This form is a summary description of the model entitled “A hot drink vending machine” 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

A Symmetric net modeling a simple hot drink vending machine. This model handles cycles of elaborations of a hot drink (Products). Each type of elaboration (modelled by the elaborateX transitions) carries a set of options (Options) for the product. For elaborate0 the set of options is empty. Products and options are restored from the places productSlots and optionSlots.

Each type of elaboration has an intrinsic quality level range (Quality), which is associated with the service. The cardinal of the set of quality levels is $M = 4 \times N$, $N$ being the number of products.

Graphical representation of the model

References

Scaling parameter

<table>
<thead>
<tr>
<th>Parameter name</th>
<th>Parameter description</th>
<th>Chosen parameter values</th>
</tr>
</thead>
<tbody>
<tr>
<td>$N$</td>
<td>Number of products</td>
<td>2, 10</td>
</tr>
</tbody>
</table>

Size of the colored net model

- number of places: 6
- number of transitions: 7
- number of arcs: 28

Size of the derived P/T model instances

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Number of places</th>
<th>Number of transitions</th>
<th>Number of arcs</th>
</tr>
</thead>
<tbody>
<tr>
<td>$N = 2$</td>
<td>24</td>
<td>72</td>
<td>440</td>
</tr>
<tr>
<td>$N = 10$</td>
<td>120</td>
<td>111160</td>
<td>1026520</td>
</tr>
</tbody>
</table>

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 transition(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 ...........................................
- reversible — there exists a reachable marking from which no transition can be fired ................................
- 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 .........

(a) stated by CÆSAR.BDD version 1.7 on all 2 instances (2 and 10).
(b) stated by CÆSAR.BDD version 1.7 on all 2 instances (2 and 10).
(c) stated by CÆSAR.BDD version 1.7 on all 2 instances (2 and 10).
(d) stated by CÆSAR.BDD version 1.7 on all 2 instances (2 and 10).
(e) stated by CÆSAR.BDD version 1.7 on all 2 instances (2 and 10).
(f) stated by CÆSAR.BDD version 1.7 on all 2 instances (2 and 10).
(g) stated by CÆSAR.BDD version 1.7 on all 2 instances (2 and 10).
(h) stated by CÆSAR.BDD version 1.7 on all 2 instances (2 and 10).
(i) stated by CÆSAR.BDD version 1.7 on all 2 instances (2 and 10).
(j) stated by CÆSAR.BDD version 1.7 on all 2 instances (2 and 10).
(k) stated by PNML2NUPN 1.3.0 on all 2 instances (2 and 10).
(l) stated by PNML2NUPN 1.3.0 on all 2 instances (2 and 10).

The colored nets are safe; the unfolded place-transition nets are deemed to be safe too, although they contain many arcs whose valuation (“inscription” in PNML) is greater than one.
Size of the marking graphs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Number of reachable markings</th>
<th>Number of transition firings</th>
<th>Max. number of tokens per place</th>
<th>Max. number of tokens per marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>$N = 2$</td>
<td>$1024^{(n)}$</td>
<td>?</td>
<td>?</td>
<td>$\geq 12^{(o)}$</td>
</tr>
<tr>
<td>$N = 10$</td>
<td>$1.153 \times 10^{18}^{(p)}$</td>
<td>?</td>
<td>?</td>
<td>$\geq 60$</td>
</tr>
</tbody>
</table>

$^{(n)}$ computed by alpina, ITS-Tools, marcie and prxld at MCC’2013.
$^{(o)}$ lower bound given by the number of initial tokens.
$^{(p)}$ computed by marcie at MCC’2013.