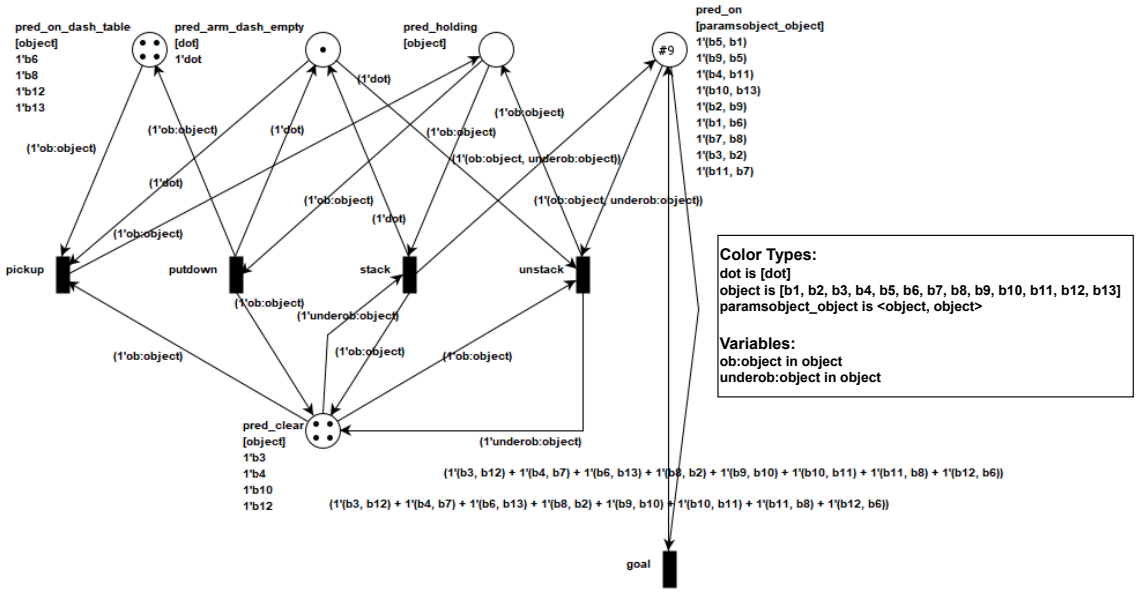
Sebastian Lassen & Henrik Ginnerup
{slasse19, hginne19}@student.aau.dk

This form is a summary description of the model entitled "BlocksWorld" 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

Blocks World is originally a classical planning task. The task concerns moving various blocks using a mechanical arm from a starting position to a desired goal position. It is designed to be reminiscent of the real-life problem of calculating a sequence of moves when stacking shipping containers s.t. as little moves as possible are used.

This model has been translated from a classical planning task to a colored Petri net using a method developed as part of our master's thesis, supervised by Alvaro Torralba and Jiri Srba at Aalborg University. The places are equivalent to predicates, transitions to actions, colors to objects, and each marking to a state in the original planning task. Therefore, a sequence of transition firings from the initial marking to a desired goal marking is a valid plan in the original planning task.



Graphical representation for $B = 13$

References

1. Gupta, N., Nau, D.S.: On the complexity of blocks-world planning. Artificial Intelligence 56(2), 223–254 (1992). https://doi.org/https://doi.org/10.1016/0004-3702(92)90028-V
2. Ginnerup, H., Lassen, S.: Planning via Colored Petri Nets. 9'th semester project, Aalborg University (2023).

Scaling parameter

Parameter name	Parameter description	Chosen parameter values
B	The number of object colors (blocks)	13, 23, 38, 53, 77

Size of the model

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

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number of places: 5
number of transitions: 5
number of arcs: 20

Structural properties

ordinary — *all arcs have multiplicity one* ..... ✔
simple free choice — *all transitions sharing a common input place have no other input place* ..... ✘
extended free choice — *all transitions sharing a common input place have the same input places* ..... ✘
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 an 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* ..... ✘
nested units — *places are structured into hierarchically nested sequential units*[(a)] ..... ✘

Behavioural properties

safe — *in every reachable marking, there is no more than one token on a place* ..... ✘
dead place(s) — *one or more places have no token in any reachable marking* ..... ✘
dead transition(s) — *one or more transitions cannot fire from any reachable marking* ..... ✘
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* ..... ✔
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
$B = 13$	?	?	?	?
...				

Other properties

The goal transition and the arcs connected to it represent the original planning goal of this particular task. To solve the planning task, check if there exists a reachable marking in which the goal transition is enabled. The goal is encoded s.t. firing the transition does not change the marking.

[(a)] the definition of Nested-Unit Petri Nets (NUPN) is available from http://mcc.lip6.fr/nupn.php