Course 02249, DTU Compute
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Computationally Hard Problems – Fall 2015
Assignment 8

Date: 17.11.2015, **Due date**: 23.11.2015, 23:59

This is the last exercise sheet with mandatory exercises.

The following exercises are **not** mandatory:

Exercise 8.1: Consider a binary game tree with $2k$ levels as discussed in the problem GameTreeEvaluation from the lecture, but assume that the labels at the leaves are from $\{0, 1, 2\}$. Propose a modification of Algorithm 5.30 (randomized evaluation) for this type of game trees. Can you (in general) bound the expected number of leaves evaluated by anything better than 2^{2k}?

End of Exercise 1

Exercise 8.2: Consider a binary game tree with $2k$ levels as discussed in the problem GameTreeEvaluation from the lecture. Let A be a deterministic algorithm which evaluates such a tree by always evaluating the left child first.
Show how to construct an assignment of 0 and 1 to the leaves such that A has to look at all leaves in order to determine the correct value at the root.

End of Exercise 2

Exercise 8.3: Suppose we change the mutation operator of the (1+1) EA in the following way:

- For each bit of y, flip it independently with probability $1/2$.

Show a general upper bound $O(2^n)$ on the expected optimization time of the resulting algorithm. What is its main disadvantage?

End of Exercise 3

The following exercise is **mandatory**:

Exercise 8.4: Consider the scenario underlying the problem GameTreeEvaluation from the lecture, but assume that the tree is a complete ternary one with $2k$ levels instead of a binary. Propose a modification of Algorithm 5.30 (randomized evalutation) for this type of game trees. Bound the expected number of leaves evaluated by the algorithm by some value that is lower than the total number of leaves.

End of Exercise 4