1 handout: slides
730W entries were due
EOLQs

Planning

$H_1$

Heuristics
State-space Planning
Operator schema:

**Parameters:** Move(block, src, dest)

**Preconditions:** On(block, src), Clear(block), Clear(dest)

**Delete list:** On(block, src) Clear(dest)

**Add list:** On(block, dest) Clear(src)

Assume everything else is static. Closed world assumption.

Invented for Shakey (SRI).
Initial: At(Home), Sells(HWS, Drill), Sells(SM, Milk), Sells(SM, Bananas)

Go (here, there)
  Pre: At(here)
  Post: At(there), ¬ At(here)

Buy(store, x)
  Pre: At(store), Sells(store, x)
  Post: Have(s)

Goal: At(Home), Have(Drill), Have(Milk), Have(Bananas)
Initial state: initial state
Branch on all applicable actions
Applicable: preconditions hold
Effects: delete deletes, then add adds
Goal reached when all goal atoms are true.
$H_1$: A Simple Heuristic for Planning
Heuristics

- Simple Heuristics
- Break
- Computing $H_1$
- Cake World
- EOLQs
Simple Heuristics

$h(n) = 0$

number of unachieved goals
ignore delete effects: $H_1$
- asst 3
- project proposals: talk with me before March 28
Computing $H_1$

$\begin{align*}
    t &\leftarrow 0 \\
    Q &\leftarrow I \\
    &\text{(current time)} \\
    &\text{(literals that became true at } t) \\
\end{align*}$

until all goals are true or $Q$ is empty,

$\begin{align*}
    Q' &\leftarrow \emptyset \\
    &\text{foreach } l \in Q, \\
    &\text{foreach } a \text{ that has } l \text{ as a precondition,} \\
    &\quad \text{if all of } a \text{'s preconditions are now true,} \\
    &\quad \quad \text{foreach add effect } e \text{ of } a, \\
    &\quad \quad \quad \text{if } e \text{ is not already true,} \\
    &\quad \quad \quad \quad \text{record that } e \text{ became true at } t + 1 \\
    &\quad \quad \quad \quad \text{add it to } Q' \\
    t &\leftarrow t + 1 \\
    Q &\leftarrow Q'
\end{align*}$

Then $\sum$ or $\max$ over goal.
Initial: Have(Cake)

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

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

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