The QBF Gallery 2013: A Non-Competitive Evaluation of QBF Tools

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Overview

Recent Progress in QBF Solving:
- Powerful preprocessing techniques, new solvers.
- Certificate generation, new applications.

Purpose of the QBF Gallery 2013:
- Evaluate the state of the art in QBF solving and related aspects.
- No competition, no winners, no prizes: collect and analyze data.
- Community-driven organization, much interactions during runs.
- Ultimate goal: Identify promising research directions.

Solvers:
- Narizzano: sq-bue3.0, Van Gelder: qhiqer3, Janota: rareqs1.1
- Goisavce: sqrt, dual_sqrt, sDual_sqrt
- Klieber: ghost, ghost-CEGAR, vGhost-CEGAR
- Lonsing: nenofex, DepQBF, DepQBF-lgup

Considered Benchmarks and Tools:
- Four preprocessors, 14 CNF solvers.
- Three 2QBF-solvers (Bayless), one NNF-solver (Janota).
- Two tool suites for certificate generation and checking + 4 new sets.
- Benchmarks randomly selected from QBFLIB.
- New benchmarks from various application domains submitted by the participants.

Showcases:
- Preprocessing, Solving, Applications, Certificates.

Details:
http://www.kr.tuwien.ac.at/events/qbfgallery2013/

Some Excerpts of the Different Showcases

Overview

The QBF Gallery 2013: An Evaluation of QBF Solvers and Related Aspects

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Preprocessing

<table>
<thead>
<tr>
<th>Solvers</th>
<th>Preprocessing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narizzano</td>
<td>Effective preprocessing techniques, new solvers.</td>
</tr>
<tr>
<td>Goisavce</td>
<td>Efficient solving methods by leveraging preprocessing.</td>
</tr>
<tr>
<td>Klieber</td>
<td>Preprocessing-driven methods significantly improving solver efficiency.</td>
</tr>
</tbody>
</table>

Solving: Sampling Experiment

<table>
<thead>
<tr>
<th>Solvers</th>
<th>Solving Time (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Narizzano</td>
<td>100%</td>
</tr>
<tr>
<td>Goisavce</td>
<td>98%</td>
</tr>
<tr>
<td>Klieber</td>
<td>96%</td>
</tr>
</tbody>
</table>

Conclusion

 Lessons Learned:
- If this had been a competition, there would not be a clear winner.
- Preprocessing strongly influences solving.
- QBF solvers are not blackboxes, some use built-in preprocessing.
- Benchmark selection and scoring methods strongly influence rankings.
- Community-driven organization is challenging, but fruitful.

What's next?
- More analysis of the available data.
- Establish fair benchmark sets for competitions and evaluations.
- Tighter integration of certificate generation.
- Common standards for input formats and testing workflows.
- Challenging long-term goal: bringing QBF to practice.