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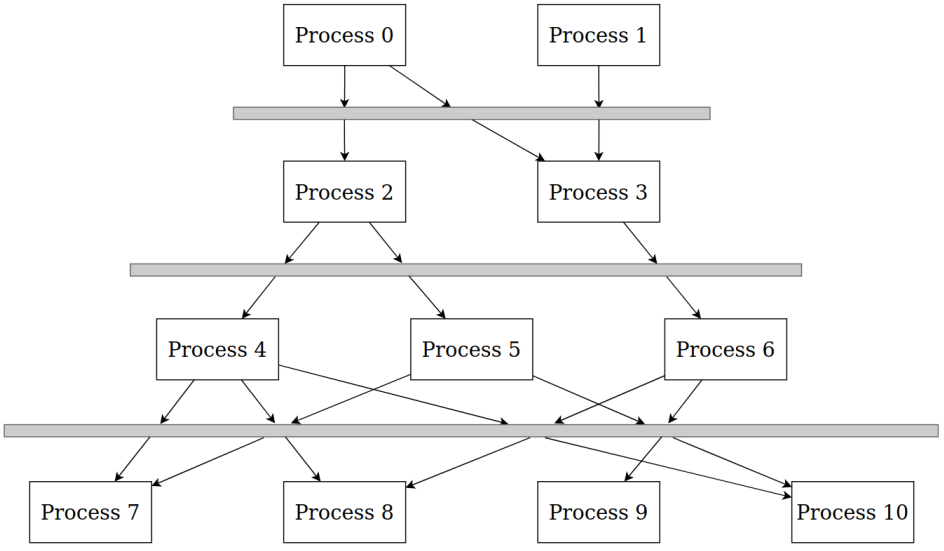
This form is a summary description of the model entitled "Champagne" proposed for the Model Checking Contest @ Petri Nets. Models can be given in several instances parameterized by scaling parameters. Colored nets can be accompanied by one or many equivalent, unfolded P/T nets. Models are given together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

Description

The Champagne model represents the way in which Champagne is served during weddings, that is, in the form of a fountain in which the first glass (i.e., the one on the top) is filled, and, once full, starts spilling Champagne into the glasses below it, and so on until reaching the lowest row of glasses.

Unlike in reality, our version of the process contains two glasses on the first row, and each glass of a row does not necessarily spill Champagne in all the glasses below it, but may do it for part of them only. Also, the spilling is done in a certain order (fixed or not). The Champagne can be spilled in three different ways: (i) randomly, meaning that a glass spills Champagne in a single glass of the row below it, (ii) in an unordered way, meaning that each glass spills Champagne in all the glasses of the row below it in a non-deterministic order, and (iii) in a ordered way, meaning that each glass spills Champagne in all the glasses of the row below it, in a determined order.

We provide 7 instances for each transmission method T (random, unordered and ordered), each of them having a different H value ranging from 4 to 10, representing the height of the fountain, i.e., the number of rows of glasses. All these instances were originally expressed in LNT, a modern language that can be translated to LOTOS automatically. Each generated LOTOS specification was then translated to an interpreted Petri net using the CADP toolbox. A P/T net was then obtained by stripping out all data-related information (variables, types, assignments, guards, etc.) from the interpreted Petri net, leading to a NUPN (Nested-Unit Petri Net) model translated to PNML using the CÆSAR.BDD tool.



Representation of the model for $H = 4$. Each row communicates (partially, e.g., process 1 does not communicate with process 2) with the row below it and synchronises before sending the information.

Scaling parameter

Parameter name	Parameter description	Chosen parameter values
(H, T)	H is the height of the fountain, i.e., the number of rows of glasses and T is the transmission method.	$\{4...10\} \times \{R, U, O\}$

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Size of the model

Parameter	Number of places	Number of transitions	Number of arcs	Number of units	HWB code
$H = 4, T = R$	219	274	666	21	5–11–65
$H = 4, T = U$	285	351	820	21	5–11–65
$H = 4, T = O$	417	494	1106	21	5–11–76
$H = 5, T = R$	299	386	966	29	6–15–89
$H = 5, T = U$	389	491	1176	29	6–15–89
$H = 5, T = O$	569	686	1566	29	6–15–104
$H = 6, T = R$	399	528	1345	39	7–20–119
$H = 6, T = U$	519	668	1625	39	7–20–119
$H = 6, T = O$	759	928	2145	39	7–20–139
$H = 7, T = R$	539	742	1934	53	8–27–161
$H = 7, T = U$	701	931	2312	53	8–27–161
$H = 7, T = O$	1025	1282	3014	53	8–27–188
$H = 8, T = R$	739	1088	2936	73	11–37–221
$H = 8, T = U$	961	1347	3454	73	11–37–221
$H = 8, T = O$	1405	1828	4416	73	11–37–258
$H = 9, T = R$	979	1572	4420	97	13–49–293
$H = 9, T = U$	1273	1915	5106	97	13–49–293
$H = 9, T = O$	1861	2552	6380	97	13–49–342
$H = 10, T = R$	1259	2192	6374	125	15–63–377
$H = 10, T = U$	1637	2633	7256	125	15–63–377
$H = 10, T = O$	2393	3452	8894	125	15–63–440

Structural properties

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

[a] stated by CÆSAR.BDD version 3.7 on all 21 instances (3 types of models (Random, Unordered, Ordered) × 7 values of H).
[b] stated by CÆSAR.BDD version 3.7 on all 21 instances (3 types of models (Random, Unordered, Ordered) × 7 values of H).
[c] stated by CÆSAR.BDD version 3.7 on all 21 instances (3 types of models (Random, Unordered, Ordered) × 7 values of H).
[d] stated by CÆSAR.BDD version 3.7 on all 21 instances (3 types of models (Random, Unordered, Ordered) × 7 values of H).
[e] stated by CÆSAR.BDD version 3.7 on all 21 instances (3 types of models (Random, Unordered, Ordered) × 7 values of H).
[f] from place 1 one cannot reach place 0.
[g] place 0 is a source place.
[h] stated by CÆSAR.BDD version 3.7 on all 21 instances (3 types of models (Random, Unordered, Ordered) × 7 values of H).
[i] stated by CÆSAR.BDD version 3.7 on all 21 instances (3 types of models (Random, Unordered, Ordered) × 7 values of H).
[j] stated by CÆSAR.BDD version 3.7 on all 21 instances (3 types of models (Random, Unordered, Ordered) × 7 values of H).
[k] stated by CÆSAR.BDD version 3.7 on all 21 instances (3 types of models (Random, Unordered, Ordered) × 7 values of H).
[l] stated by CÆSAR.BDD version 3.7 on all 21 instances (3 types of models (Random, Unordered, Ordered) × 7 values of H).
[m] stated by CÆSAR.BDD version 3.7 on all 21 instances (3 types of models (Random, Unordered, Ordered) × 7 values of H).
[n] the definition of Nested-Unit Petri Nets (NUPN) is available from http://mcc.lip6.fr/nupn.php

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Behavioural properties

safe — *in every reachable marking, there is no more than one token on a place* ..... yes [(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* ..... ? [(r)]
reversible — *from every reachable marking, there is a transition path going back to the initial marking* ..... ? [(s)]
live — *for every transition t, from every reachable marking, one can reach a marking in which t can fire* ..... ? [(t)]

Size of the marking graphs

Parameter	Number of reachable markings	Number of transition firings	Max. number of tokens per place	Max. number of tokens per marking
$H = 4, T = R$	7.06076e+13 [(u)]	?	1	11
$H = 4, T = U$	1.72873e+15 [(v)]	?	1	11
$H = 4, T = O$	1.50605e+17 [(w)]	?	1	11
$H = 5, T = R$	7.20799e+18 [(x)]	?	1	15
$H = 5, T = U$	5.65585e+20 [(y)]	?	1	15
$H = 5, T = O$	2.54003e+23 [(z)]	?	1	15
$H = 6, T = R$	$\geq$ 1.3039e+25 [(aa)]	?	1 [(ab)]	20
$H = 6, T = U$	$\geq$ 4.37958e+27 [(ac)]	?	1 [(ad)]	20
$H = 6, T = O$	$\geq$ 1.49772e+31 [(ae)]	?	1 [(af)]	20
$H = 7, T = R$	$\geq$ 6.75116e+33 [(ag)]	?	1 [(ah)]	27
$H = 7, T = U$	$\geq$ 1.80296e+37 [(ai)]	?	1 [(aj)]	27
$H = 7, T = O$	$\geq$ 1.01319e+42 [(ak)]	?	1 [(al)]	27
$H = 8, T = R$	$\geq$ 1.34941e+46 [(am)]	?	1 [(an)]	37
$H = 8, T = U$	$\geq$ 1.72246e+50 [(ao)]	?	1 [(ap)]	37
$H = 8, T = O$	$\geq$ 1.27144e+57 [(aq)]	?	1 [(ar)]	37
$H = 9, T = R$	$\geq$ 4.70498e+59 [(as)]	?	1 [(at)]	49
$H = 9, T = U$	$\geq$ 5.30706e+66 [(au)]	?	1 [(av)]	49
$H = 9, T = O$	$\geq$ 2.5631e+74 [(aw)]	?	1 [(ax)]	49
$H = 10, T = R$	$\geq$ 9.22957e+58 [(ay)]	?	1 [(az)]	63
$H = 10, T = U$	$\geq$ 6.19963e+72 [(ba)]	?	1 [(bb)]	63
$H = 10, T = O$	$\geq$ 4.47731e+84 [(bc)]	?	1 [(bd)]	63

(o) safe by construction – stated by the CÆSAR compiler.
(p) stated by CÆSAR.BDD version 3.7 to be false on 6 instance(s) out of 21, and unknown on the remaining 15 instance(s).
(q) stated by CÆSAR.BDD version 3.7 to be false on 6 instance(s) out of 21, and unknown on the remaining 15 instance(s).
(r) stated by CÆSAR.BDD version 3.7 to be true on 6 instance(s) out of 21, and unknown on the remaining 15 instance(s).
(s) stated by CÆSAR.BDD version 3.7 to be false on 6 instance(s) out of 21, and unknown on the remaining 15 instance(s).
(t) stated by CÆSAR.BDD version 3.7 to be false on 6 instance(s) out of 21, and unknown on the remaining 15 instance(s).
(u) stated by CÆSAR.BDD version 3.7.
(v) stated by CÆSAR.BDD version 3.7.
(w) stated by CÆSAR.BDD version 3.7.
(x) stated by CÆSAR.BDD version 3.7.
(y) stated by CÆSAR.BDD version 3.7.
(z) stated by CÆSAR.BDD version 3.7.
(aa) stated by CÆSAR.BDD version 3.7.
(ab) stated by the CÆSAR compiler.
(ac) stated by CÆSAR.BDD version 3.7.
(ad) stated by the CÆSAR compiler.
(ae) stated by CÆSAR.BDD version 3.7.
(af) stated by the CÆSAR compiler.
(ag) stated by CÆSAR.BDD version 3.7.
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(ai) stated by CÆSAR.BDD version 3.7.
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(ak) stated by CÆSAR.BDD version 3.7.
(al) stated by the CÆSAR compiler.

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(am) stated by CÆSAR.BDD version 3.7.
(an) stated by the CÆSAR compiler.
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