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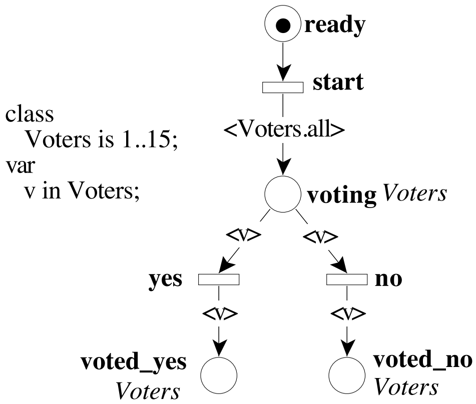
This form is a summary description of the model entitled "Referendum" proposed for the Model Checking Contest @ Petri Nets. Models can be given in several instances parameterized by scaling parameters. Colored nets can be accompanied by one or many equivalent, unfolded P/T nets. Models are given together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

Description

This simple Petri net models a referendum system where a population is asked to accept a given proposal by votin "yes" or "no". It was introduced in [1] as an example of combinatorial explosion that could be contained by using Symmetric Nets with Bags (SNB).



Graphical representation of the Referendum model for V=15.

References

1 S. Haddad, F. Kordon, L. Petrucci, J-F. Pradat-Peyre, and N. Trèves. Efficient State-Based Analysis by Introducing Bags in Petri Net Color Domains. 28th American Control Conference (ACC), pages 5018-5025, Omnipress IEEE Catalog, June 2009

Scaling parameter

Parameter name	Parameter description	Chosen parameter values
V	the maximum number of voters (in the color domain)	10, 15, 20, 50, 100, 200, 500, 1000

Size of the colored net model

number of places:	4
number of transitions:	3
number of arcs:	6

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Size of the derived P/T model instances

Parameter	Number of places	Number of transitions	Number of arcs
$V = 10$	31	21	51
$V = 15$	46	31	76
$V = 20$	61	41	101
$V = 50$	151	101	251
$V = 100$	301	201	501
$V = 200$	601	401	1001
$V = 500$	1501	1001	2051
$V = 1000$	3001	2001	5001

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]
deadlock — *there exists a reachable marking from which no transition can be fired* .... ✔ [p]
reversible — *from every reachable marking, there is a transition path going back to the initial marking* .... ✗ [q]

(a) stated by CÆSAR.BDD version 2.7 on all 8 instances (see all aforementioned parameter values).
(b) stated by CÆSAR.BDD version 2.7 on all 8 instances (see all aforementioned parameter values).
(c) transition “start_0” is not of a state machine.
(d) stated by CÆSAR.BDD version 2.7 on all 8 instances (see all aforementioned parameter values).
(e) stated by CÆSAR.BDD version 2.7 on all 8 instances (see all aforementioned parameter values).
(f) stated by CÆSAR.BDD version 2.7 on all 8 instances (see all aforementioned parameter values).
(g) place “ready” is a source place.
(h) place “vote_yes” is a sink place.
(i) stated by CÆSAR.BDD version 2.7 on all 8 instances (see all aforementioned parameter values).
(j) stated by CÆSAR.BDD version 2.7 on all 8 instances (see all aforementioned parameter values).
(k) stated by CÆSAR.BDD version 2.7 on all 8 instances (see all aforementioned parameter values).
(l) transition “start_0” is not conservative.
(m) transition “start_0” is not subconservative.
(n) the definition of Nested-Unit Petri Nets (NUPN) is available from `http://mcc.lip6.fr/nupn.php`
(o) there is only one token of a given color at most in each colored place; stated by CÆSAR.BDD version 2.7 to be true on 5 instance(s) out of 8, and unknown on the remaining 3 instance(s).
(p) tokens accumulate in “vote_yes” or in “voted_no”; stated by CÆSAR.BDD version 2.7 to be true on 5 instance(s) out of 8, and unknown on the remaining 3 instance(s).
(q) the marking graph has deadlocks and contains more than one reachable marking; stated by CÆSAR.BDD version 2.7 to be false on 5 instance(s) out of 8, and unknown on the remaining 3 instance(s).

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quasi-live — *for every transition t, there exists a reachable marking in which t can fire* .... ✔ [(r)]
live — *for every transition t, from every reachable marking, one can reach a marking in which t can fire* .... ✗ [(s)]

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
$V = 10$	59 050 [(t)]	393 661 [(u)]	1	$\in [10, 31]$ [(v)]
$V = 15$	14 348 908 [(w)]	143 489 071 [(x)]	1	$\in [15, 46]$ [(y)]
$V = 20$	3.48678e+09 [(z)]	?	1	$\in [20, 61]$ [(aa)]
$V = 50$	7.17898e+23 [(ab)]	?	1	$\in [50, 151]$ [(ac)]
$V = 100$	5.15378e+47 [(ad)]	?	1	$\in [100, 301]$ [(ae)]
$V = 200$	?	?	?	≥ 200 [(af)]
$V = 500$	?	?	?	≥ 500 [(ag)]
$V = 1000$	?	?	?	≥ 1000 [(ah)]

(r) each transition is reachable from the initial state; stated by CÆSAR.BDD version 2.7 to be true on 5 instance(s) out of 8, and unknown on the remaining 3 instance(s).
(s) the net has at least one transition and its marking graph has deadlocks; stated by CÆSAR.BDD version 2.7 to be false on 5 instance(s) out of 8, and unknown on the remaining 3 instance(s).
(t) computed by Prod in March 2017; confirmed by CÆSAR.BDD version 2.7.
(u) computed by Prod in March 2017.
(v) lower and upper bounds given by the number of initial tokens and the number of places.
(w) computed by Prod in March 2017; confirmed by CÆSAR.BDD version 2.7.
(x) computed by Prod in March 2017.
(y) lower and upper bounds given by the number of initial tokens and the number of places.
(z) stated by CÆSAR.BDD version 2.7.
(aa) lower and upper bounds given by the number of initial tokens and the number of places.
(ab) stated by CÆSAR.BDD version 2.7.
(ac) lower and upper bounds given by the number of initial tokens and the number of places.
(ad) stated by CÆSAR.BDD version 2.7.
(ae) lower and upper bounds given by the number of initial tokens and the number of places.
(af) lower bound given by the number of initial tokens.
(ag) lower bound given by the number of initial tokens.
(ah) lower bound given by the number of initial tokens.