Fluid Survival Tool: A model checker for Hybrid Petri nets

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Characteristics of critical infrastructures
- Essential for economy and society
- Exposed to variety of attacks and failures
- Highly complex systems
- Hybrid Characteristics:
  - Discrete variables
  - Continuous variables
  - Stochastic behavior

Hybrid Petri net (HPNG*) models

Stochastic Time Logic (STL) specification
- To specify dependability measures
  \[ \psi := \mu | x P \leq c | mp = a | \neg \psi | \psi_1 \land \psi_2 | \psi_1 \land \psi_2 \land \psi_3 \]
* = An Hybrid Petri net with one general one-shot transition (HPNG)

Tool Functionalities

<table>
<thead>
<tr>
<th>Functionality</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model checking</td>
<td>HPNG model, STL formula, Time to check</td>
<td>✓</td>
</tr>
<tr>
<td>Stochastic time diagram</td>
<td>HPNG model</td>
<td><img src="image" alt="2D plot" /></td>
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<tr>
<td>Transient probabilities</td>
<td>HPNG model, STL formula, Time range</td>
<td><img src="image" alt="3D plot" /></td>
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Case Study: Sewage water treatment facility

Scalable HPNG model
- 7 to 30 places
- 8 to 31 transitions
- Computation times:
  - Model checking: 1 to 13 ms
  - 2D plot: 158 to 182 ms
  - 3D plot: 277 to 896 ms