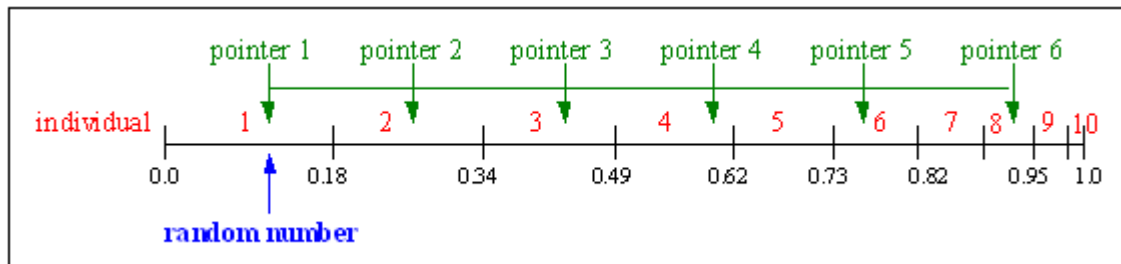# Selection methods

Stochastic Universal Sampling (SUS)

Instead of random N times like in the roulette wheel, SUS spin the wheel once and use N equally spaced pointer to select N parents. Consider N is the number of individuals to be selected, then the distance between the pointers is 1/N and the position of the first pointer is given by a randomly generated number in the range [0, 1/N]
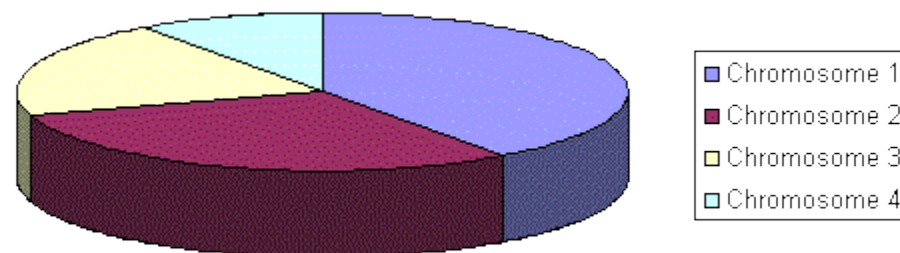

The selected individuals are 1, 2, 3, 4, 6, 8

Rank Selection

This method is proposed to prevent quick convergence. The population is ranked by the fitness value and the chance to be selected is assigned by its rank.
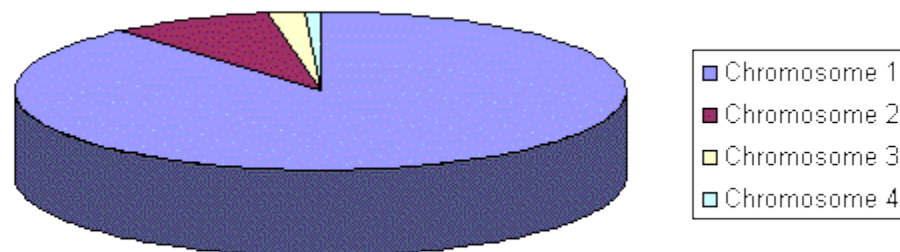
Before ranking

After ranking

Sigma Scaling

This method calculates expected value of the individual i to be selected by normalizing its fitness value

$$ExpVal(i) = \begin{cases} 1 + \dfrac{(fitness(i) - mean}{2\sigma} & ; if\ \sigma \neq 0 \\ 1.0 & ; if\ \sigma = 0 \end{cases}$$

If $ExpVal(i)$ is less than 0, reset to 0.1

Elitism

Copy the best or top-k chromosome to next generation to prevent losing the best chromosome from crossover and mutation. The remaining offspring is selected by other general selection methods.

Tournament Selection

Two individuals are chosen randomly from the population. A random number r is then chosen between 0 and 1. If r < k (where k is a parameter, for example 0.75), the fitter of the two individuals is selected to next generation; otherwise the less fit individual is selected. The two are then returned to the original population and can be selected again.

References

Melanie Mitchell, an Introduction to Genetic Algorithms.

http://www.obitko.com/tutorials/genetic-algorithms/selection.php

http://www.geatbx.com/docu/algindex-02.html#P363_18910