2 handouts: slides, asst 8
Simple Heuristics

1. \( h(n) = 0 \)
2. number of unachieved goals
3. reachability ('don’t delete'): \( H_1 \) max
4. \( H_1 \) sum
The ‘Planning Graph’

2 types of layers: fact and action
track both positive and negative grounded literals
‘no-op’ frame actions

actions $a$ and $b$ mutex iff:

**inconsistency:** $a$ deletes add of $b$

**interference:** $a$ deletes precondition of $b$

**competing needs:** inconsistent preconditions

literals $a$ and $b$ mutex iff:

**inconsistent:** $a$ is $\neg b$

**inconsistent support:** all ways of achieving them are mutex
Initial: Have(Cake)

**Eat:**  Pre: Have(Cake)  
Post: ¬Have(Cake), Eaten(Cake)

**Bake:**  Pre: ¬Have(Cake)  
Post: Have(Cake)

Goal: Have(Cake), Eaten(Cake)
Break

- asst 7
- asst 8
Relaxed Plan

Basic graph assumes parallelism: serial planning graph

building a relaxed plan:

- choose no-op when possible
- re-use previously chosen action when possible

optimal relaxed plan is admissible but NP-hard

need actions if optimizing costs (not makespan)

$H_1$ max too small, sum too large
Comparison

level-based heuristics

1. poor if many ‘concurrent’ actions at one level

max vs sum

1. sum poor if positive interactions

\[ h^n \]

1. poor if negative interactions
1. 0
2. number of unachieved goals
3. $H_1 \text{ max}$
4. $H_1 \text{ sum}$
5. planning graph max
6. planning graph sum
7. relaxed plan
Concurrent Actions

The Planning Graph
- Simple Heuristics
- Planning Graphs
- Cake World
- Break
- Relaxed Plan
- Comparison
- Heuristics
- Concurrent Actions
- EOLQs

$2^k$ vs incremental
EOLQs

- What question didn’t you get to ask today?
- What’s still confusing?
- What would you like to hear more about?

Please write down your most pressing question about AI and put it in the box on your way out.

Thanks!