A Verified MATLAB Implementation of Markov Set-Chains

Gabor Rebner, Philipp Limbourg, Ekaterina Auer, Wolfram Luther
rebner@inf.uni-due.de

FIRST VERIFIED MSC IMPLEMENTATION

Aim: Integrate interval arithmetic features into Markov Set-Chains

- MATLAB
- INTLAB: Interval library

Define MSC

Uncertain parameters in
- Transition matrices
- Initial vectors
- Handling of round-off errors

Work with MSCs

Verified Computation of
- HiLo - method
- Coefficient of ergodicity
- Vertices

Plot Solution Spaces

Example of ergodic MSC

Goal: Compute Limit Solution Space

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>A 0.423</td>
<td>B 0.459</td>
<td>C 0.043</td>
</tr>
<tr>
<td>Q</td>
<td>A 0.473</td>
<td>B 0.509</td>
<td>C 0.093</td>
</tr>
</tbody>
</table>

Solution space of \( p \) and \( q \)

Column tight bounds of step 3, 5 and 10

Advantages of MSC are:
- Verified results
- Unified treatment of uncertainty
- Fast function evaluation

Future work:
Application of verified MSC and fault tree analysis to modeling processes in SO fuel cells.