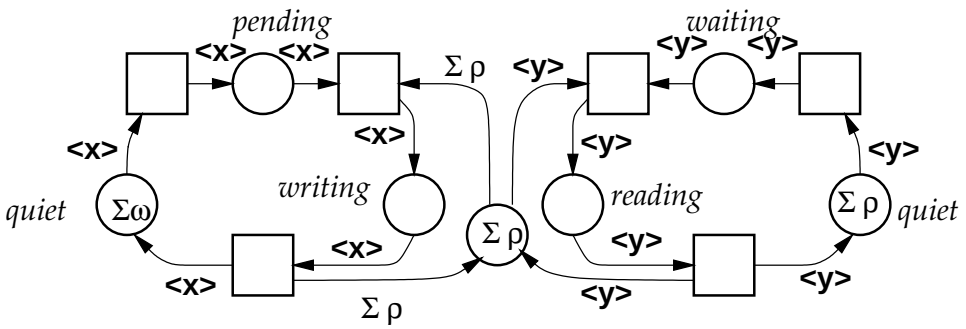
   Another case where a philosopher may starve is a so called livelock. If all the conflicts are resolved in favour of one philosopher, the other never gets to eat. In the reachability graph this can be seen in the cycle comprising the transitions $t_1\,[x \mapsto ph_1]$, $t_2\,[x \mapsto ph_1]$, and $t_3\,[x \mapsto ph_1]$.

   Saavutettavuusgraafi:

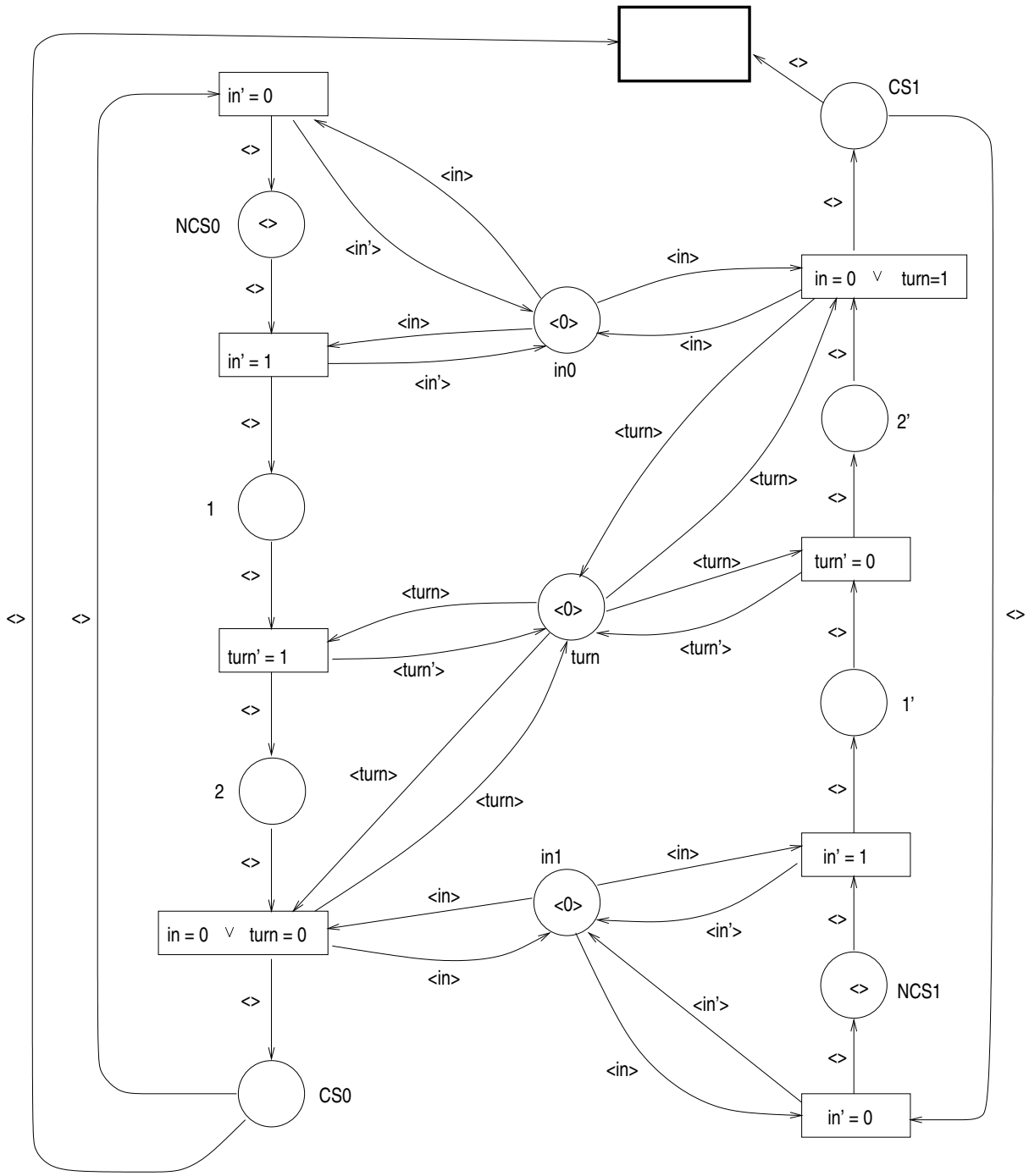
   - Merkinnät muotoa (P,F,W,E)

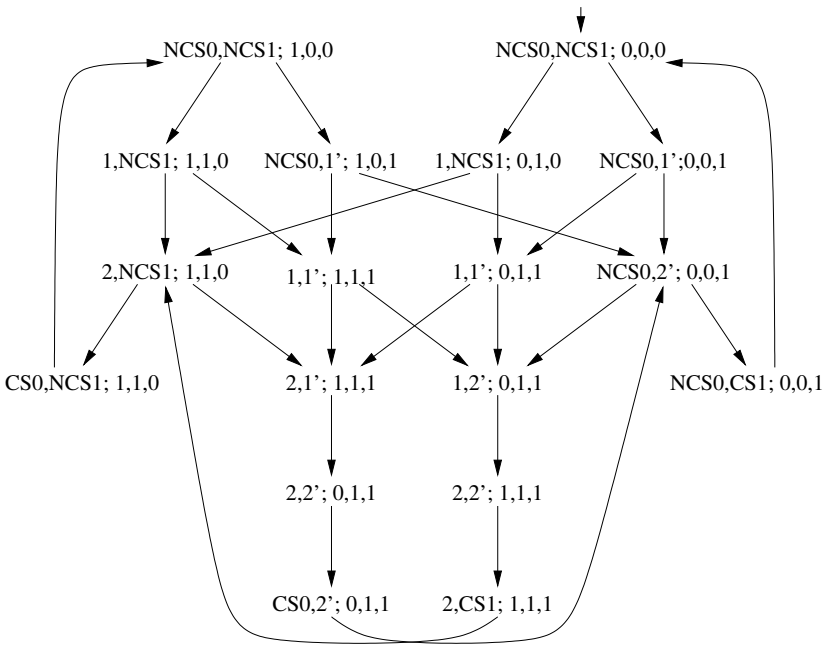


2. A solution to the readers/writers problem is given below. $\Sigma\rho$ is a shorthand for `<r1> + <r2> + ... + <rR>`. $\Sigma\omega$ is a shorthand for `<w1> + <w2> + ... + <wW>`.



3. A Pr/T net model of Peterson's algorithm is given below. The reachability graph shows that it is impossible to find a marking where both processes are in their critical sections. The same can be concluded because the fact transition in the top of the net is never enabled.


<>
CS1
in' = 0
NCS0
<in>
<in'>
in = 0 ∨ turn=1
<0>
in0
in' = 1
1
2'
<turn>
turn' = 0
turn' = 1
turn
1'
2
in1
in = 0 ∨ turn = 0
NCS1
CS0
in' = 0


NCS0,NCS1; 1,0,0
NCS0,NCS1; 0,0,0
1,NCS1; 1,1,0
NCS0,1'; 1,0,1
1,NCS1; 0,1,0
NCS0,1';0,0,1
2,NCS1; 1,1,0
1,1'; 1,1,1
1,1'; 0,1,1
NCS0,2'; 0,0,1
CS0,NCS1; 1,1,0
2,1'; 1,1,1
1,2'; 0,1,1
NCS0,CS1; 0,0,1
2,2'; 0,1,1
2,2'; 1,1,1
CS0,2'; 0,1,1
2,CS1; 1,1,1