

Evolutionary Algorithms: Introduction

Jiří Kubalík

The Czech Institute of Informatics, Robotics and Cybernetics
CTU Prague



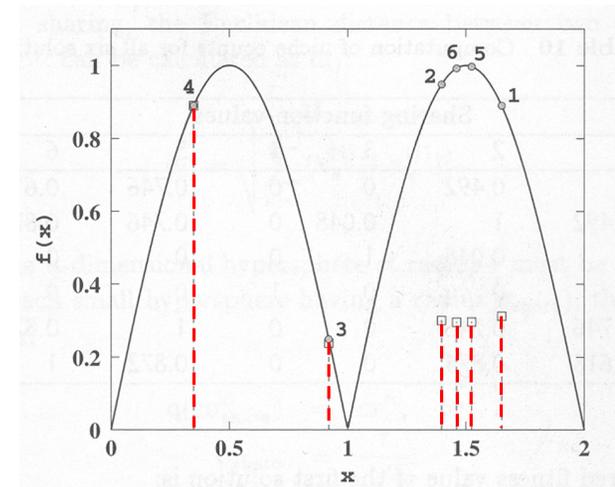
<http://cw.felk.cvut.cz/doku.php/courses/a0m33eoa/start>

Fitness Sharing: Example

Bimodal function - six solutions and corresponding shared fitness functions

- $\sigma_{share} = 0.5, \alpha = 1.$

Sol. i	String	Decoded value	$x^{(i)}$	f_i	nc_i	f'_i
1	110100	52	1.651	0.890	2.856	0.312
2	101100	44	1.397	0.948	3.160	0.300
3	011101	29	0.921	0.246	1.048	0.235
4	001011	11	0.349	0.890	1.000	0.890
5	110000	48	1.524	0.997	3.364	0.296
6	101110	46	1.460	0.992	3.364	0.295



©Kalyanmoy Deb: Multi-Objective Optimization using Evolutionary Algorithms.

Let's calculate the shared fitness value of the first solution

- $d_{11} = 0.0, d_{12} = 0.254, d_{13} = 0.731, d_{14} = 1.302, d_{15} = 0.127, d_{16} = 0.191$
- $Sh(d_{11}) = 1, Sh(d_{12}) = 0.492, Sh(d_{13}) = 0, Sh(d_{14}) = 0,$
 $Sh(d_{15}) = 0.746, Sh(d_{16}) = 0.618.$
- $nc_1 = 1 + 0.492 + 0 + 0 + 0.746 + 0.618 = 2.856$
- $f'(1) = f(1)/nc_1 = 0.890/2.856 = 0.312$

Artificial Ant Problem: Example cont.

Ant behavior

- What happens if the ant "hits" an obstacle?
- What is strange with transition from state 10 to the initial state 00?
- When does the ant succeed?
- Is the number of states sufficient to solve the problem?
- Do all of the possible 34-bit chromosomes represent a feasible solution?

