

Lab 3 (22.04.2016)

Task 2: Crowding Algorithm

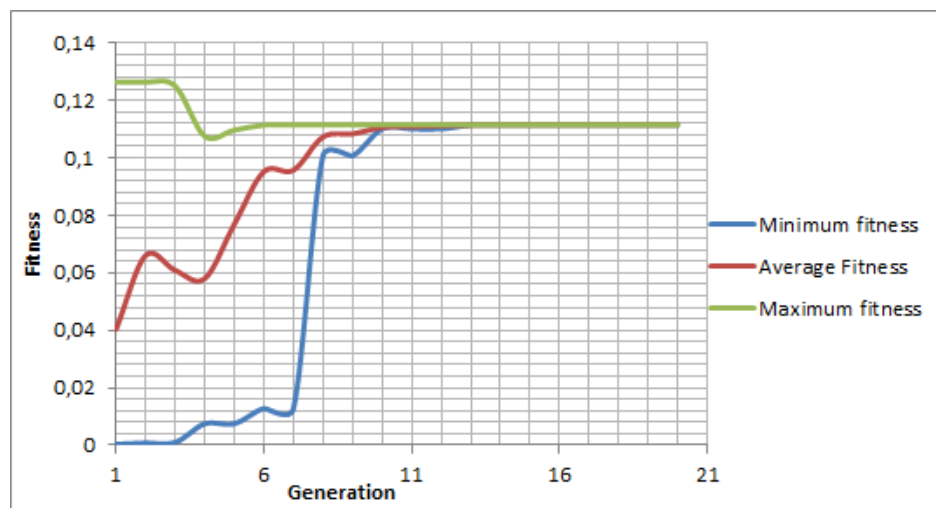
Algorithm

1. Choose two parents, p1 and p2, at random.
2. Produce two children, c ' 1 and c ' 2.
3. Replace parent with child as follows:
 - IF $d(p1, c1) + d(p2, c2) > d(p1, c2) + d(p2, c1)$
 - * IF $f(c1) > f(p1)$ THEN replace p1 with c1
 - * IF $f(c2) > f(p2)$ THEN replace p2 with c2
 - ELSE
 - * IF $f(c2) > f(p1)$ THEN replace p1 with c2
 - * IF $f(c1) > f(p2)$ THEN replace p2 with c1

Description:

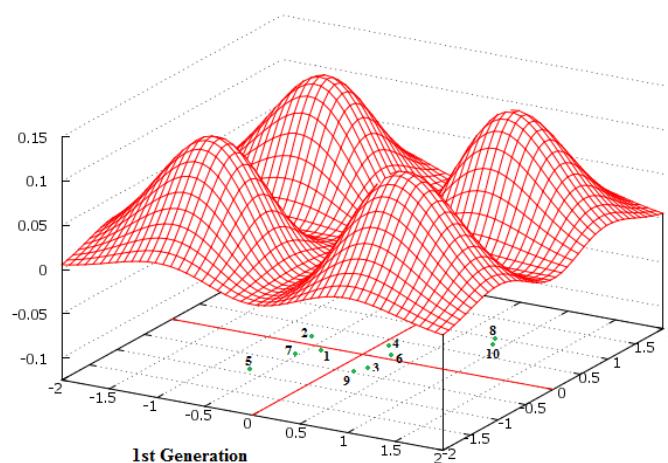
In this lab using crowding algorithm we have to maximize 3D function

$$z = x^2 \cdot (e^{-x^2}) \cdot y^2 \cdot (e^{-y^2})$$



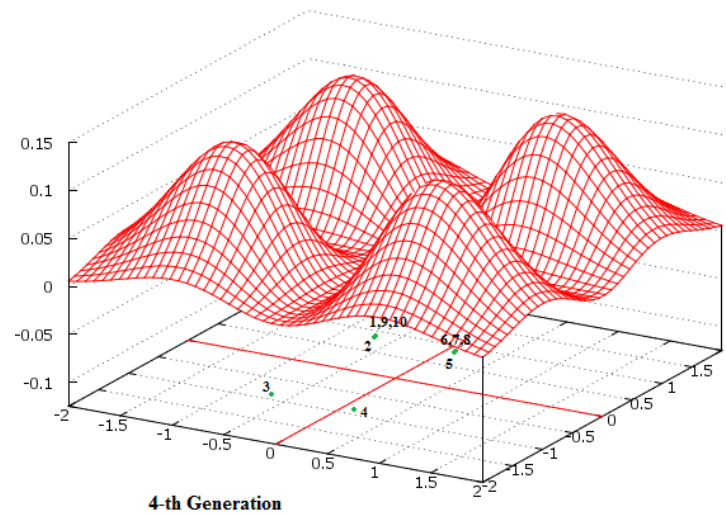
We have reached stable fitness after 13 generations.

1-st generation:



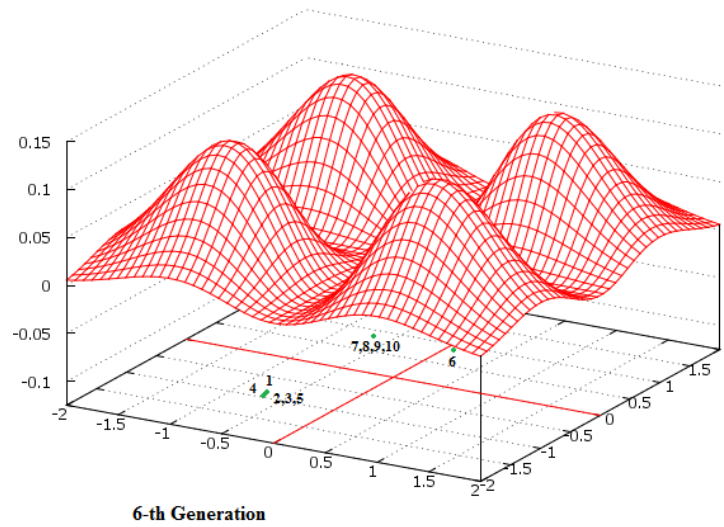
	Selected parents & fitness	Created children & fitness	d(p1,c1)+d(p2,c2)	d(p1,c2)+d(p2,c1)	New chromosomes
1	p1:(111001111001111101001) = (0,8094;0,9785) z=0,1251 p2:(1001111101100101010010) = (0,2454;-0,3304) z=0,0055	c1:(111001111001111101010) = (0,8094;0,9795) z=0,1251 c2:(1001111101100101010001) = (0,2454;-0,3294) z=0,0055	0,0020	2,8505	(111001111001111101001) (111001111001111101010)
2	p1:(0101100001001110100100) = (-0,6901;-0,9110) z=0,1071 p2:(1001111101100101010010) = (0,2454;-0,3304) z=0,0055	c1:(0101111101100101010010) = (-0,7458;-0,3304) z=0,0312 c2:(1001100001001110100100) = (0,1896;-0,9110) z=0,0126	1,1666	1,8710	(0101100001001110100100) (0101111101100101010010)
3	p1:(10010010110001111010001) = (0,1466;-0,4780) z=0,0038 p2:(1111000101111101110000) = (0,8866;0,8602) z=0,1265	c1:(1001001011111101110000) = (0,1476;0,8602) z=0,0075 c2:(1111000101000111101001) = (0,8856;-0,4780) z=0,0651	2,6764	1,4780	(1001001011111101110000) (1111000101111101110000)
4	p1:(1001111101100101010010) = (0,2454;-0,3304) z=0,0055 p2:(0101100001001110100100) = (-0,6901;-0,9110) z=0,1071	c1:(100111110100111010100100) = (0,2444;-0,9110) z=0,0204 c2:(0101100001100101010010) = (-0,6911;-0,3304) z=0,0290	1,1613	1,8710	(0101100001100101010010) (0101100001001110100100)
5	p1:(1000110000110101101010) = (0,0948;0,3539) z=0,0010 p2:(1010010010110001001000) = (0,2864;0,0704) z=0,0004	c1:(1000110000110101001000) = (0,0948;0,3206) z=0,0008 c2:(1010010010110001101010) = (0,2864;0,1036) z=0,0008	0,0665	0,6303	(1000110000110101101010) (1000110000110101001000)

4th generation:



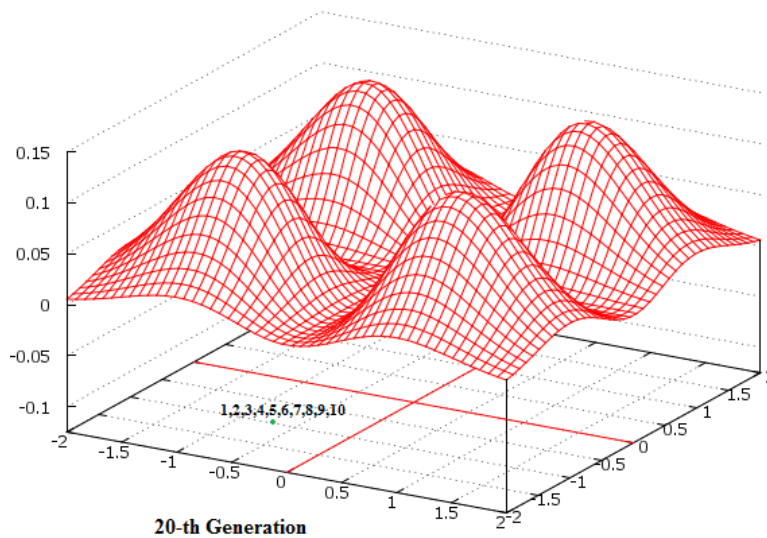
	Selected parents & fitness	Created children & fitness	d(p1,c1)+d(p2,c2)	d(p1,c2)+d(p2,c1)	New chromosomes
1	p1:(1001001011111101110000) = (0,1476;0,8602) z=0,0075 p2:(0101100001101110100100) = (-0,6911;-0,9110) z=0,1072	c1:(1001000001101110100100) = (0,1281;-0,9110) z=0,0058 c2:(0101101011111101110000) = (-0,7107;0,8602) z=0,1076	3,5427	1,6774	(1001001011111101110000) (0101101011111101110000)
2	p1:(0101101011111101110000) = (-0,7107;0,8602) z=0,1076 p2:(1001100001101110100100) = (0,1906;-0,9110) z=0,0127	c1:(0101100001101110100100) = (-0,6911;-0,9110) z=0,1072 c2:(1001101011111101110000) = (0,2102;0,8602) z=0,0149	3,5427	1,8025	(0101101011111101110000) (1001101011111101110000)
3	p1:(0101101011111101101010) = (-0,7107;0,8543) z=0,1072 p2:(1001001011111101110000) = (0,1476;0,8602) z=0,0075	c1:(0101001011111101110000) = (-0,6481;0,8602) z=0,0974 c2:(1001101011111101101010) = (0,2102;0,8543) z=0,0149	0,1257	1,7165	(0101101011111101101010) (0101001011111101110000)
4	p1:(0101101011111101101010) = (-0,7107;0,8543) z=0,1072 p2:(1001100001101110100100) = (0,1906;-0,9110) z=0,0127	c1:(0101101001101110100100) = (-0,7067;-0,9110) z=0,1097 c2:(1001100011111101101010) = (0,1945;0,8543) z=0,0128	3,5308	1,8025	(0101101001101110100100) (1001100011111101101010)
5	p1:(1001001011111101110000) = (0,1476;0,8602) z=0,0075 p2:(0101101011111101110000) = (-0,7107;0,8602) z=0,1076	c1:(1001101011111101110000) = (0,2102;0,8602) z=0,0149 c2:(0101001011111101110000) = (-0,6481;0,8602) z=0,0974	0,1251	1,7165	(0101001011111101110000) (0101101011111101110000)

6th generation:



	Selected parents & fitness	Created children & fitness	$d(p1,c1)+d(p2,c2)$	$d(p1,c2)+d(p2,c1)$	New chromosomes
1	p1:(010100101111101110000) = (-0,6481;0,8602) z=0,0974 p2:(0101101001101110100100) = (-0,7067;-0,9110) z=0,1097	c1:(010100101111101100100) = (-0,6481;0,8485) z=0,0967 c2:(010110100110111010000) = (-0,7067;-0,9228) z=0,1101	0,0235	3,5445	(010110100110111010000) (0101101001101110100100)
2	p1:(100110001111101101010) = (0,1945;0,8543) z=0,0128 p2:(0101101001101110100100) = (-0,7067;-0,9110) z=0,1097	c1:(1001100001101110100100) = (0,1906;-0,9110) z=0,0127 c2:(010110101111101101010) = (-0,7107;0,8543) z=0,1072	3,5308	1,8025	(100110001111101101010) (0101101001101110100100)
3	p1:(0101101001101110100000) = (-0,7067;-0,9071) z=0,1095 p2:(0101001011111011100000) = (-0,6481;0,8602) z=0,0974	c1:(010110101111101110000) = (-0,7107;0,8602) z=0,1076 c2:(0101001001101110100000) = (-0,6442;-0,9071) z=0,0990	3,5347	0,1251	(0101101001101110100000) (0101001001101110100000)
4	p1:(010100101111101110000) = (-0,6481;0,8602) z=0,0974 p2:(100110001111101101010) = (0,1945;0,8543) z=0,0128	c1:(010100101111101101010) = (-0,6481;0,8543) z=0,0971 c2:(100110001111101110000) = (0,1945;0,8602) z=0,0129	0,0117	1,6852	(010100101111101110000) (010100101111101101010)
5	p1:(010100101111101110000) = (-0,6481;0,8602) z=0,0974 p2:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115	c1:(010100100110111110000) = (-0,6442;-0,9853) z=0,1008 c2:(010110101111101110000) = (-0,7107;0,8602) z=0,1076	3,6911	0,1251	(010100100110111110000) (010110100110111110000)

The last generation:



	Selected parents & fitness	Created children & fitness	$d(p1,c1)+d(p2,c2)$	$d(p1,c2)+d(p2,c1)$	New chromosomes
1	p1:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115 p2:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115	c1:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115 c2:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115	0,0000	0,0000	(010110100110111110000) (010110100110111110000)
2	p1:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115 p2:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115	c1:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115 c2:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115	0,0000	0,0000	(010110100110111110000) (010110100110111110000)
3	p1:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115 p2:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115	c1:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115 c2:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115	0,0000	0,0000	(010110100110111110000) (010110100110111110000)
4	p1:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115 p2:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115	c1:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115 c2:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115	0,0000	0,0000	(010110100110111110000) (010110100110111110000)
5	p1:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115 p2:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115	c1:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115 c2:(010110100110111110000) = (-0,7067;-0,9853) z=0,1115	0,0000	0,0000	(010110100110111110000) (010110100110111110000)

In the last generation all chromosomes have the same genes, so it is shown only 1 point on the graph above.