

Homework #1: Chapters 1, 2, 3

The following exercises are due at the beginning of class on February 1. Each exercise will be graded for correctness, so please start early and be sure you are confident in your answers. Also, remember that all work should be your own.

- [15 points] Develop a PEAS description for the following task environments:
 - A computer program that given an image of a fingerprint can find the best match in a database of criminal fingerprints
 - An internet shopping agent that given a product description, can locate and compare matching products from different online retailers (i.e., it does what mySimon and Froogle do).
 - An autonomous vehicle capable of winning DARPA's Grand Challenge race in the Mojave Desert.
- [15 points] For each of the agents described above, categorize it with respect to the six dimensions of task environments as described on pages 40-43. Give a short justification for each property.
- [10 points] In what way is the table-driven agent better than the simple reflex-agent? How is the simple reflex-agent better than the table-driven agent?
- [25 points] Consider the following situation. A 3-foot tall monkey is in a room where some bananas are suspended from the 8-foot tall ceiling. He would like to get the bananas. The room contains two stackable, movable, climbable 3-foot-high crates. Give the initial state, goal test, successor function, and cost function for this problem. Choose a formulation that is precise enough to be implemented. In particular, specify the successor function by describing each action formally (i.e., precisely describe what kinds of states each action can be used in and how the state is changed when it is applied).
- [25 points] Consider the 8-puzzle with the initial and goal states shown below. Use breadth-first search to solve this problem. In order to reduce unnecessary search, you can ignore moves that return you to the state you just came from. Show your search tree, and label each node with the order in which it is expanded. Hint: Your tree should have 5 levels (not including the root node), some of which may have almost 15 nodes, so be sure to leave room to fit it on one sheet of paper.

Initial State

2	8	3
1	6	4
7		5

Goal State

1	2	3
8		4
7	6	5

- [10 points] Does a finite state space always lead to a finite search tree? Explain your answer.