Model: HouseConstruction
Type: P/T Net
Origin: Academic

since
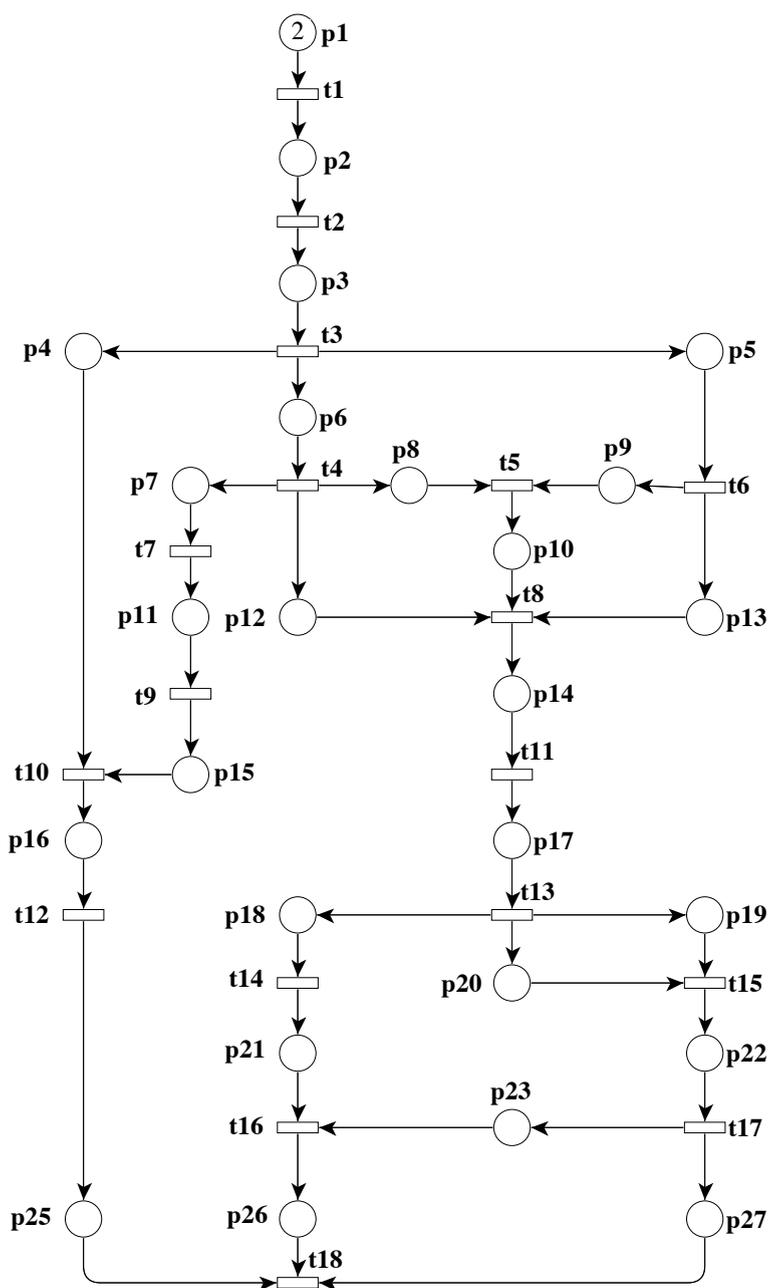MCC 2013

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*This form is a summary description of the model entitled "HouseConstruction" 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 has been extracted from the `petriweb.org` repository available at http://www.petriweb.org. According to the provided information, the net was designed by J. L. Peterson, from a PERT chart by F. Levy. The PERT chart contains timing information, which is not accurately translated.

*The six largest instances have been added in 2019.*



*Graphical representation for $N = 2$*

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## References

This model was probably described in: Peterson, James Lyle (1981). *Petri Net Theory and the Modeling of Systems*. Prentice Hall. ISBN 0-13-661983-5. However, this was not checked, the book being unavailable in our library.

## Scaling parameter

| Parameter name | Parameter description | Chosen parameter values |
|---|---|---|
| $N$ | initial number of tokens on place p2 | 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 4000, 8000, 16000, 32000 |

## Size of the model

Although the model is parameterized, its size does not depend on parameter values.

| | |
|---|---|
| number of places: | 26 |
| number of transitions: | 18 |
| number of arcs: | 51 |

## Structural properties

**ordinary** — *all arcs have multiplicity one* ............................................................... yes

**simple free choice** — *all transitions sharing a common input place have no other input place* ..................... yes [a]

**extended free choice** — *all transitions sharing a common input place have the same input places* ................. yes [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* ............................................. yes [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] ..................................... no

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[a] stated by CÆSAR.BDD version 2.8 on all 14 instances (2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 4000, 8000, 16000, and 32000).

[b] stated by CÆSAR.BDD version 2.8 on all 14 instances (2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 4000, 8000, 16000, and 32000).

[c] 11 transitions are not of a state machine, e.g., transition "t3".

[d] place "p1" is not of a marked graph.

[e] stated by CÆSAR.BDD version 2.8 on all 14 instances (2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 4000, 8000, 16000, and 32000).

[f] from place "p2" one cannot reach place "p1".

[g] place "p1" is a source place.

[h] stated by CÆSAR.BDD version 2.8 on all 14 instances (2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 4000, 8000, 16000, and 32000).

[i] stated by CÆSAR.BDD version 2.8 on all 14 instances (2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 4000, 8000, 16000, and 32000).

[j] transition "t18" is a sink transition.

[k] stated by CÆSAR.BDD version 2.8 on all 14 instances (2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 4000, 8000, 16000, and 32000).

[l] 11 transitions are not conservative, e.g., transition "t3".

[m] 5 transitions are not subconservative, e.g., transition "t3".

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

## 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 |
|---|---|---|---|---|
| $N = 2$ | 1501 [s] | 4780 [t] | 2 [u] | 12 [v] |
| $N = 5$ | 1.1880E+6 [w] | 7.1911E+6 [x] | 5 [y] | 30 [z] |
| $N = 10$ | 1.6636E+9 [aa] | 1.4808E+10 [ab] | 10 [ac] | 60 [ad] |
| $N = 20$ | 1.3666E+13 [ae] | 1.6144E+14 [af] | 20 [ag] | 120 [ah] |
| $N = 50$ | 1.5682E+19 [ai] | ? | 50 [aj] | 300 [ak] |
| $N = 100$ | ? | ? | ? | $\geq 100$ [al] |
| $N = 200$ | ? | ? | ? | $\geq 200$ [am] |
| $N = 500$ | ? | ? | ? | $\geq 500$ [an] |
| $N = 2000$ | ? | ? | ? | $\geq 2000$ [ao] |
| $N = 4000$ | ? | ? | ? | $\geq 4000$ [ap] |
| $N = 8000$ | ? | ? | ? | $\geq 8000$ [aq] |
| $N = 16000$ | ? | ? | ? | $\geq 16000$ [ar] |
| $N = 32000$ | ? | ? | ? | $\geq 32000$ [as] |

[o] in the initial marking, some places have several tokens (the number of which depends on $N$); confirmed CÆSAR.BDD version 2.8 on all 14 instances (2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 4000, 8000, 16000, and 32000).

[p] stated by CÆSAR.BDD version 3.3 on all 14 instances (2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 4000, 8000, 16000, and 32000).

[q] stated by CÆSAR.BDD version 2.8 on all 14 instances (2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 4000, 8000, 16000, and 32000).

[r] confirmed at MCC'2014 by Lola and Tapaal on 8 instances, and by GreatSPN on 4 instances.

[s] computed at MCC'2013 by Alpina, ITS-Tools, Marcie, Neco, and PNXDD; confirmed at MCC'2014 by GreatSPN, Marcie, PNMC, PNXDD, Strategem, and Tapaal.

[t] computed at MCC'2014 by Marcie.

[u] computed at MCC'2014 by GreatSPN, Marcie, PNMC, and Tapaal.

[v] computed at MCC'2014 by GreatSPN, Marcie, PNMC, and Tapaal.

[w] computed at MCC'2013 by Alpina, ITS-Tools, Marcie, Neco, and PNXDD; exact value: 1 187 984; confirmed at MCC'2014 by GreatSPN, Marcie, PNMC, PNXDD, Strategem, and Tapaal.

[x] computed at MCC'2014 by Marcie.

[y] computed at MCC'2014 by GreatSPN, Marcie, PNMC, and Tapaal.

[z] computed at MCC'2014 by GreatSPN, Marcie, PNMC, and Tapaal.

[aa] computed at MCC'2013 by ITS-Tools, Marcie, and PNXDD; confirmed at MCC'2014 by GreatSPN, Marcie, and PNMC.

[ab] computed at MCC'2014 by Marcie.

[ac] computed at MCC'2014 by GreatSPN, Marcie, and PNMC.

[ad] computed at MCC'2014 by GreatSPN, Marcie, and PNMC.

[ae] computed at MCC'2013 by ITS-Tools, and Marcie; confirmed at MCC'2014 by GreatSPN, Marcie, and PNMC.

[af] computed at MCC'2014 by Marcie.

[ag] computed at MCC'2014 by GreatSPN, Marcie, and PNMC.

[ah] computed at MCC'2014 by GreatSPN, Marcie, and PNMC.

[ai] computed at MCC'2014 by GreatSPN.

[aj] computed at MCC'2014 by GreatSPN.

[ak] computed at MCC'2014 by GreatSPN.

[al] lower bound given by the number of initial tokens.
[am] lower bound given by the number of initial tokens.
[an] lower bound given by the number of initial tokens.
[ao] lower bound given by the number of initial tokens.
[ap] lower bound given by the number of initial tokens.
[aq] lower bound given by the number of initial tokens.
[ar] lower bound given by the number of initial tokens.
[as] lower bound given by the number of initial tokens.

*generated on June 22, 2025*