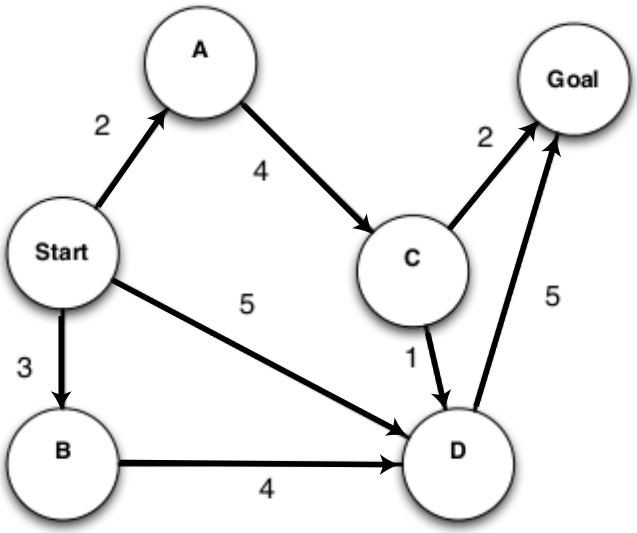
CS 188
Summer 2023

Discussion 1A

1 Search Algorithms in Action



For each of the graph search strategies, work out the order in which states are expanded, as well as the path returned by graph search. Break ties such that states with earlier alphabetical order are expanded first.

a) Depth-first search.

b) Breadth-first search.

c) Uniform cost search.

2 Agents and Environments

(a) Below is a list of task environments. For each of the sub-parts, choose all the environments in the list that falls into the specified type.
A: The competitive rock-paper-scissors game
B: The classical Pacman game (with ghosts following a fixed path)
C: Solving a crossword puzzle
D: A robot that removes defective cookies from a cookie conveyor belt

(i) Which of the environments can be formulated as *single-agent*? ☐ A ☐ B ☐ C ☐ D

(ii) Which of the environments are *static*? ☐ A ☐ B ☐ C ☐ D

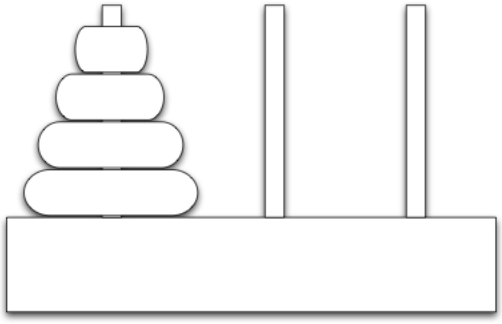
(iii) Which of the environments are *discrete*? ☐ A ☐ B ☐ C ☐ D

(b) **(i)** ◯ T ◯ F Reflex agents cannot be rational.

(ii) ◯ T ◯ F There exist task environments in which no pure reflex agent can behave rationally.

(iii) ◯ T ◯ F A perfectly rational poker-playing agent never loses.

3 Towers of Hanoi



The Towers of Hanoi is a famous problem for studying recursion in computer science and recurrence equations in discrete mathematics. We start with N discs of varying sizes on a peg (stacked in order according to size), and two empty pegs. We are allowed to move a disc from one peg to another, but we are never allowed to move a larger disc on top of a smaller disc. The goal is to move all the discs to the rightmost peg (see figure).

In this problem, we will formulate the Towers of Hanoi as a search problem.

(a) Propose a state representation for the problem

(b) What is the size of the state space?

(c) What is the start state?

(d) From a given state, what actions are legal?

(e) What is the goal test?