INF3490 exercises - week 4 2015

$\mathbb{P}$ marks the programming exercises.

Problem 1

In what ways does the island model and the diffusion model handle migration differently? With the population arranged into a grid of 3×5 subpopulations, how many iterations would at least be needed for a mutation in one corner of the grid to reach the corner at the opposite end with 4 neighbors (N,S,E,W) and with 8 neighbors (N,NE,E,SE,S,SW,W,NW)?

Problem 2

a) A common variant of evolution strategies used for (local) search is the $(1+4)$ ES. How would this differ from the $(1+1)$ ES in how the search space is explored? How does this, and $(1+\lambda)$ in general, compare to hill climbing and greedy search?

b) What effect does an adaptive search strategy have on optimization performance?

c) How would it affect the search if the strategy parameters were mutated after the solution parameters instead of before?

Problem 3

$\mathbb{P}$ **a)** Ignoring mutation, and starting with the population $\{1, 2, 3, 4\}$, implement and run 3 generations of a $(4+8)$ ES maximizing $g(x) = x$, and observe what the end population looks like (use intermediary recombination).

b) If an (4, 8) ES had been used in Problem 3a, what would the probability of the optimal solution ($x = 4$) surviving the first generation have been?

$\mathbb{P}$ **c)** Repeat Problem 3a with an EP with $q = 2$. How do the two algorithms compare?

Problem 4

In a 0-1 knapsack problem, how could you implement a repair mutation to transform infeasible solutions into feasible ones (i.e. make the sum of costs of the selected items go below the budget)?