Towards Search Node-Specific Special-Case Heuristics for HTN Planning – An Empirical Analysis of Search Space Properties under Progression

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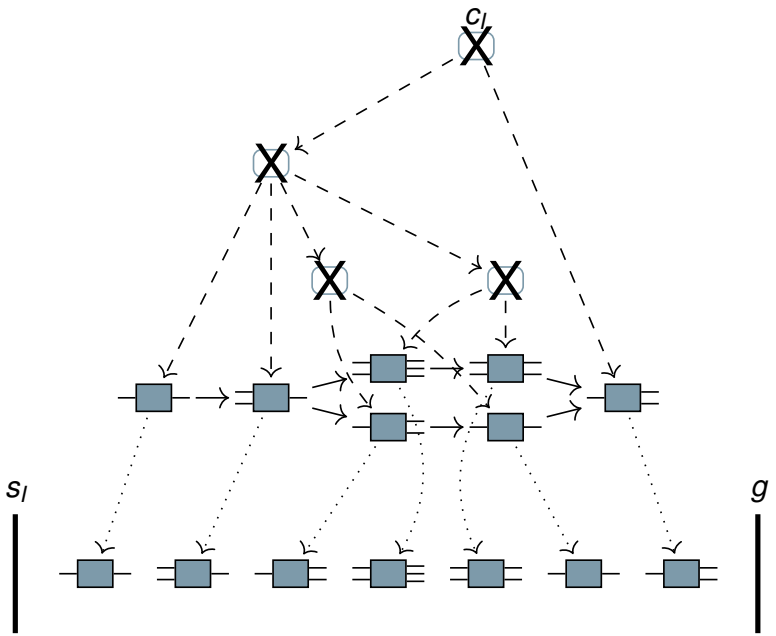
Hierarchical Task Network Planning

Introduction to HTN Planning



$$\mathcal{P} = (V, P, \delta, C, M, s_I, c_I, g)$$

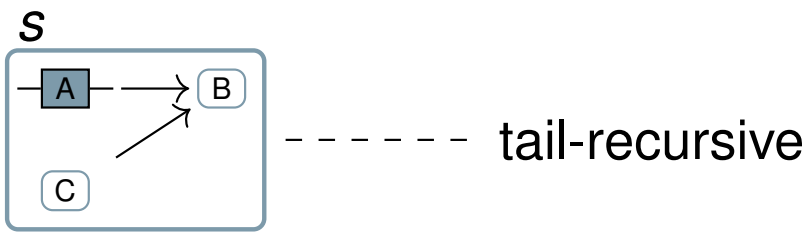
- V a set of state variables
- P a set of primitive task names
- $\delta : P \rightarrow (2^V)^3$ the task name mapping
- C a set of compound task names
- $c_I \in C$ the initial task
- $M \subseteq C \times 2^{TN}$ the methods
- $s_I \in 2^V$ the initial state
- $g \subseteq V$ the (optional) goal description

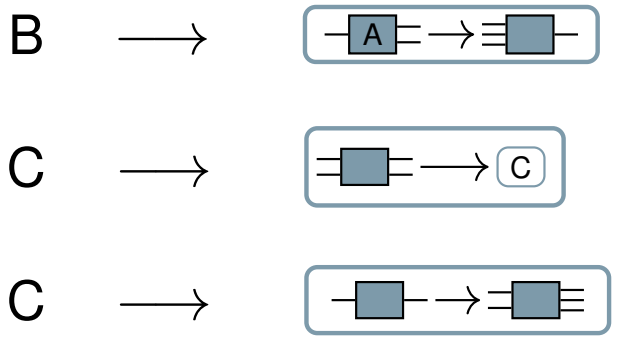
A solution task network *tn* must:

- be a refinement of c_I,
- only contain primitive tasks, and
- have an executable linearization that makes the goals in g true.

Special Cases during Progression Search

We can do better! (Make search systematic)





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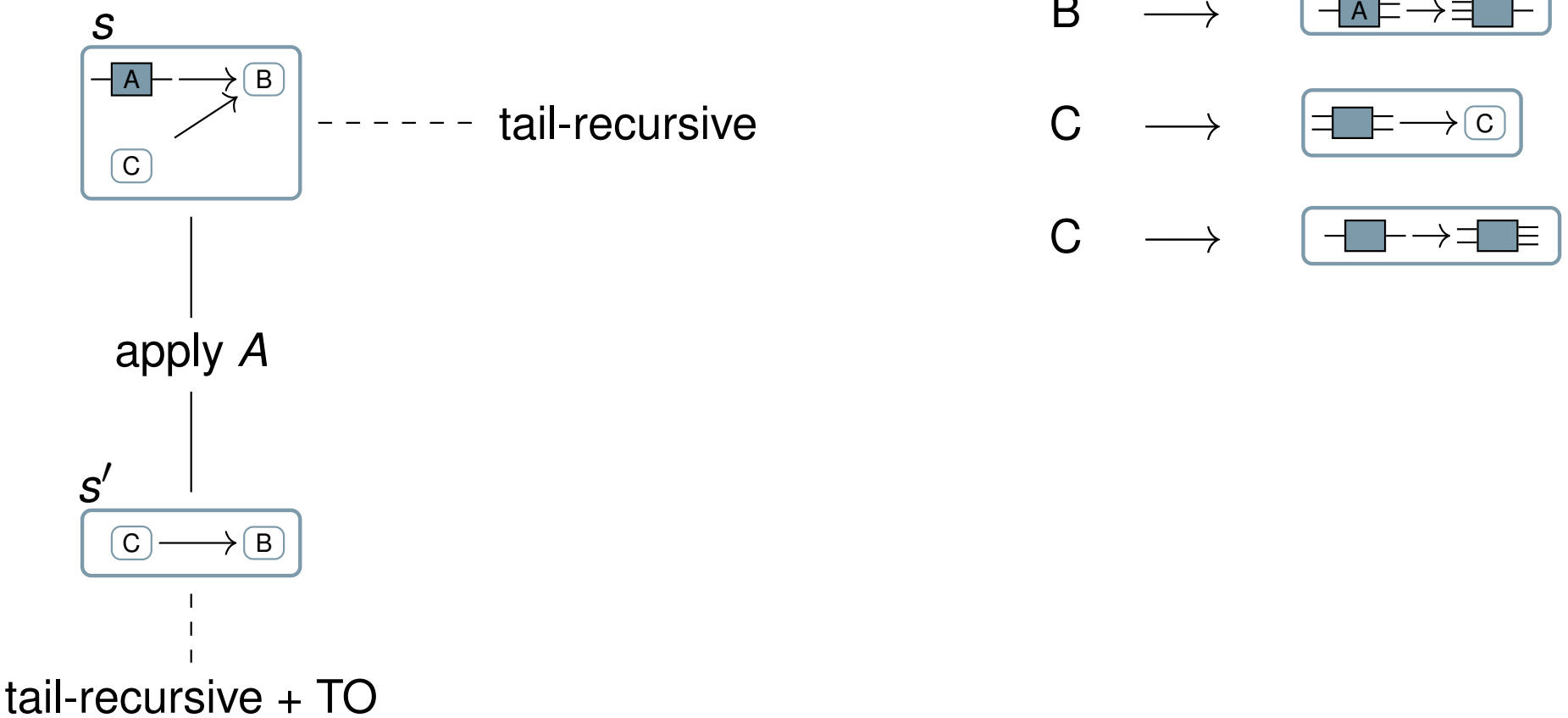

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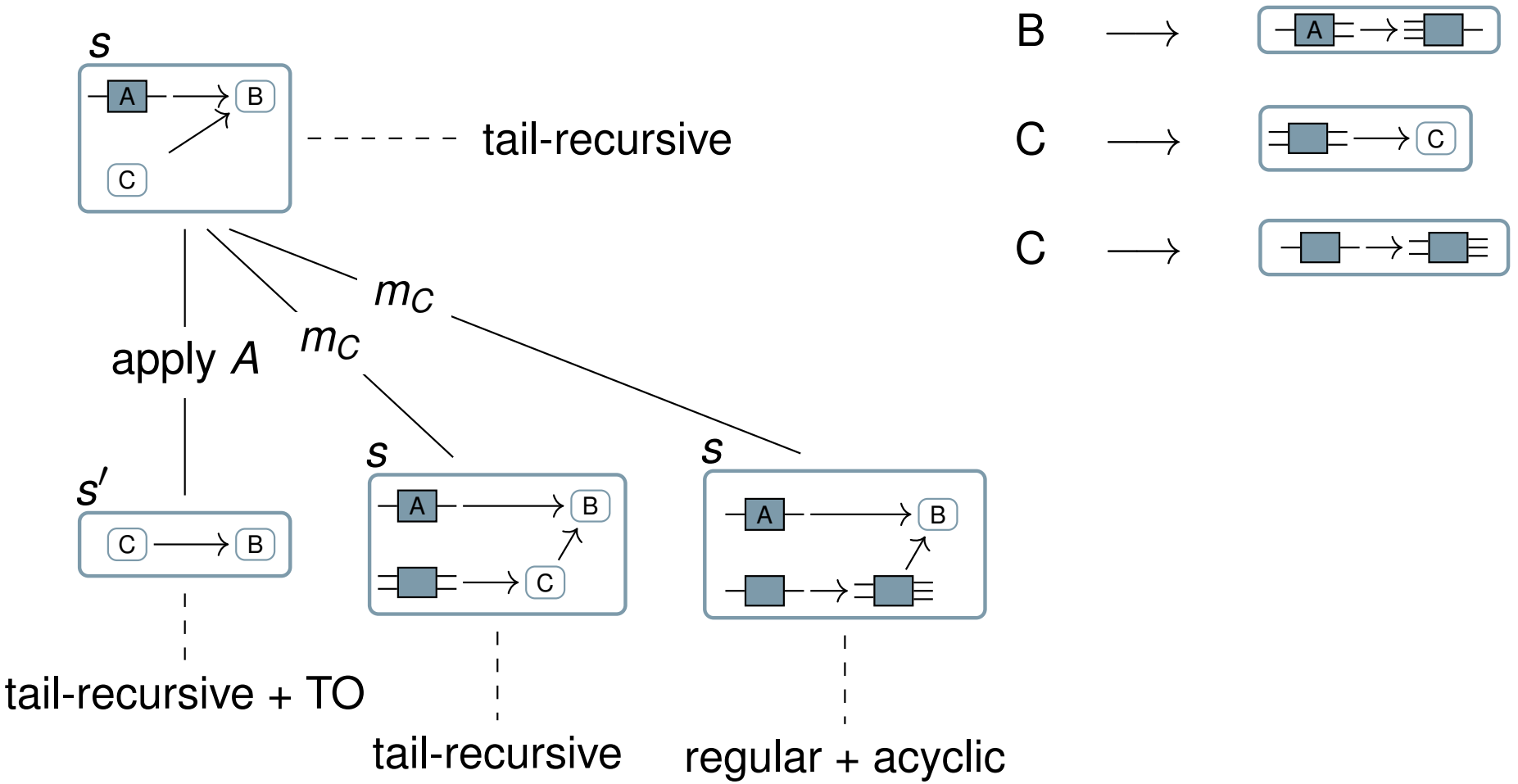

Our Motivation and Investigations

Results

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- We can deploy – *dependent on search nodes* – specialized:
  - heuristics
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Our work:

- Measure problem class frequency: Is detection effort worth it?!
- Propose two techniques for detection:
  - one cheap, but does not update impact of action progressions
  - one more expensive, and obtains tighter problem classes