Autonomous Intelligent Systems,
Institute for Computer Science VI, University of Bonn

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Exercises for Artificial Life (MA-INF 4201), SS15

Exercises sheet 9, till: Mon 22.6.2015

15.6.2015

Group	Name	56	57	58	59	60	61	62	$\sum$

Assignment 56 (2 Points)

Determine a formula that calculates the probability ω_i for an individual i to be chosen as parent. The rank of the individual i shall be $r(i)$, the size of the population is P.
The selection shall be probabilistic, fitness dependent, rank depending using the *Wheel-of-Fortune* method.

Assignment 57 (2 Points)

Within an Evolutionary Algorithm the probabilistic, rank based parent selection selects $\rho = 4$ parents from the population of $P = 32$ individuals.
The method shall be *Tournament selection* (as described within the lecture) starting with 16 different individuals, chosen randomly from the population.
Calculate the probability ω_T that the best individual from the population ($P = 32$) is among the $\rho = 4$ selected parents.

Assignment 58 (2 Points)

Within an Evolutionary Algorithm the probabilistic, rank based parent selection selects $\rho = 4$ parents from the population of $P = 32$ individuals.
The method shall be *Wheel-of-Fortune* (as described within the lecture).
Calculate the probability ω_F that the best individual from the population ($P = 32$) is among the $\rho = 4$ selected parents.

Assignment 59 (2 Points)

Describe what a so called *Super-Individual* is.
Explain why it should be avoided.

Assignment 60 (2 Points)

Name and describe two methods to avoid super-individuals.

Assignment 61 (3 Points)

The distribution of the fitness values $f(g)$ for a population of P individuals within an evolutionary algorithm happen to be (almost) a normal distribution around a rather bad fitness value $\bar{f}$, with a standard deviation of σ.
The best fitness value within the population shall be f^*, with $f^* \geq \bar{f} + 4\sigma$.

The stochastic, **fitness proportional** selection process is selecting μ individuals to be the pool of parents.
Explain the resulting distribution of fitness values within the pool of parents. Depict the distribution; a sketch is sufficient.

Assignment 62 (2 Points)

Propose an inheritance operator (recombination, k=2 parents) and a mutation operator for tree based genetic/evolutionary programming genomes.
Explain the functionality of the proposed operators using a little example. Support your explanation with a sketch or a diagram.