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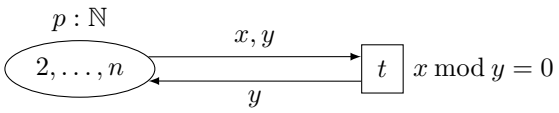
This form is a summary description of the model entitled "Eratosthenes' sieve" proposed for the Model Checking Contest @ Petri Nets. Models can be given in several instances parameterized by scaling parameters. Colored nets can be accompanied by one or many equivalent, unfolded P/T nets. Models are given together with property files (possibly, one per model instance) giving a set of properties to be checked on the model.

Description

This model implements an Eratosthenes' sieve: place p contains all the integers from 2 to scaling parameter n, to be filtered by the sieve. Each firing of t consumes two integers x and y from p if y is a divider of x and returns only y to the place. When t cannot be fired anymore, p is marked with only prime numbers.

An unfolding can be provided but would reduce the complexity of the model because all the guards would have been already validated. But this is exactly one of the difficulties with coloured Petri on this model: the combinatorial when choosing token x and y such that $x \bmod y = 0$. So we strongly suggest that unfolding, if allowed, should be included into the analysis time of P/T net tools.

This model was produced from a high-level colored net (Python-like description).



Scaling parameter

Parameter name	Parameter description	Chosen parameter values
n	size of the sieve	10, 20, 50 ,100, 200, 500

Size of the model

Parameter	Number of places	Number of transitions	Number of arcs
$n = 10$	9	8	24
$n = 20$	19	27	81
$n = 50$	49	108	324
$n = 100$	99	283	849
$n = 200$	199	699	2097
$n = 500$	499	2191	6573

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]

[a] stated by CÆSAR.BDD version 2.6 on all 6 instances (10, 20, 50 ,100, 200, and 500).
[b] stated by CÆSAR.BDD version 2.6 on all 6 instances (10, 20, 50 ,100, 200, and 500).
[c] stated by CÆSAR.BDD version 2.6 on all 6 instances (10, 20, 50 ,100, 200, and 500).
[d] stated by CÆSAR.BDD version 2.6 on all 6 instances (10, 20, 50 ,100, 200, and 500).
[e] stated by CÆSAR.BDD version 2.6 on all 6 instances (10, 20, 50 ,100, 200, and 500).

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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* ..... ✓ (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
$n = 10$	32 (u)	120 (v)	1 (w)	9 (x)
$n = 20$	2048 (y)	23 040 (z)	1 (aa)	19 (ab)
$n = 50$	1.7180E+10 (ac)	7.3014E+11 (ad)	1 (ae)	49 (af)
$n = 100$	1.8890E+22 (ag)	2.0259E+24 (ah)	1 (ai)	99 (aj)
$n = 200$	1.1418E+46 (ak)	2.9173E+48 (al)	1 (am)	199 (an)
$n = 500$	4.1316E+121 (ao)	3.2061E+124 (ap)	1 (aq)	499 (ar)

(f) the net is not connected and, thus, not strongly connected.
(g) stated by CÆSAR.BDD version 2.6 on all 6 instances (10, 20, 50 ,100, 200, and 500).
(h) stated by CÆSAR.BDD version 2.6 on all 6 instances (10, 20, 50 ,100, 200, and 500).
(i) stated by CÆSAR.BDD version 2.6 on all 6 instances (10, 20, 50 ,100, 200, and 500).
(j) stated by CÆSAR.BDD version 2.6 on all 6 instances (10, 20, 50 ,100, 200, and 500).
(k) stated by CÆSAR.BDD version 2.6 on all 6 instances (10, 20, 50 ,100, 200, and 500).
(l) stated by CÆSAR.BDD version 2.6 on all 6 instances (10, 20, 50 ,100, 200, and 500).
(m) stated by CÆSAR.BDD version 2.6 on all 6 instances (10, 20, 50 ,100, 200, and 500).
(n) the definition of Nested-Unit Petri Nets (NUPN) is available from http://mcc.lip6.fr/nupn.php
(o) stated by CÆSAR.BDD version 2.0 on all 6 instances (10, 20, 50 ,100, 200, and 500).
(p) stated by CÆSAR.BDD version 3.3 to be false on 5 instance(s) out of 6, and unknown on the remaining 1 instance(s).
(q) stated by CÆSAR.BDD version 2.0 to be false on 5 instances out of 6, and unknown on the remaining 1 instance(s).
(r) stated by CÆSAR.BDD version 2.0 on all 6 instances (10, 20, 50 ,100, 200, and 500); confirmed at MCC'2014 by Lola and Tapaal on all 6 instances, and by GreatSPN and PNXDD on fewer instances.
(s) the marking graph has deadlocks and contains more than one reachable marking.
(t) the net has at least one transition and its marking graph has deadlocks.
(u) computed at MCC'2013 by Alpina, ITS-Tools, Marcie, Neco, and PNXDD; confirmed by CÆSAR.BDD version 1.8; confirmed at MCC'2014 by GreatSPN, Marcie, PNMC, PNXDD, Stratagem, and Tapaal.
(v) computed at MCC'2014 by Marcie.
(w) confirmed at MCC'2014 by GreatSPN, Marcie, PNMC, and Tapaal.
(x) number of initial tokens, because the net is sub-conservative.
(y) computed at MCC'2013 by Alpina, ITS-Tools, Marcie, Neco, and PNXDD; confirmed by CÆSAR.BDD version 1.8; confirmed at MCC'2014 by GreatSPN, Marcie, PNMC, PNXDD, Stratagem, and Tapaal.
(z) computed at MCC'2014 by Marcie.
(aa) computed at MCC'2014 by GreatSPN, Marcie, PNMC, and Tapaal.
(ab) number of initial tokens, because the net is sub-conservative.
(ac) computed at MCC'2013 by Alpina, ITS-Tools, Marcie, and PNXDD; confirmed by CÆSAR.BDD version 1.8; confirmed at MCC'2014 by GreatSPN, Marcie, PNMC, PNXDD, and Stratagem.

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(ad) computed at MCC'2014 by Marcie.
(ae) computed at MCC'2014 by GreatSPN, Marcie, and PNMC.
(af) number of initial tokens, because the net is sub-conservative.
(ag) computed at MCC'2013 by Alpina, ITS-Tools, Marcie, and PNXDD; confirmed by CÆSAR.BDD version 1.8; confirmed at MCC'2014 by GreatSPN, Marcie, PNMC, PNXDD, and Stratagem.
(ah) computed at MCC'2014 by Marcie.
(ai) confirmed at MCC'2014 by GreatSPN, Marcie, and PNMC.
(aj) number of initial tokens, because the net is sub-conservative.
(ak) computed at MCC'2013 by ITS-Tools, Marcie, and PNXDD; confirmed by CÆSAR.BDD version 1.8; confirmed at MCC'2014 by GreatSPN, Marcie, PNMC, PNXDD, and Stratagem.
(al) computed at MCC'2014 by Marcie.
(am) confirmed at MCC'2014 by GreatSPN, Marcie, and PNMC.
(an) number of initial tokens, because the net is sub-conservative.
(ao) computed at MCC'2013 by ITS-Tools, Marcie, and PNXDD; confirmed by CÆSAR.BDD version 1.8; confirmed at MCC'2014 by Marcie, PNMC, and PNXDD.
(ap) computed at MCC'2014 by Marcie.
(aq) confirmed at MCC'2014 by Marcie and PNMC.
(ar) number of initial tokens, because the net is sub-conservative.