< Search >

CS50 AI with Python

search problems

agent - entity that perceives its environment and acts upon that environment.

state - a configuration of the agent and its environment.

initial state - the state in which the agent begins

actions - choices that can be made in a state

transition model - a description of what state results from performing any ~~application~~ applicable action in any states.

state space - the set of all states reachable from the initial state by any sequence of actions.

goal test - way to determine whether a given state is a goal state.

path cost - numerical cost associated with a given path.

solution - a sequence of actions that leads from the initial state to a goal state.

optimal solution - a solution that has the lowest path cost among all solutions.

node - a data structure that keeps track of
- a state
- a parent (node that generate this node)
- an action (action applied to parent to get node)
- a path cost (from initial state to node)

Approach.

- Start with a frontier that contain the initial state.
- Repeat:
  - If the frontier is empty, then no solution
  - Remove a node from the frontier.
  - If node contains goal state, return the solution
  - Expand node, add resulting nodes to the frontier.

Add to the explored set

↳ already test nodes.

arbitrary 任意的 [数学] | adversarial 对手的

stack - Last-in first-out data type

↳ Depth-first search (DFS)

↳ search algorithm that always expands the deepest node in the frontier.

uninformed search

↳ Breadth-first search (BFS)

↳ search algorithm that always expands the shallowest node in the frontier.

queue - first-in first-out data type.

?? ☆ informed search. - search strategy that uses problem-specific knowledge to find solutions more efficiently.

↳ greedy best-first search

↳ search algorithm that expands the node that is closest to the goal, as estimated by a heuristic function h(n)

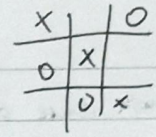
↳ Manhattan distance

↳ A* search

↳ search algorithm that expands node with lowest value of g(n) + h(n)

g(n) = cost to reach goal (how many steps have done)

h(n) = estimated cost to goal



adversarial search.

↳ Minimax.

Max (X) aims to maximum score

Min (O) aims to minimum score

S_0 : initial state

Player(s): returns which player to move in state s.

Action(s) : return legal moves in state s

Result(s, a): return state after action a taken in state s

Terminal(s) : checks if state s is a terminal state.

Utility(s) : final numerical value for terminal state s.

< Knowledge >

Knowledge-based agent →

↳ agents that reason by operating on internal representations of knowledge.

Sentence

↳ an assertion about the world in a knowledge representation language.

propositional logic

- proposition symbols. ie. P, Q, R.

logical connectives [T - True F - False]

P	¬P
T	F
F	T

"¬ not" "∧ and" "∨ or" "→ implication" "↔ biconditional"

P	Q	P∧Q
T	T	T
T	F	F
F	T	F
F	F	F

P	Q	P∨Q
T	T	T
T	F	T
F	T	T
F	F	F

if [P], then will be [Q]

P	Q	P→Q
T	T	T
T	F	F
F	T	T
F	F	T

前提是錯誤的，此句話無任何意義，⇒ True

if/only if [P], then will be [Q]

P	Q	P↔Q
T	T	T
T	F	F
F	T	F
F	F	T