Beyond STRIPS
Hierarchy

1 handout: slides
Beyond STRIPS
Beyond STRIPS

Comparison

Extensions
Setting
Break

Hierarchy

Forward: states
- + state known: strong heuristic, expressivity
- - irrelevant states

Backward: sets of states
- + relevant states
- - partial states: larger space, weaker heuristic, expressivity

Partial-order: plans
- + small space
- +/− least commitment
- - poor heuristics
negated goals: no problem with CWA

disjunctive precondition: for regression, just branch

conditional effects: for regression, if we need the effect, plan for the condition

universal preconditions and effects: just ground goals and preconditions
STRIPS assumes static, deterministic world, discrete time, single discrete actions.

1. time, resources
2. concurrent actions
3. abstraction: hierarchical planning
4. uncertainty: eg, disjunctive effects
5. temporally extended goals
6. execution monitoring, replanning
7. continuous state
8. multiple (self-interested) agents
Beyond STRIPS
- Comparison
- Extensions
- Setting
- Break

Hierarchy

- asst 8
- asst 9
- full project proposals
Hierarchy

Beyond STRIPS

Hierarchy
- HTNs
- HTN Example
- HGNs
- HGN Example
- DAO
- Class Outline
- EOLQs

Hierarchy
task decomposition

- actions = goals for lower level
- actions = restrictions for lower level
- actions = heuristic for lower level
Hierarchical Task Networks

- states and tasks
- actions: preconditions, effects, primitive vs high-level
- method: preconditions, tasks
- ‘goal’: complete decomposition into primitive actions

downward refinement: high-level guaranteed to refine into legal primitives
SHOP2 planner
actions: Drive, Load, Unload
method:

\textbf{MovePackageByTruck}(p, s, d, t)
\begin{itemize}
  \item \textbf{pre:} $\text{At}(p, s)$
  \item \textbf{post:} $\text{At}(p, d)$
  \item \textbf{subtasks:} Drive($t, s$), Load($p, t$), Drive($t, d$), At($p, d$)
\end{itemize}
Hierarchical Goal Networks (IJCAI, 2013)

- operators as in STRIPS
- goal network: partially-ordered set of DNF formulas over literals
- method: preconditions and subgoals. postconditions are last subgoal.
- subgoal: conjunction of literals

planner branches on:
- progressing state using applicable actions
- ‘decomposing’ problem using applicable methods applicable in state and relevant to goal

methods are only for search guidance!
actions: Drive, Load, Unload
method:

**MovePackageByTruck(p,s,d, t)**

*pre:* At(p,s)

*subgoals:* At(t, s), In(p,t), At(t,d), At(p,d)
Example: Dragon Age: Origins

Beyond STRIPS

Hierarchy
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- HTNs
- HTN Example
- HGNs
- HGN Example
- DAO

Class Outline
- EOLQs
1. search: heuristics, CSPs, games
2. knowledge representation: FOL, resolution
3. planning: STRIPS, MDPs
4. learning: supervised, unsupervised
5. uncertainty: particle filters, HMMs
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!