Informatics 2D: Tutorial 1

Agents, Environment, Search

Week 2

1 Agents and Environments

Consider the following agents:

1. A robot vacuum cleaner which follows a preset route around a house and vacuums if it senses dirt, using a camera on the robot's underside. When it has vacuumed the whole house it returns to a recharging station and waits until the next day to vacuum again.
2. A chess-playing agent which tries to checkmate the opposing player.
3. A robot football player which must help its team score goals and prevent the opposition from scoring, as well as conserve energy and avoid damaging itself.

Question 1.a) Classify these agents according to the following types: simple-reflex based, model-reflex based, goal based or utility based.

Question 1.b) Answer the following questions for each agent, giving a short justification for your answer:

1. What is the agent's environment?
    - Fully or partially observable?
    - Deterministic or Stochastic?
    - Discrete or Continuous?
    - Single Agent or Multi-Agent?
    - Episodic or Sequential?
    - Static or Dynamic?
2. What are its percepts?
3. What are its actions?

4. What are its internal models, if any?
5. What are its goals, if any?
6. What are its utilities, if any?

2 The Sticks Problem

Consider the following puzzle[1]. There are 8 sticks lined up as shown in Fig. 1 (a). By moving exactly 4 sticks, you are to achieve the configuration shown in Fig. 1 (b). Each move consists of picking up a stick, jumping over exactly two other sticks, and then putting it down onto a fourth stick. For example, in Fig.1 (c), stick d could be moved onto stick a or g passing over sticks c and b or e and f, respectively. It could not be moved anywhere else. In Fig. 1 (d) stick d cannot be moved at all. Note that when there is a stick x on top of another stick y, it is illegal to put another stick z on top of y.

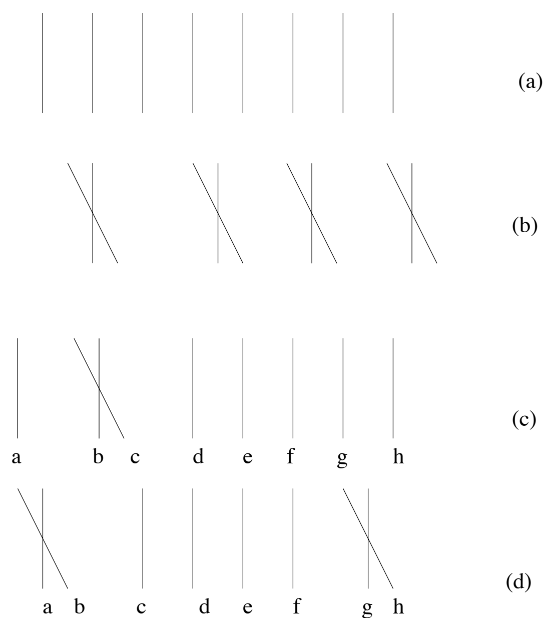

Figure 1: The Sticks Problem

The search space for this problem is shown on page 4. States which are essentially identical due to symmetry are not duplicated.

Here are your tasks for this tutorial:

1. Decide on a notation for representing states, which you could use in state space search.

[1]Originally set by John Hallam

2. Using this notation, show the initial state and the goal state.
3. Give the details of all the operators. For each, describe its preconditions, and give an example (i.e. apply the operator to a state and give the new state).
4. Apply the uninformed search algorithms, depth-first and breadth-first search, to the search tree. Is any one obviously the best in reaching the goal? How many nodes do they expand? How many nodes do they keep on the frontier at one time?

3 *More to learn[2]

How does a web crawel work? (`https://en.wikipedia.org/wiki/Web_crawler`)

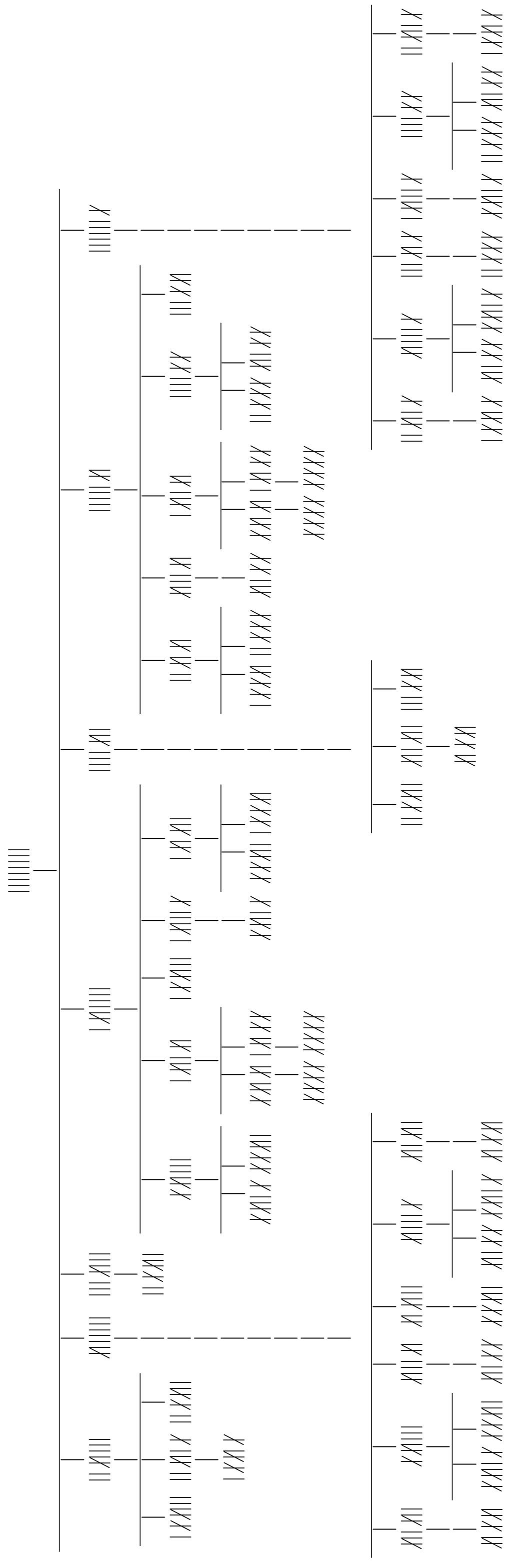

Figure 2: Search tree for the Sticks Problem