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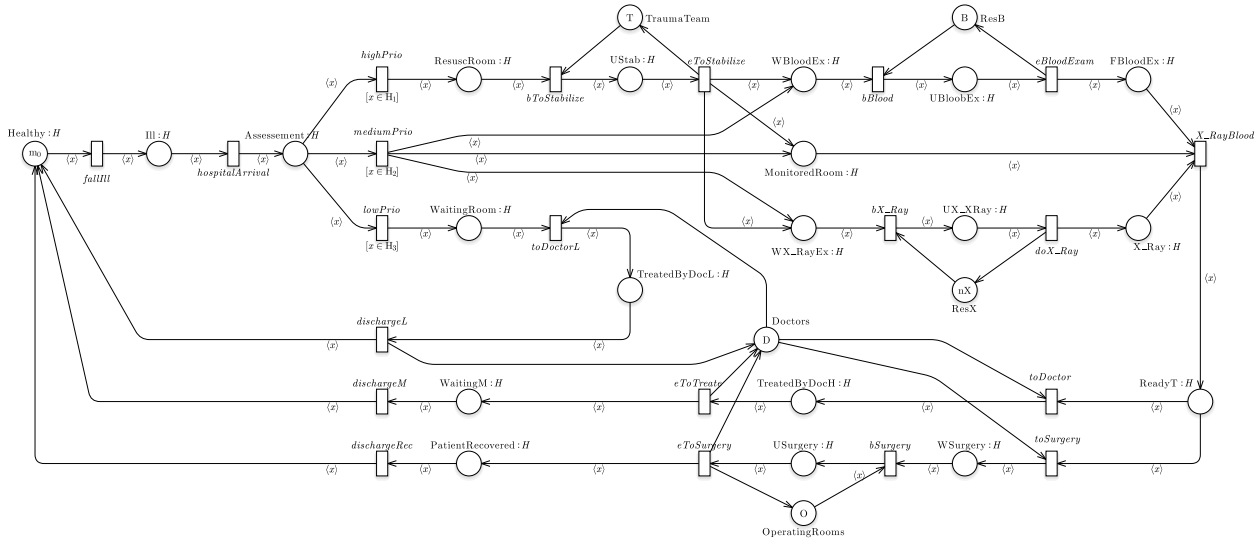
This form is a summary description of the model entitled "HospitalTriage" proposed for the Model Checking Contest @ Petri Nets. Models can be given in several instances parameterized by scaling parameters. Colored nets can be accompanied by one or many equivalent, unfolded P/T nets. Models are given together with property files (possibly, one per model instance) giving a set of properties to be checked on the model.

Description

The model represents the workflow of a hospital Emergency Department (ED) [1], described in [2] and [3]. Patients are divided in three categories: patients requiring resuscitation (high priority), patients with major illnesses or injuries (medium priority) and patients with minor illnesses or injuries (low priority). High priority patients go through a stabilization process first. Medium priority patients are immediately admitted to a Monitored room, where the examinations (blood test, X-ray) can be performed by a doctor. Low priority patients stay in a waiting room, and wait the availability of a doctor when no other high priority patients are being treated. Priorities, which were part of the original model, have been dropped in order to obtain a P/T PNML2009 model.



Graphical representation of the Hospital model

References

[1] G. Balbo, M. Beccuti, M. D. Pierro, and G. Franceschinis. *Computing first passage time distributions in stochastic well-formed nets.* In ICPE?11 - Second Joint WOSP/SIPEW International Conference on Performance Engineering, pages 7?18, Karlsruhe, Germany, March 2011.

[2] S. Wau Men Au-Yeung. *Response Times in Healthcare Systems.* PhD thesis, Imperial College, London, 2008. pubs.doc.ic.ac.uk/response-times-in-healthcare

[3] Elvio Gilberto Amparore, Benoit Barbot, Marco Beccuti, Susanna Donatelli, and Giuliana Franceschinis. 2013. *Simulation-based verification of hybrid automata stochastic logic formulas for stochastic symmetric nets.* In Proceedings of the 1st ACM SIGSIM Conference on Principles of Advanced Discrete Simulation (SIGSIM PADS 2013). ACM, pp. 253-264.

Scaling parameter

This model is not parameterized.

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Size of the model

number of places:	245
number of transitions:	228
number of arcs:	680

Structural properties

ordinary — *all arcs have multiplicity one* ..... ✔
simple free choice — *all transitions sharing a common input place have no other input place* ..... ✗ (a)
extended free choice — *all transitions sharing a common input place have the same input places* ..... ✗ (b)
state machine — *every transition has exactly one input place and exactly one output place* ..... ✗ (c)
marked graph — *every place has exactly one input transition and exactly one output transition* ..... ✗ (d)
connected — *there is an undirected path between every two nodes (places or transitions)* ..... ✔ (e)
strongly connected — *there is a directed path between every two nodes (places or transitions)* ..... ✗ (f)
source place(s) — *one or more places have no input transitions* ..... ✔ (g)
sink place(s) — *one or more places have no output transitions* ..... ✗ (h)
source transition(s) — *one or more transitions have no input places* ..... ✗ (i)
sink transitions(s) — *one or more transitions have no output places* ..... ✗ (j)
loop-free — *no transition has an input place that is also an output place* ..... ✔ (k)
conservative — *for each transition, the number of input arcs equals the number of output arcs* ..... ✗ (l)
subconservative — *for each transition, the number of input arcs equals or exceeds the number of output arcs* ..... ✗ (m)
nested units — *places are structured into hierarchically nested sequential units* (n) ..... ✗

Behavioural properties

safe — *in every reachable marking, there is no more than one token on a place* ..... ✗ (o)
dead place(s) — *one or more places have no token in any reachable marking* ..... ✔ (p)
dead transition(s) — *one or more transitions cannot fire from any reachable marking* ..... ✔ (q)
deadlock — *there exists a reachable marking from which no transition can be fired* ..... ?
reversible — *from every reachable marking, there is a transition path going back to the initial marking* ..... ?
live — *for every transition t, from every reachable marking, one can reach a marking in which t can fire* ..... ?

(a) 108 arcs are not simple free choice, e.g., the arc from place "P31" (which has 2 outgoing transitions) to transition "T58" (which has 2 input places).
(b) transitions "T216" and "T7" share a common input place "P38", but only the former transition has input place "P20".
(c) 172 transitions are not of a state machine, e.g., transition "T1".
(d) 57 places are not of a marked graph, e.g., place "P2".
(e) stated by CÆSAR.BDD version 2.7.
(f) from place "P2" one cannot reach place "P18".
(g) there exist 16 source places, e.g., place "P18".
(h) stated by CÆSAR.BDD version 2.7.
(i) stated by CÆSAR.BDD version 2.7.
(j) stated by CÆSAR.BDD version 2.7.
(k) stated by CÆSAR.BDD version 2.7.
(l) 172 transitions are not conservative, e.g., transition "T1".
(m) 76 transitions are not subconservative, e.g., transition "T1".
(n) the definition of Nested-Unit Petri Nets (NUPN) is available from http://mcc.lip6.fr/nupn.php
(o) in the initial marking, there exist 11 places containing between 2 and 4 tokens.
(p) 84 places, at least, are never marked, e.g., place "P18".
(q) 80 transitions, at least, can never fire, e.g., transition "T2".

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Size of the marking graph

number of reachable markings:	?
number of transition firings:	?
max. number of tokens per place:	?
max. number of tokens per marking:	≥ 37 [(r)]

[(r)] lower bound given by the number of initial tokens.