

15-381 Artificial Intelligence

Means-Ends Analysis and Constraint Propagation

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Topics Covered:

- # Homework 1 (generalized state-space search)
 - # Means-Ends Analysis (backchaining)
 - # Search Control Rules in MEA
 - # Constraint-Based Search
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Search → Planning: Parameterized Operations

Multi-State Transitions

Instead of: $Op_{i,j}: S_i \rightarrow S_j$, We have $Op_{k,l}: \{S_k\} \rightarrow \{S_l\}$

Preconditions and Post-Conditions

- Conjunctive set of first-order predicates
 - Arguments can be constants or (typed) variables
 - Intentional description of subset of all states
 - *Pre-image* $\{S_k\}$ states where preconditions are true
 - *Post-image* $\{S_l\}$ states where post-conditions are true
 - Requires Consistent variable bindings within and across preconditions and post-conditions
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Search → Planning: Parameterized Operations

First Example

OPERATOR DRIVE-CAR(<car>, <driver>, <keys>, <loc-1>)

[PRE: (AT <car> <loc-1>)
(AT <driver> <loc-1>)
(CONTAINS-GAS <car>)
(HAVE <keys> <driver>)
(CORRESPOND <keys> <car>)]

[POST: (AT <car> <loc-2>)
(AT <driver> <loc-2>)
(NOT (AT <car> <loc-1>))
(NOT (AT <driver> <loc-1>)))]
