Visualization of Hierarchical Domain Models
Outline

- Hybrid Planning
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Hybrid Planning

POCL-Planning
Causal reasoning

Hierarchical Planning
Abstraction

- Powerful technology for solving complex real world problems
- Suitable for humans
Motivation

What do we mean by visualization?

- Display domain graphically
- Show all necessary information
  - Tasks
  - Hierarchy (Decomposition methods)
  - Planstructure
  - Variables and constants
Motivation

Why do we need visualization?

- Intuitive
- Automatic generation (for papers, articles, presentations, etc.)
Motivation

PANDA-Editor:

- Powerful tool to create domains
- Boosts efficiency
- Lists
  - Relations
  - Tasks
  - Decomposition methods
  - etc . . .
- Can be “abused” to inspect domain

⇒ We need a better solution!
Motivation

Screenshot of PANDA Editor
Overview

PANDA2 creates a representation implemented by a task decomposition tree used by different renderers such as GraphViz and Processing with different layouts.
Task Decomposition Tree

Datastructure for visualization

- More than a 1:1 mapping of domain

```
create_Task(Task: ?var0)
```

- Display every possible decomposition of a task
- Has to be calculated
Task Decomposition Tree

Technical requirements:

- Fast calculation
- Compatibel with PANDA₂
  - Can later be grounded and pruned
  - This can improve search performance (see Appendix)
- Independent of used renderer
Task Decomposition Tree

Visual requirements:

- Display only domain
- Display domain with given problem
- Different layouts
- Plan structure (ordering constraints, causal links)
- Show variables and their domains
Task Decomposition Tree

Emerged data model:

- **AND/OR-Tree** (TDT, bipartite)
- Consisting of
  - Method nodes (representing a decomposition method)
  - Task nodes (representing a task)
- Relies on PANDA$_2$ data structures for variables, ordering constraints, causal links
Task Decomposition Tree

Structure of Task Decomposition Tree
Live demo

Live demo of the tool
Summary

Accomplished Goals:

- Created datastructure which meets all requirements
- Implemented two renderers (GraphViz, Processing) with different layouts
- Incorporated the domain visualization into PANDA2 Planvis Tool
Thanks for your attention!
Appendix
**PANDA2 Algorithm vs. TDT-Algorithm**

(a) Application of a decomposing method

(b) Decomposing an artificial, partial plan

Application of decompositions
**Landmark-Technique**

(a) Task Decomposition Graph

(b) Landmark table

An example of a landmark table