**Abstraction Heuristics**

- $a: 4$
- $b: 4$
- $c: 1$
- $d: 1$

**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.

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

**Post-hoc Optimization**

- Operators $a$, $b$, $d$ affect $h_1$:
  - $h_1(s_2) = 5$
- Operators $a$, $b$, $c$ affect $h_2$:
  - $h_2(s_2) = 4$

Minimize $4A + 4B + 1C + 1D$ such that:

- $4A + 4B + 1D \geq 5$
- $4A + 4B + 1C \geq 4$
- $A \geq 0, B \geq 0, C \geq 0, D \geq 0$

$$h^{PhO}_{(h_1, h_2)}(s_2) = 5$$

**Saturated Post-hoc Optimization**

- Operator $b$ has saturated cost of 1 in $h_1$.
- Operator $a$ has saturated cost of 1 in $h_2$.

Minimize $4A + 4B + 1C + 1D$ such that:

- $4A + 4B + 1D \geq 5$
- $1A + 4B + 1C \geq 4$
- $A \geq 0, B \geq 0, C \geq 0, D \geq 0$

$$h^{SPhO}_{(h_1, h_2)}(s_2) = 7.2$$

**Cost Partitioning Algorithms**

- SCP $ightarrow$ GZOCPP
- SPhO $ightarrow$ PhO
- CAN
- OUCP
- UCP

**Experiments**

<table>
<thead>
<tr>
<th></th>
<th>HC</th>
<th>Sys2</th>
<th>CARTESIAN</th>
<th>COMBINED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dom. ↑ (48)</td>
<td>6</td>
<td>16</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>Dom. ↓ (48)</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Tasks (1827)</td>
<td>823 +10</td>
<td>759 +51</td>
<td>657 +169</td>
<td>806 +169</td>
</tr>
</tbody>
</table>

**Summary**

- Saturated Post-hoc Optimization
  - Saturates costs.
  - Dominates original.
  - Is admissible.
  - Yields much stronger heuristics.