Operator-Counting Heuristics in HTN Planning

Automated Planning Class

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Introduction

Planning (automation of world-relevant problems)

Approaches to solve planning tasks:

- Classical planning;
- Hierarchical planning.

Heuristics:

- basis for the existing solvers;
- techniques in classical planning are more sophisticated.

We propose to use classical operator-counting heuristics in hierarchical planning to improve the performance of HTN planners.

Overview

- **Heuristic search;**
- **Delete-relaxation, critical path, landmark, operator-counting;**
- **HTN (Hierarchical Task Network);**
  - **primitive and abstract tasks**

Strategies to solve HTN problems:

- decomposition-based search (plan-space);
- progression-search (state-space);

Solvers:

- SHOP2 (progression-search without heu);
- PANDA (progression-search with heu).

PANDA

- **Planner** (progression search as a search-based algorithm);
- **Heuristics:**
  - delete- and ordering-relaxation
  - landmark counting
  - additive
  - maximization
  - fast-forward

We address the **lack** of promising heuristics in HTN planning (e.g., **operator-counting**) to improve the performance of PANDA. We aim to implement an LP/IP-based heuristic in the **PANDA** framework to find **optimal and more efficient plans** than other heuristics.

Technical Approach

Use LP/IP-based heuristics to improve PANDA planner.

- Improve PANDA solver;
- Use progression search;
- Operator-counting heuristics;
- HDDL language;

Guide research.

Investigate how existing heuristics work in PANDA.

Implement a C++/Python operator-counting heuristic.

Use RC model.

Project Management

Proposal presentation.

Week 1

To understand the PANDA solver algorithm and how we use the base heuristics hAdd, hFF, and hLM-cut.

Week 2

To choose a domain and run this domain with different heuristics.

Week 3

Week 4

To analyse how the PANDA solver can be improved with other heuristics, such as operator-counting ones. Study this heuristic.

Week 5

To suggest in algorithmic form ideas of how to implement the operator-counting heuristic. If possible, implement the operator-counting heuristic.

Week 6

To write the final paper.

Conclusion

Use operator-counting heuristics in HTN planning.

- How PANDA planner works;
- How heuristics in PANDA works;
- How operator-counting works;
- Implement a solution;
- Compare results.

Find optimal plans.

Improve the performance of PANDA planner.

Thank you!

Operator-counting heuristics in HTN planning

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