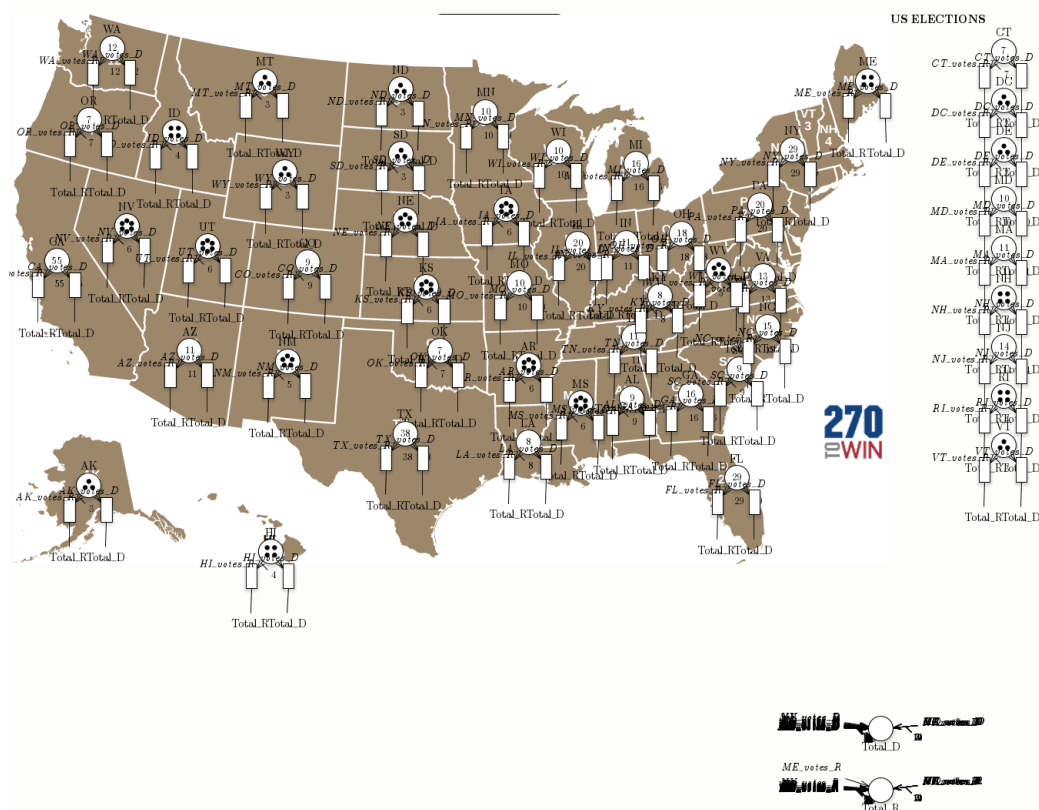


This form is a summary description of the model entitled "Election 2020" proposed for the Model Checking Contest @ Petri Nets. Models can be given in several instances parameterized by scaling parameters. Colored nets can be accompanied by one or many equivalent, unfolded P/T nets. Models are given together with property files (possibly, one per model instance) giving a set of properties to be checked on the model.

Description

The Petri net models the US election map of the 2020 elections. The PNML model has one place for each state, with a number of tokens equal to the state representatives. Two additional places, *Total_D* and *Total_R*, represent the final count. Two states (ME, NE) assign their repr. independently, while all other states have a winner-take-all policy.



Graphical representation of the Petri net.

References

Map taken from <https://www.270twin.com/>

Scaling parameter

This model is not parameterized.

Size of the model

| | |
|------------------------|-----|
| number of places: | 53 |
| number of transitions: | 102 |
| number of arcs: | 204 |

Structural properties

| | |
|--|-------|
| ordinary — all arcs have multiplicity one | X |
| simple free choice — all transitions sharing a common input place have no other input place | X (a) |
| extended free choice — all transitions sharing a common input place have the same input places | X (b) |
| state machine — every transition has exactly one input place and exactly one output place | X (c) |
| marked graph — every place has exactly one input transition and exactly one output transition | X (d) |
| connected — there is an undirected path between every two nodes (places or transitions) | ✓ (e) |
| strongly connected — there is a directed path between every two nodes (places or transitions) | X (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 | X (i) |
| sink transitions(s) — one or more transitions have no output places | X (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⁾ | X |

Behavioural properties

| | |
|--|---|
| safe — in every reachable marking, there is no more than one token on a place | X |
| dead place(s) — one or more places have no token in any reachable marking | X |
| dead transition(s) — one or more transitions cannot fire from any reachable marking | X |
| 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 | X |
| live — for every transition t , from every reachable marking, one can reach a marking in which t can fire | X |

Size of the marking graph

| | |
|------------------------------------|---------|
| number of reachable markings: | ? |
| number of transition firings: | ? |
| max. number of tokens per place: | ? |
| max. number of tokens per marking: | 538 (o) |

(a) the net is not ordinary (however, the “equal conflict” property holds).

(b) the net is not ordinary (however, the “extended equal conflict” property holds).

(c) the net is not ordinary (however, the net is a weighted S-system).

(d) the net is not ordinary.

(e) stated by [CÆSAR.BDD](#) version 3.2.

(f) from place “AL” one cannot reach place “Total.R”.

(g) there exist 51 source places, e.g., place “AL”.

(h) there exist 2 sink places, e.g., place “Total.D”.

(i) stated by [CÆSAR.BDD](#) version 3.2.

(j) stated by [CÆSAR.BDD](#) version 3.2.

(k) stated by [CÆSAR.BDD](#) version 3.2.

(l) stated by [PNML2NUPN](#) 3.2.0.

(m) stated by [PNML2NUPN](#) 3.2.0.

(n) the definition of Nested-Unit Petri Nets (NUPN) is available from <http://mcc.lip6.fr/nupn.php>

(o) number of initial tokens, because the net is conservative.