

Artificial Intelligence

Joint class 5314 / 4320

Final

(take-home, due by 11:59pm on Sunday May, 7)

Exercise 1 (Game playing) (50 points) Answer the following questions in your own words.

1. Explain Minimax and Alpha-Beta pruning, and give an example of:
 - (a) how alpha-beta pruning can improve the performance of minimax;
 - (b) how the performance of alpha-beta pruning depends on the order in which the states are visited.
2. Discuss the performance of alpha-beta pruning? Is this an efficient method? why? Give examples (applications).
3. Imperfect Real-Time Decision:
 - (a) What is a method of imperfect real-time decision?
 - (b) Explain how it is different from the other methods that are perfect? What does this mean for a method to be perfect?
 - (c) Give an example of a game along with a method (clearly defined: both informally and formally) of imperfect real-time decision. Justify your choice and the performance of your method. The game you choose should be difficult enough to justify the use of an imperfect real-time decision method.

Exercise 2 (Knapsack problem) (50 points) In the exercise, you consider the knapsack problem as formulated in class.

1. Give the definition (formulation) of the problem.
2. In class, you were given three different evaluation functions. The first one always lead to choose the considered object, except in the case that it does not fit. Prove that this evaluation function leads indeed always to this decision.
3. "Evaluation functions should always be optimistic": this is a statement that we've discussed in class. Explain what this means in the case of the knapsack problem, and why guaranteeing this property is so important.
4. Propose a fourth evaluation function. Discuss its complexity and prove that it is an optimistic evaluation function.

Exercise 3 [Extra-credit on Constraint Solving] (10 points) When you solve discrete constraints, you may want to use either a generate-and-test method or constraint propagation.

1. Describe both the generate-and-test and the constraint propagation methods.
2. Explain which is better, why?