Saturated Post-hoc Optimization for Classical Planning

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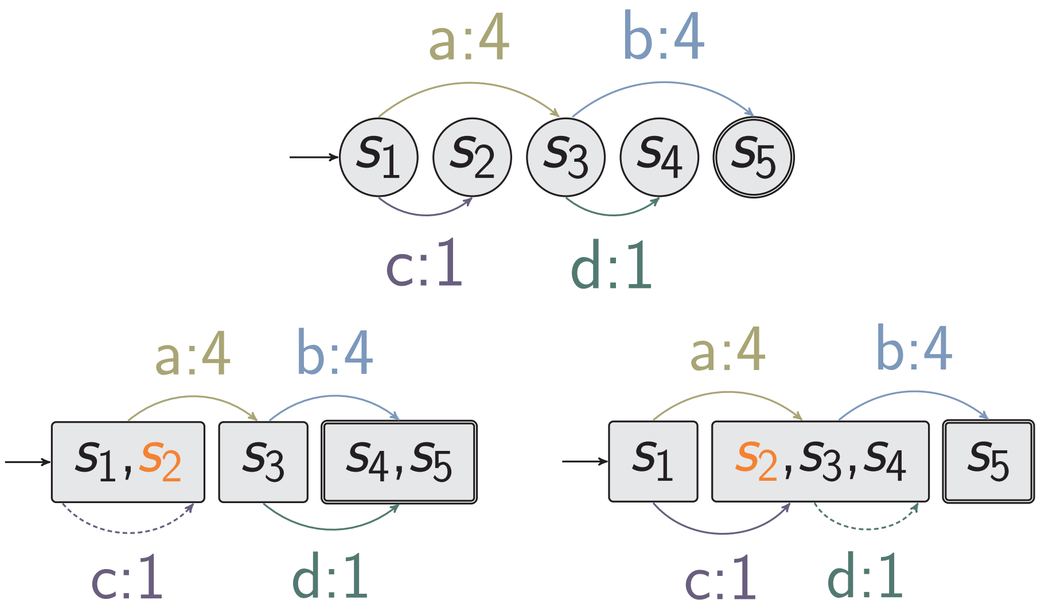
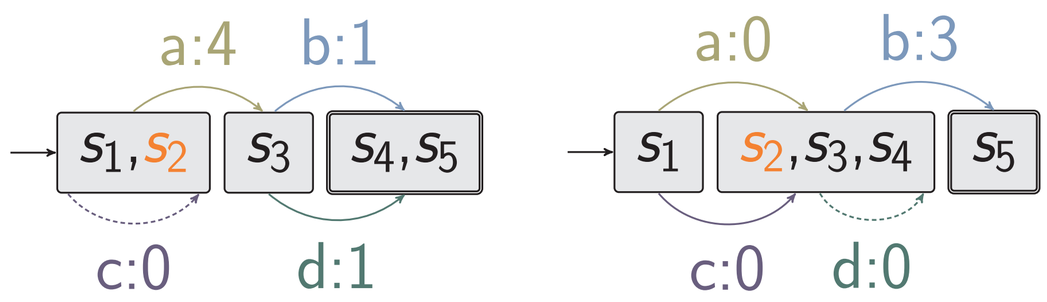
Abstraction Heuristics



Saturated Cost Partitioning

- order heuristics and set remaining costs to operator costs
- for each heuristic h:
  - compute estimates of h using remaining costs
  - use minimum costs preserving all estimates of h
  - adjust remaining costs for subsequent heuristics



$$h^{\text{SCP}}_{\langle h_1, h_2 \rangle}(s_2) = 5 + 3 = 8$$

Post-hoc Optimization

- operators a, b, d affect h_1 $\quad h_1(s_2) = 5$
- operators a, b, c affect h_2 $\quad h_2(s_2) = 4$

$$\begin{aligned} &\text{minimize } 4A + 4B + 1C + 1D \text{ such that} \\ &4A + 4B + 1D \geq 5 \\ &4A + 4B + 1C \geq 4 \\ &A \geq 0, B \geq 0, C \geq 0, D \geq 0 \end{aligned}$$

$$h^{\text{PhO}}(s_2) = 5$$

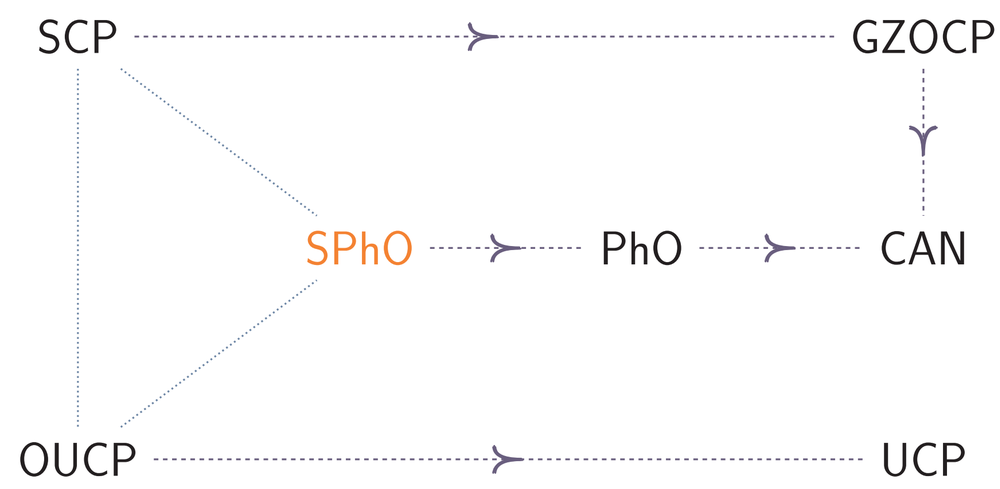
Saturated Post-hoc Optimization

- operator b has saturated cost of 1 in h_1
- operator a has saturated cost of 1 in h_2

$$\begin{aligned} &\text{minimize } 4A + 4B + 1C + 1D \text{ such that} \\ &4A + 1B + 1D \geq 5 \\ &1A + 4B + 1C \geq 4 \\ &A \geq 0, B \geq 0, C \geq 0, D \geq 0 \end{aligned}$$

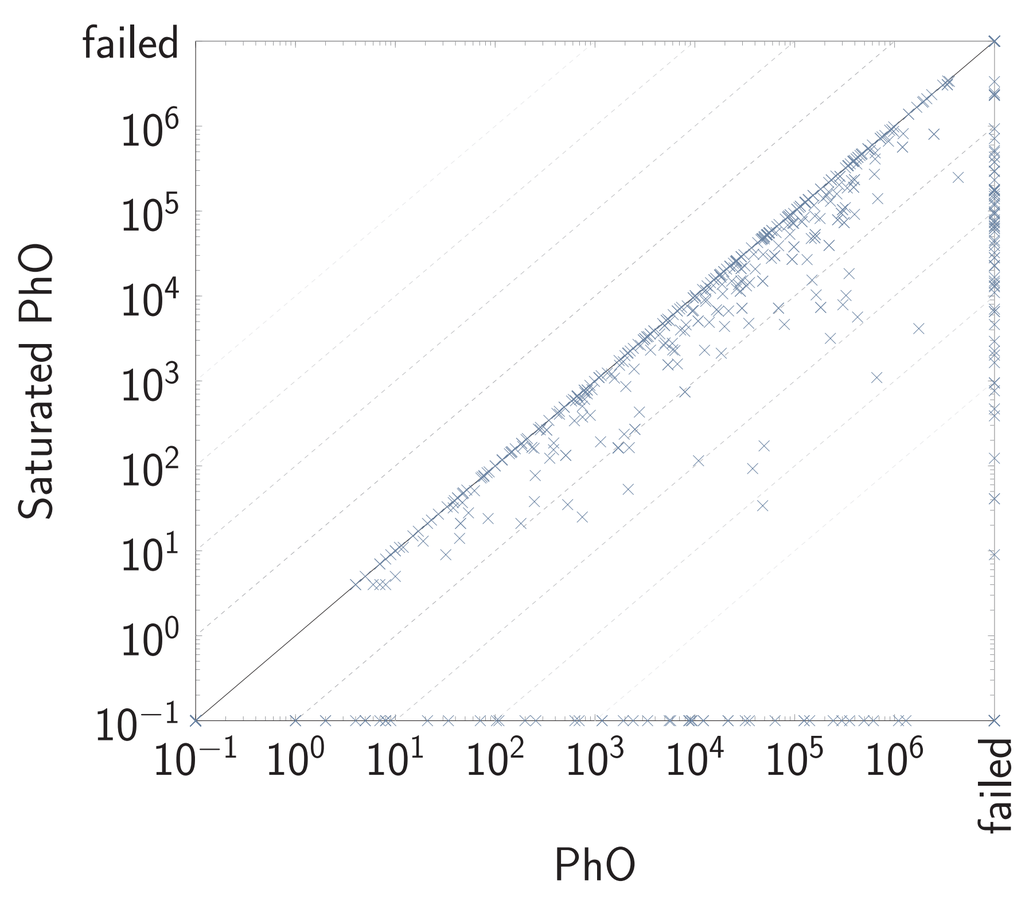
$$h^{\text{SPhO}}(s_2) = 7.2$$

Cost Partitioning Algorithms



Experiments

	HC	SYS2	CARTESIAN	COMBINED
Dom. ↑ (48)	**6**	**16**	**18**	**19**
Dom. ↓ (48)	1	0	2	0
Tasks (1827)	823 **+10**	759 **+51**	657 **+169**	806 **+169**



Summary

Saturated Post-hoc Optimization

- saturates costs
- dominates original
- is admissible
- yields much stronger heuristics