Homework 2, AI course

This homework covers chapter 4, 5 and 6 in AIMA.

The homework is due before midnight Friday September 22. You report it by emailing your written report (either as a PDF file or as a MS Word file) to the examiner (TR).

Each homework assignment handed in on time gives one bonus-point for the oral exam. Homework handed in too late gives no bonus-points but each student must hand in all homework before the oral exam (or else he/she will not be allowed to take the oral exam).

Read Chapters 4, 5 and 6 (except 4.4, 4.5, and 5.4) in AIMA.

1. Exercise 4.1 AIMA
2. The "Towers of Hanoi" is a famous mathematical game. It consists of three rods and *N* disks with holes in them (so that they can be placed on the rods), see Figure 1. The task is to move all disks from the leftmost rod on to the rightmost rod, without ever placing a larger disk on top of a smaller disk (you can find plenty of information about this problem on the web, and applets where you can play around with it, e.g., http://www.cut-the-knot.org/recurrence/hanoi.shtml). For a four disk solution: http://mathworld.wolfram.com/TowersofHanoi.html.
   (a) Work out the breadth-first search tree for this problem with three (3) disks (do not expand illegal nodes). Expand the tree until you find the first solution.
   (b) Work out (at least part of) the depth-first search tree for this problem.
   (c) Design a heuristic function for this problem. (Hint: You could try finding an exact solution to the relaxed problem, as described in section 4.2)
   (d) Show how a greedy search would solve the problem (write out the value of your heuristic for each expanded node).
   (e) Show how an A* algorithm would solve the problem.
3. Exercise 6.1 AIMA
4. Exercise 6.4 AIMA (it is necessary and sufficient to implement only one game using alpha-beta, you do not need to check the effects of improving move ordering etc.).

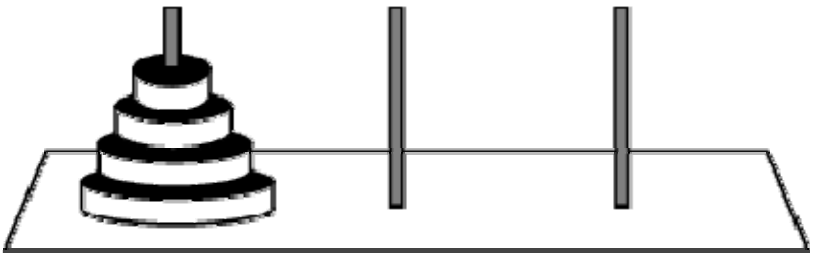

Figure 1 *The Towers of Hanoi initial setup.*
(Image borrowed from http://mathworld.wolfram.com/TowersofHanoi.html)