INF 4130 Exercise set for 3rd Oct. 2013

Exercise 1

Study figures 23.13 and 23.14 (pages 735 and 736 in B&P) where -1 and +1 is used to indicate win and loss, respectively. Look at all nodes and make sure you understand how values for the internal nodes are calculated with the min/max-algorithm. Always keep in mind that values indicate the situation for the player with the opening move – *A*. For *B* smaller values are better. (Note also that in exercise 3 we negate (* – 1) values on every other level so that we can always maximize!)

Exercise 2

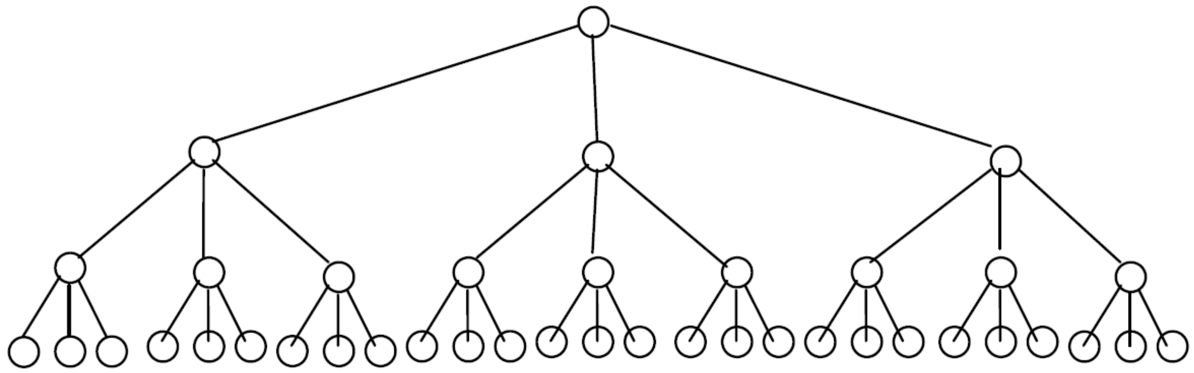
Study figures 23.16 and 23.17 (pages 738 and 740 in B&P) and check that your understanding of alpha-beta-pruning is correct; then solve exercise 23.22 in the text book (B&P).

Exercise 3

Go through the program on page 741 and discuss the solution chosen there, where values are negated (* – 1) on every other level. (Note that there are some typos in the program, see the lecture slides.) Finally assume that the nodes (among them *X*) are objects of a class with attributes `bestMove` (typed with the same class) and `value` (real) indicating the best move from, and the alpha/beta values of *X*, wieved from the player with the move in state *X*.

Exercise4

In Rune Djurhuus's slides from October 3 it says that if we are lucky(?) enough to always look at the best move first we get good pruning. He even claims that if we go down to depth *d*, with a branching factor of *b*, the search time with alpha/beta-pruning is $O(\underbrace{b \cdot 1 \cdot b \cdot 1 \cdot b \ldots}_{d \text{ factors}})$, instead of $O(\underbrace{b \cdot b \cdot b \ldots}_{d \text{ factors}})$. We shall not attempt to prove it, but instead look at a concrete example. We let *d* = 3, and *b* = 3, and get the tree below. Mark the branches you have to evaluate (and thereby the ones you can avoid). The tree has 39 edges, how many do you avoid looking at?



EXTRA: Assume you are unlucky(?) and always look at the best node *last*. Will you get any pruning at all?

Exercise 5 (not central to the course)

Assume you are playing the game of NIM, with two piles, and that it is your move, that no pile is empty, and that the piles are of different size (number of pebbles or matches, or whatever). Try to come up with a strategy that guarantees victory.

[END]