Beyond STRIPS
Comparison

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
Break

Beyond STRIPS
- Comparison
- Extensions
- Setting
- Break

Hierarchy

- asst 8
- asst 9 Tue Apr 7
- wildcard vote Thu Apr 2
Hierarchy
The Many Forms of Hierarchy

- task decomposition/refinement
- actions = goals for lower level
- actions = restrictions for lower level
- actions = heuristic for lower level
Hierarchical Task Networks

- states, tasks, methods, actions
- actions: preconditions, effects
- methods: preconditions, subtasks
- ‘goal’: complete decomposition into primitive actions

downward refinement: high-level guaranteed to refine into legal primitives

planning is semi-decidable, plan verification is NP-hard

SHOP2 planner
actions: Drive, Load, Unload

method:

\textbf{MovePackageByTruck}(p,s,d, t)

\textbf{pre}: \texttt{At}(p,s)

\textbf{post}: \texttt{At}(p,d)

\textbf{subtasks}: Drive(t, s), Load(p,t,s), Drive(t,d), Unload(p,t,d)
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:

\textbf{MovePackageByTruck}(p,s,d, t)

\textbf{pre: } At(p,s)

\textbf{subgoals: } At(t, s), In(p,t), At(t,d), At(p,d)
Example: Dragon Age: Origins

Beyond STRIPS

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

Class Outline
- EOLQs
Beyond STRIPS

Hierarchy
- Hierarchy
- 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!