AI Planning

Dr. Gerhard Wickler & Prof. Austin Tate
University of Edinburgh
Planning

explicit deliberation process that chooses and organizes actions by anticipating their outcomes
\*\* moves a robot between two adjacent locations

\*\* (action move
  parameters (?r - robot ?from ?to - location)
  precondition (and
    (adjacent ?from ?to) (at ?r ?from)
    (not (occupied ?to)))
  effect (and
    (at ?r ?to) (occupied ?to)
    (not (occupied ?from)) (not (at ?r ?from)) ))

The successor function \( \Gamma_m : 2^S \rightarrow 2^S \) for a STRIPS domain \( \Sigma = (S, A, \gamma) \) is defined as:

\[ \Gamma(s) = \{ \gamma(s, a) \mid a \in A \text{ and } a \text{ applicable in } s \} \]

\[ \Gamma({s_1, \ldots, s_n}) = \bigcup_{k \in [1, n]} \Gamma(s_k) \]

\[ \Gamma_0({s_1, \ldots, s_n}) = \{ s_1, \ldots, s_n \} \]

\[ \Gamma_m({s_1, \ldots, s_n}) = \Gamma(\Gamma_{m-1}({s_1, \ldots, s_n})) \]

The transitive closure of \( \Gamma \) defines the set of all reachable states:

\[ \Gamma^>(s) = \bigcup_{k \in [0, \infty]} \Gamma_k({s}) \]

function fwdSearch(\( O, s_i, g \))

\( \text{state} \leftarrow s_i \)
\( \text{plan} \leftarrow \langle \rangle \)

loop
  if state satisfies(\( g \)) then return \( \text{plan} \)
  \( \text{applicables} \leftarrow \{ \text{ground instances from } O \text{ applicable in } \text{state} \} \)
  if applicables isEmpty() then return failure
  \( \text{action} \leftarrow \text{applicables.chooseOne()} \)
  \( \text{state} \leftarrow \gamma(\text{state}, \text{action}) \)
  \( \text{plan} \leftarrow \text{plan} \cdot \langle \text{action} \rangle \)
return \( \text{plan} \)
AI Planning

Dr. Gerhard Wickler & Prof. Austin Tate
University of Edinburgh