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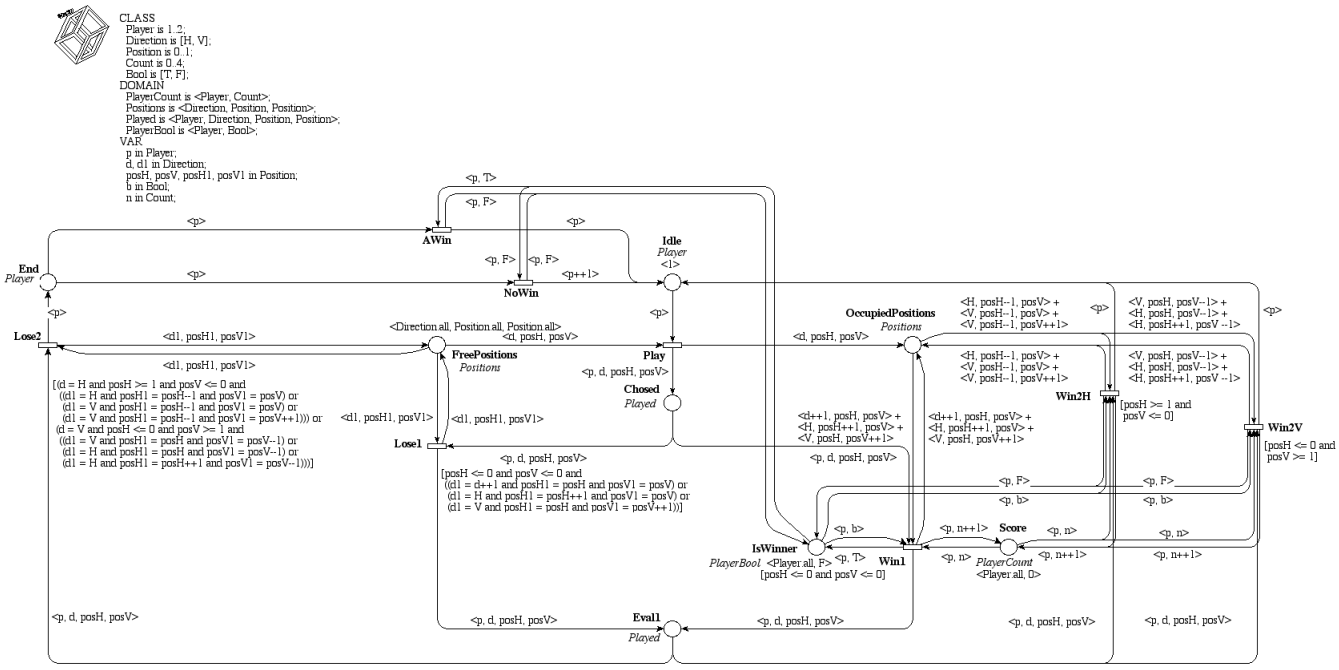
This form is a summary description of the model entitled "Dot&Boxes" proposed for the Model Checking Contest @ Petri Nets. Models can be given in several instances parameterized by scaling parameters. Colored nets can be accompanied by one or many equivalent, unfolded P/T nets. Models are given together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

Description

Dot and Boxes is a pencil and paper game you have certainly played in your childhood: from an empty grid of dots, two players add, in turn, a line between two adjacent dots. The player that finishes a box owns it and can play again. The game ends when all possible lines are drawn and the winner is the player that owns the larger number of boxes.

Exceptionally, this model has no equivalent P/T.



Graphical representation for $N = 2$

References

http://en.wikipedia.org/wiki/Dots_and_Boxes

Scaling parameter

Parameter name	Parameter description	Chosen parameter values
N	The grid has been squared with *N+1* dots per line	2, 3, 4, 5

Size of the model

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

number of places:	8
number of transitions:	8
number of arcs:	44

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Structural properties

free choice — *all (different) transitions with a shared input place have no other input place* ..... ✗
state machine — *every transition has exactly one input place and exactly one output place* ..... ✗
marked graph — *every place has exactly one input transition and exactly one output transition* ..... ✗
connected — *there is a undirected path between every two nodes (places or transitions)* ..... ?
strongly connected — *there is a directed path between every two nodes (places or transitions)* ..... ?
source place(s) — *one or more places have no input transitions* ..... ?
sink place(s) — *one or more places have no output transitions* ..... ?
source transition(s) — *one or more transitions have no input places* ..... ?
sink transitions(s) — *one or more transitions have no output places* ..... ?
loop-free — *no transition has an input place that is also an output place* ..... ?
conservative — *for each transition, the number of input arcs equals the number of output arcs* ..... ?
subconservative — *for each transition, the number of input arcs equals or exceeds the number of output arcs* ..... ?

Behavioural properties

safe — *in every reachable marking, there is no more than one token on a place* ..... ✓
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* ..... ✗
quasi-live — *for every transition t, there exists a reachable marking in which t can fire* ..... ?
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
$N = 2$	11 [(a)]	?	?	?
$N = 3$	383 [(b)]	?	?	?
$N = 4$	270 156 [(c)]	?	?	?

(a) Computed by alpina, and ITS-Tools at MCC'2013.
(b) Computed by ITS-Tools at MCC'2013.
(c) Computed by ITS-Tools at MCC'2013.