Relaxations

PAH (Planning and Games)

Michal Štolba

michal.stolba@agents.fel.cvut.cz

Relaxations

- General approach to computing heuristic estimates
- *Relax* some constraints
  - I.e. Ignore delete effects
- Compute or estimate cost/length of (optimal) *relaxed plan*

Quiz

- Heuristic *h* dominates *h‘* when
  1. *h* <= *h‘* for all states
  2. *h* >= *h‘* for all states
  3. *h* != *h‘* for all states

Quiz

- Heuristic *h* dominates *h‘* when
  1. *h* <= *h‘* for all states
  2. *h* >= *h‘* for all states
  3. *h* != *h‘* for all states

Answer:

2. *h* >= *h‘* for all states

Quiz

- What is the most commonly used relaxation of a STRIPS action $a=\langle pre(a),add(a),del(a)\rangle$?:

1. $a+=\langle \emptyset,add(a),del(a)\rangle$
2. $a+=\langle pre(a), \emptyset ,del(a)\rangle$
3. $a+=\langle pre(a),add(a), \emptyset \rangle$

Answer:

Quiz

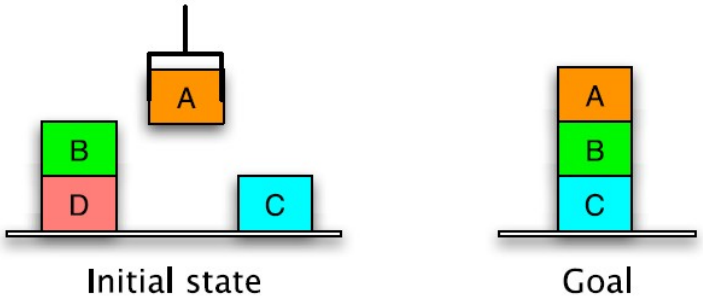
- What is the most commonly used relaxation of a STRIPS action $a=<pre(a),add(a),del(a)>$?:

1. $a+=<\emptyset,add(a),del(a)>$
2. $a+=<pre(a),\emptyset,del(a)>$
3. $a+=<pre(a),add(a),\emptyset>$

Answer:

3. $a+=<pre(a),add(a),\emptyset>$

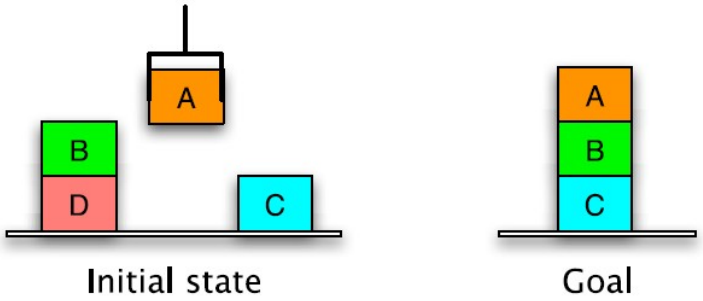
Quiz



- Relaxed plan for:
  1. put-A-on-B, pickup-B, put-B-on-C, put-A-on-B
  2. put-A-on-C, pickup-B, put-B-on-C, put-A-on-B
  3. pickup-B, put-B-on-C, put-A-on-B

Answer:

Quiz



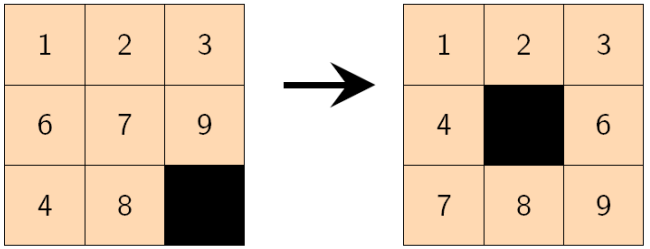
- Relaxed plan for:

1. put-A-on-B, pickup-B, put-B-on-C, put-A-on-B
2. put-A-on-C, pickup-B, put-B-on-C, put-A-on-B
3. pickup-B, put-B-on-C, put-A-on-B

Answer:

1. put-A-on-B, pickup-B, put-B-on-C, put-A-on-B

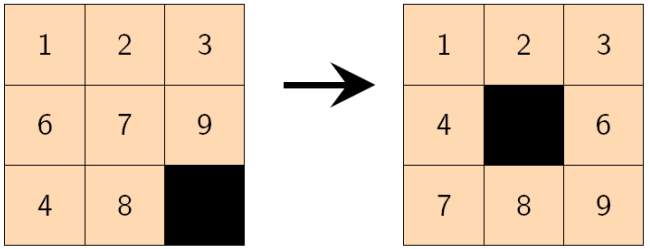
Quiz



- Optimal relaxed plan for:
  1. 9d, 7l, 7d, 4u, 6r, 6r
  2. 9d, 7r, 6r, 6r, 4u, 7l, 7l, 7d
  3. 9d, 8r, 7d, 6r, 6r, 4u, 7l

Answer:

Quiz



- Optimal relaxed plan for:
  1. 9d, 7l, 7d, 4u, 6r, 6r
  2. 9d, 7r, 6r, 6r, 4u, 7l, 7l, 7d
  3. 9d, 8r, 7d, 6r, 6r, 4u, 7l

Answer:

3. 9d, 8r, 7d, 6r, 6r, 4u, 7l

Quiz

- What is not true:
  1. Relaxations of plans are relaxed plans.
  2. Relaxations are no harder to solve than the original task.
  3. Optimal relaxed plans may be longer than optimal plans for original tasks.

Answer:

Quiz

- What is not true:
  1. Relaxations of plans are relaxed plans.
  2. Relaxations are no harder to solve than the original task.
  3. Optimal relaxed plans may be longer than optimal plans for original tasks.

Answer:

3. Optimal relaxed plans may be longer than optimal plans for original tasks.

Quiz

- What heuristic is defined by
  - *cost(p) = min(cost(a1),..., cost(an))*
  - *cost(a) = max(cost(p1),..., cost(pn))*:

1. hmax
2. hadd
3. hSTRIPS

Answer:

Quiz

- What heuristic is defined by
  - *cost(p) = min(cost(a1),..., cost(an))*
  - *cost(a) = max(cost(p1),..., cost(pn))*:

1. hmax
2. hadd
3. hSTRIPS

Answer:

1. hmax

Quiz

- For hadd is not true.
  1. Assumes independence of facts.
  2. All facts are assumed to be achieved by the cheapest action.
  3. Is admissible.

Answer:

Quiz

- For hadd is not true.
  1. Assumes independence of facts.
  2. All facts are assumed to be achieved by the cheapest action.
  3. Is admissible.

Answer:

3. Is not admissible.

Quiz

- Which heuristic is typically the most informative?:
  1. hmax
  2. hadd
  3. hSTRIPS

Answer:

Quiz

- Which heuristic is typically the most informative?:
  1. hmax
  2. hadd
  3. hSTRIPS

Answer:

1. hadd

Quiz

- Which heuristic is admissible?:
  1. hmax
  2. hadd
  3. hSTRIPS

Answer:

Quiz

- Which heuristic is admissible?:
  1. hmax
  2. hadd
  3. hSTRIPS

Answer:

1. hmax