Integrating Automated Provers in Proof Assistants
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Introduction

The veracity of a theorem can be checked by generating complete proofs. However, tools that generate complete proofs are less efficient than tools that generate proof traces.

An ATP (Automated Theorem Prover) is a tool that produce whether a complete proof or a proof trace.

By using the proof trace generated by an ATP, we can extract problems that are not proved and call an other ATP to solve them.

Goal

Generate complete proofs that are easy to check from proof traces.

Gain

- Complete proofs
- Fast generating (thanks to parallel computation)
- Independant ATPs

Benchmarks

In this benchmark we've used E-prover and ZenonModulo as ATPs and Dedukti as a proof checker.

TPTP format for problems (7000 problems).
TSTP format for traces.

<table>
<thead>
<tr>
<th></th>
<th>E-prover</th>
<th>ZenonModulo</th>
<th>E+ZenonModulo</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSTP / Dedukti</td>
<td>55%</td>
<td>15%</td>
<td>34%</td>
</tr>
<tr>
<td>Checkability</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Time/Problem</td>
<td>5mn</td>
<td>5mn</td>
<td>5mn + 10s/problem</td>
</tr>
</tbody>
</table>

Informations and Links

- Git [https://github.com/elhaddadyacine/](https://github.com/elhaddadyacine/)
- ProblemExtractor [https://github.com/elhaddadyacine/ProblemExtractor](https://github.com/elhaddadyacine/ProblemExtractor)
- E-prover [https://github.com/eprover/eprover](https://github.com/eprover/eprover)
- Zenon Modulo [https://github.com/elhaddadyacine/zenon_modulo](https://github.com/elhaddadyacine/zenon_modulo)
- Email elhaddad@lsv.fr