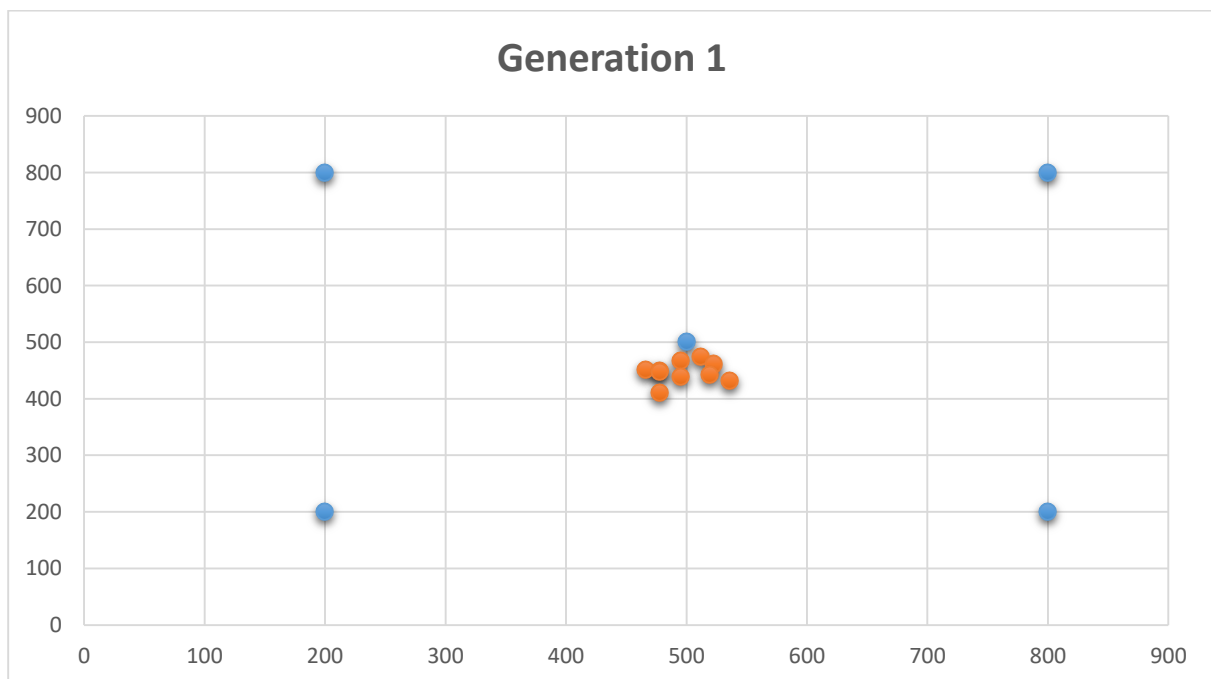
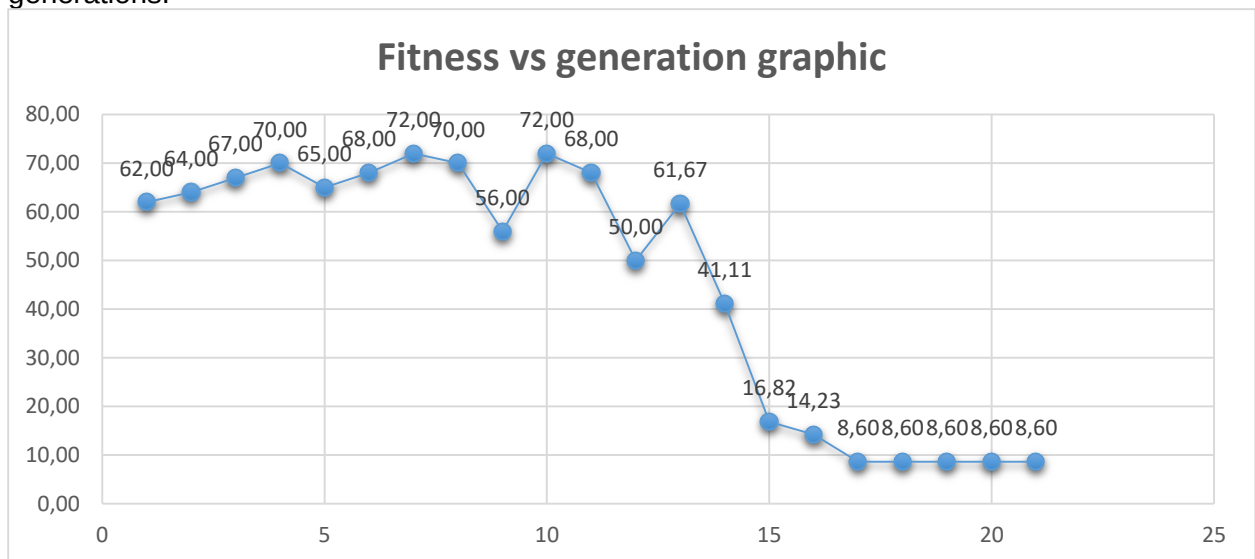


Modern intelligent IT
Lab 3 (22.04.2016)
Akira Imada
Student – Vlad Mironchuk (AC-36)

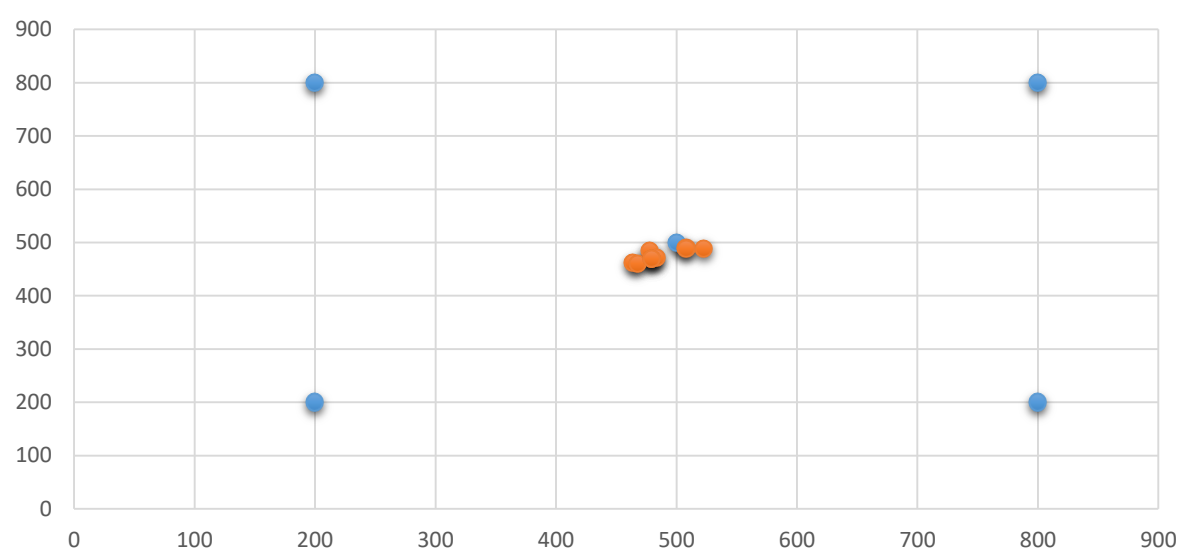
Task 1: Lucky Dog Problem with Fitness Sharing Algorithm

The aim is to create a population of 10 dogs with 1000 genes in each, whose goal is to come from the 'house' located on (500;500) and reach one of four sausages (200;200) (200;800) (800;800) or (800;200). Because of normal distribution our dogs don't reach the sausages, they roam near the 'house'. In the end, the closest result is (476;490), which is closer to sausage located on (200;800)

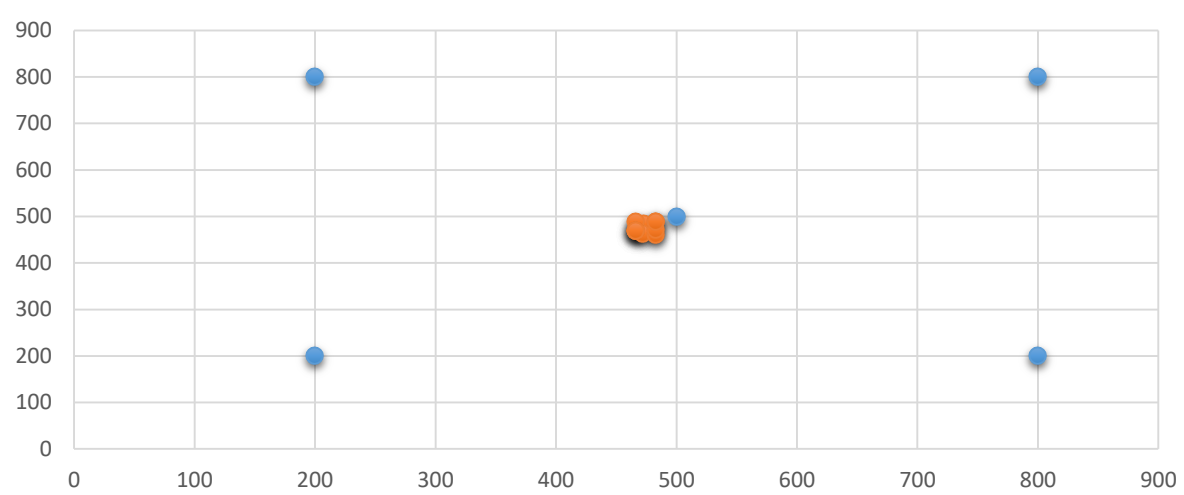
These are the Fitness vs. Generation graphic and 4 graphics of locations of dogs on different generations.

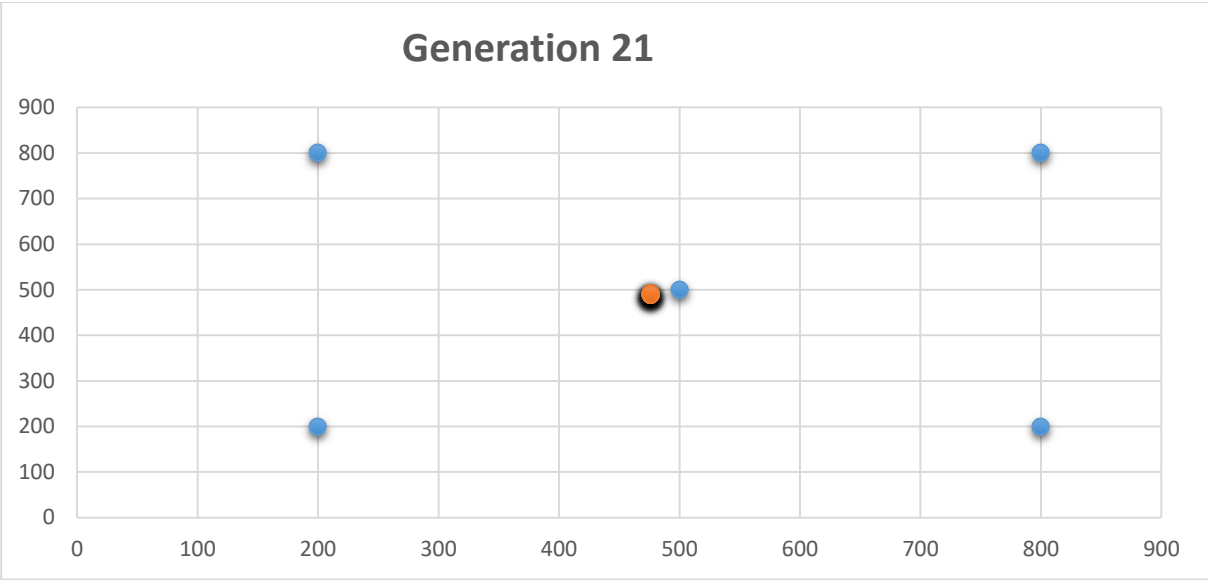


Generation 7



Generation 11





	#1 generation			#2 generation		
Dogs	Position	Original fitness	Shared fitness	Position	Original fitness	Shared fitness
#1	(478,410)	52	52	(452,484)	64	64
#2	(512,474)	46	46	(521,543)	64	64
#3	(466,452)	46	46	(480,526)	46	46
#4	(523,461)	44	44	(484,530)	46	46
#5	(536,432)	44	44	(479,477)	44	44
#6	(495,467)	32	32	(508,526)	34	34
#7	(519,443)	22	22	(477,507)	30	30
#8	(478,450)	32	20	(478,490)	32	26,6667
#9	(478,448)	30	18,75	(479,485)	36	22,0119
#10	(495,439)	6	6	(478,486)	36	20

	#6 generation			#7 generation			#8 generation		
Dogs	Position	Original fitness	Shared fitness	Position	Original fitness	Shared fitness	Position	Original fitness	Shared fitness
#1	(508,548)	56	56	(523,489)	72	72	(474,544)	70	70
#2	(479,529)	50	50	(478,484)	66	66	(460,522)	62	51,6667
#3	(473,513)	40	40	(464,462)	58	58	(464,522)	58	48,3333
#4	(462,516)	54	33,75	(468,460)	52	52	(508,548)	56	46,6667
#5	(517,539)	56	18,6667	(484,472)	48	48	(494,540)	46	46
#6	(517,539)	56	18,6667	(508,490)	58	36,25	(507,541)	48	40
#7	(517,539)	56	18,6667	(508,488)	56	35	(507,545)	52	37,1429
#8	(461,519)	58	18,125	(479,469)	50	16,6667	(523,549)	72	24
#9	(461,519)	58	18,125	(479,469)	50	16,6667	(523,549)	72	24
#10	(461,519)	58	18,125	(479,469)	50	16,6667	(523,549)	72	24

	#10 generation			#11 generation			#12 generation		
Dogs	Position	Original fitness	Shared fitness	Position	Original fitness	Shared fitness	Position	Original fitness	Shared fitness

#1	(466,538)	72	72	(483,489)	74	74	(487,557)	70	50
#2	(483,545)	62	62	(473,484)	70	58,3333	(483,557)	74	33,6364
#3	(464,522)	58	58	(472,462)	68	56,6667	(483,557)	74	33,6364
#4	(502,554)	56	56	(483,460)	62	20,6667	(473,543)	70	18,4211
#5	(477,543)	66	33	(483,472)	62	20,6667	(473,543)	70	18,4211
#6	(473,543)	70	13,4615	(483,490)	62	20,6667	(473,543)	70	18,4211
#7	(473,543)	70	13,4615	(466,488)	72	18	(472,540)	68	14,7826
#8	(473,543)	70	13,4615	(466,469)	72	18	(472,540)	68	14,7826
#9	(473,543)	70	13,4615	(466,469)	72	18	(472,540)	68	14,7826
#10	(473,543)	70	13,4615	(466,469)	72	18	(472,540)	68	14,7826

	#10 generation			#21 generation		
Dogs	Position	Original fitness	Shared fitness	Position	Original fitness	Shared fitness
#1	(432,448)	86	8,6	(476,490)	86	8,6
#2	(432,448)	86	8,6	(476,490)	86	8,6
#3	(432,448)	86	8,6	(476,490)	86	8,6
#4	(432,448)	86	8,6	(476,490)	86	8,6
#5	(432,448)	86	8,6	(476,490)	86	8,6
#6	(432,448)	86	8,6	(476,490)	86	8,6
#7	(432,448)	86	8,6	(476,490)	86	8,6
#8	(432,448)	86	8,6	(476,490)	86	8,6
#9	(432,448)	86	8,6	(476,490)	86	8,6
#10	(432,448)	86	8,6	(476,490)	86	8,6

Task 2: A maximization of 3D function with Crowding Algorithm

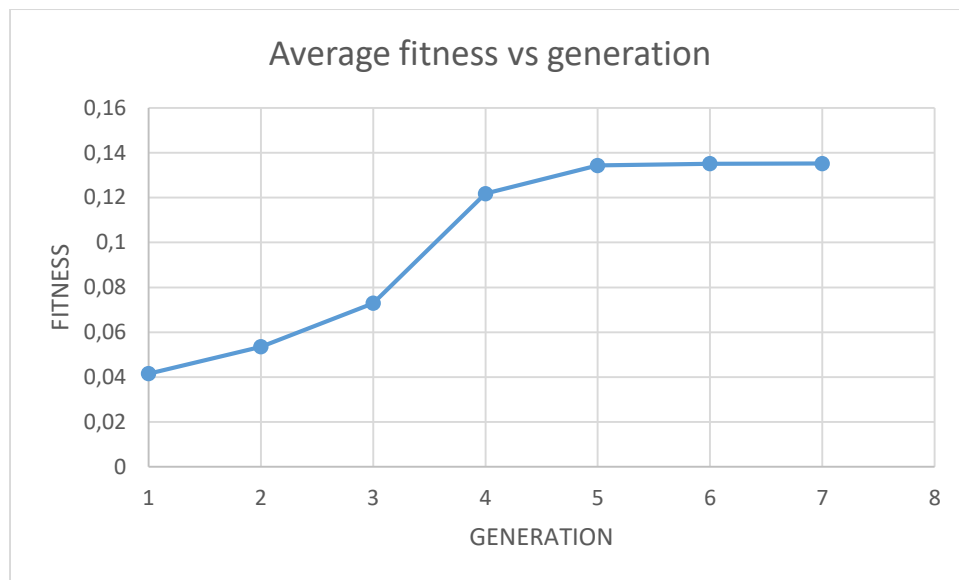
Our goal in this problem is to create a population of 10 binary chromosomes of 22 genes each of

which represents one point in x – y plane $-2 \leq x; y \leq 2$, then to build a function

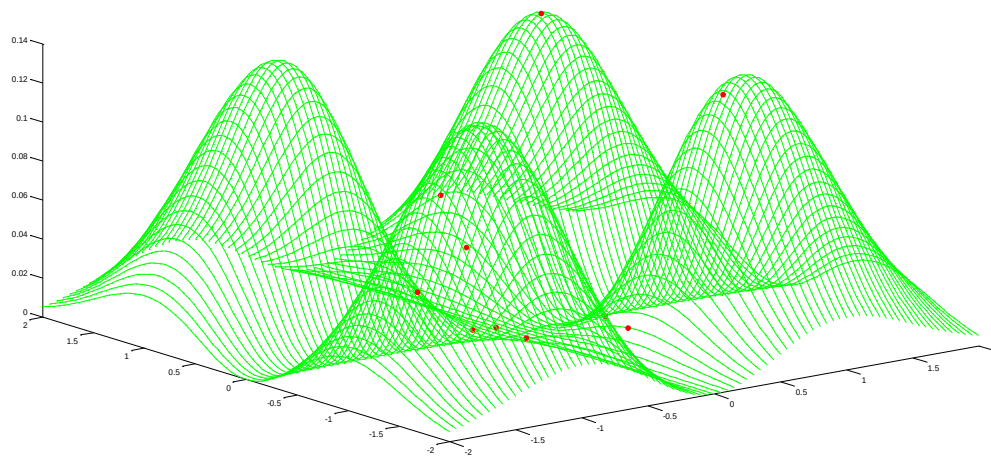
$$z = x^2 * y^2 * e^{-x^2} * e^{-y^2}$$

With fitness being value of Z, we should maximize Z applying to Crowding Algorithm.

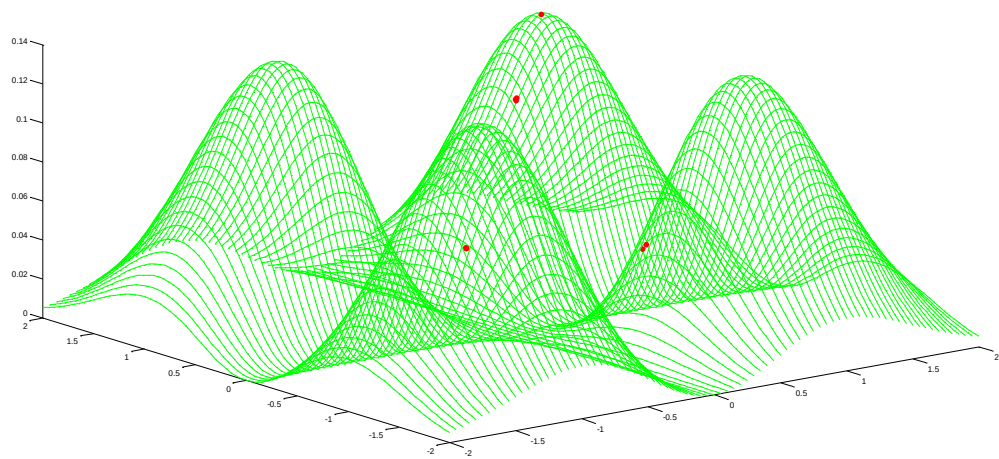
There are presented graphs of Fitness vs Generation and 4 3D graphs including 10 points on different generations.



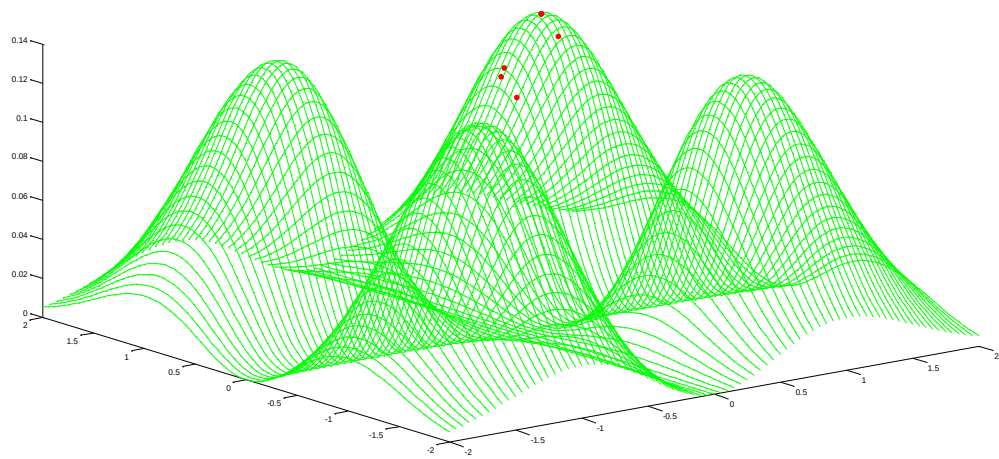
Generation 1



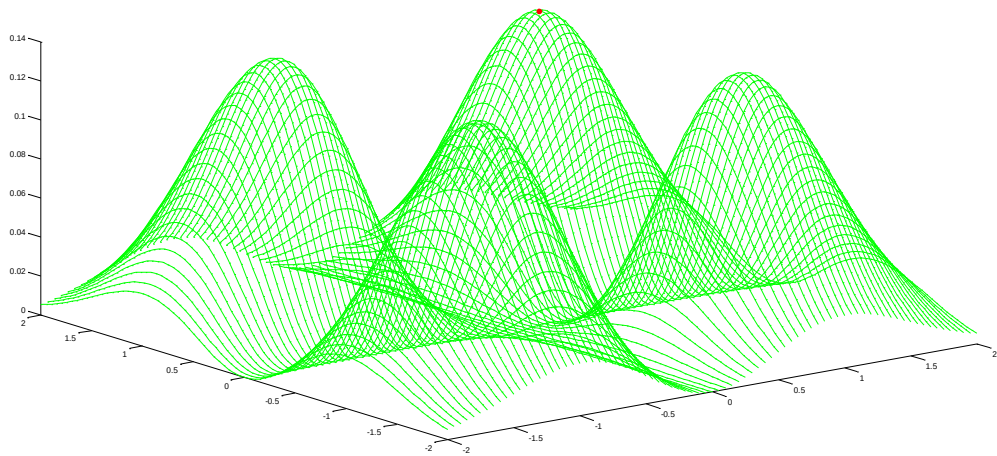
Generation 3



Generation 4



Generation 6



Generation 1				
selected parents & fitness	created children & fitness	d(p1,c1) + d(p2,c2)	d(p1;c2) + d(p2;c1)	new chromosomes
p1: (0011010000110110010110) = (-0.4076;0.3969) z=0.0189 p2: (1101011001100000101001) = (0.6755;-0.0401) z=0.0005	c1: (0011010001100000101001) = (-0.4096;-0.0401) z=0.0002 c2: (1101011000110110010110) = (0.6735;0.3969) z=0.0388	0.8739	2.1662	1101011000110110010110 1101011001100000101001
p1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 p2: (0111111101001001100011) = (-0.9951;-0.5973) z=0.0919	c1: (1111110111011111100011) = (0.9834;0.9726) z=0.1351 c2: (0111111101001001110010) = (-0.9951;-0.6119) z=0.0947	0.0293	5.0697	1111110111011111110010 1111110111011111100011
p1: (1010010100011101001001) = (0.2893;0.8221) z=0.0265 p2: (0000000100110010001111) = (-0.0088;0.1398) z=0.0000	c1: (1010010100011101001111) = (0.2893;0.8280) z=0.0266 c2: (0000000100110010001001) = (-0.0088;0.1339) z=0.0000	0.0117	1.5000	1010010100011101001001 1010010100011101001111
p1: (0001101000100110100101) = (-0.2043;-0.4115) z=0.0057 p2: (1101011001100000101001) = (0.6755;-0.0401) z=0.0005	c1: (0001011001100000101001) = (-0.1750;-0.0401) z=0.0000 c2: (1101101000100110100101) = (0.7048;-0.4115) z=0.0432	0.7452	1.7595	1101101000100110100101 1101011001100000101001
p1: (1111111111001100011110) = (0.9990;-0.7801) z=0.1218 p2: (0000000100110010001111) = (-0.0088;0.1398) z=0.0000	c1: (1111111100110010001111) = (0.9941;0.1398) z=0.0070 c2: (0000000111001100011110) = (-0.0137;-0.7801) z=0.0001	1.8397	2.0156	1111111111001100011110 1111111100110010001111

Generation 2				
selected parents & fitness	created children & fitness	d(p1,c1) + d(p2,c2)	d(p1;c2) + d(p2;c1)	new chromosomes
p1: (1101101000100110100101) = (0.7048;-0.4115) z=0.0432 p2: (1101011000110110010110) = (0.6735;0.3969) z=0.0388	c1: (1101101000110110010110) = (0.7048;0.3969) z=0.0407 c2: (1101011000100110100101) = (0.6735;-0.4115) z=0.0412	1.6168	0.0626	1101101000100110100101 1101011000100110100101
p1: (1010010100011101001111) = (0.2893;0.8280) z=0.0266 p2: (1101011001100000101001) = (0.6755;-0.0401) z=0.0005	c1: (1010011001100000101001) = (0.3001;-0.0401) z=0.0001 c2: (1101010100011101001111) = (0.6647;0.8280) z=0.0981	1.7362	0.7507	1010010100011101001111 1101010100011101001111
p1: (1010010100011101001001) = (0.2893;0.8221) z=0.0265 p2: (1101011001100000101001) = (0.6755;-0.0401) z=0.0005	c1: (1010011001100000101001) = (0.3001;-0.0401) z=0.0001 c2: (1101010100011101001001) = (0.6647;0.8221) z=0.0977	1.7245	0.7507	1010010100011101001001 1101010100011101001001
p1: (1101101000100110100101) = (0.7048;-0.4115) z=0.0432 p2: (111111011101111110010) = (0.9834;0.9873) z=0.1352	c1: (111111011101111110010) = (0.9834;0.9873) z=0.1352 c2: (1101101000100110100101) = (0.7048;-0.4115) z=0.0432	2.8526	0.0000	111111011101111110010 111111011101111110010
p1: (1101011000110110010110) = (0.6735;0.3969) z=0.0388 p2: (1010010100011101001001) = (0.2893;0.8221) z=0.0265	c1: (110101100011101001001) = (0.6725;0.8221) z=0.0989 c2: (1010010100110110010110) = (0.2903;0.3969) z=0.0104	0.8504	0.7664	1101011000011101001001 1010010100011101001001

Generation 3				
selected parents & fitness	created children & fitness	d(p1,c1) + d(p2,c2)	d(p1;c2) + d(p2;c1)	new chromosomes
p1: (1101101000100110100101) = (0.7048;-0.4115) z=0.0432 p2: (111111011101111110010) = (0.9834;0.9873) z=0.1352	c1: (1101101000011111110010) = (0.7038;0.9873) z=0.1110 c2: (1111110111100110100101) = (0.9844;-0.4115) z=0.0526	2.7977	0.5591	1101101000011111110010 1111110111011111110010
p1: (1101011000100110100101) = (0.6735;-0.4115) z=0.0412 p2: (111111011101111110010) = (0.9834;0.9873) z=0.1352	c1: (1101011011011111110010) = (0.6784;0.9873) z=0.1068 c2: (1111110100100110100101) = (0.9785;-0.4115) z=0.0525	2.7977	0.6100	1101011011011111110010 1111110111011111110010
p1: (111111011101111110010) = (0.9834;0.9873) z=0.1352 p2: (1101011000011101001001) = (0.6725;0.8221) z=0.0989	c1: (1111111000011101001001) = (0.9853;0.8221) z=0.1264 c2: (110101011101111110010) = (0.6706;0.9873) z=0.1055	0.3304	0.6256	1111110111011111110010 1111111000011101001001
p1: (1101010100011101001001) = (0.6647;0.8221) z=0.0977 p2: (111111011101111110010) = (0.9834;0.9873) z=0.1352	c1: (1101010100011101001010) = (0.6647;0.8231) z=0.0977 c2: (111111011101111110001) = (0.9834;0.9863) z=0.1352	0.0020	0.7170	1111110111011111110001 1111110111011111110010
p1: (1101101000100110100101) = (0.7048;-0.4115) z=0.0432 p2: (1101011000011101001001) = (0.6725;0.8221) z=0.0989	c1: (1101101000100110100101) = (0.7048;-0.4115) z=0.0432 c2: (1101011000011101001001) = (0.6725;0.8221) z=0.0989	0.0000	2.4681	1101011000011101001001 1101011000011101001001

Generation 4				
selected parents & fitness	created children & fitness	d(p1,c1) + d(p2,c2)	d(p1;c2) + d(p2;c1)	new chromosomes
p1: (1101011000011101001001) = (0.6725;0.8221) z=0.0989 p2: (1111110111011111110001) = (0.9834;0.9863) z=0.1352	c1: (1101011011011111110001) = (0.6784;0.9863) z=0.1068 c2: (1111110100011101001001) = (0.9775;0.8221) z=0.1264	0.3287	0.6100	1111110100011101001001 1111110111011111110001
p1: (1101011011011111110010) = (0.6784;0.9873) z=0.1068 p2: (1111110111011111110001) = (0.9834;0.9863) z=0.1352	c1: (1101011011011111110001) = (0.6784;0.9863) z=0.1068 c2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	0.0020	0.6100	1111110111011111110010 1111110111011111110001
p1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 p2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	c1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 c2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	0.0000	0.0000	1111110111011111110010 1111110111011111110010
p1: (1101011011011111110010) = (0.6784;0.9873) z=0.1068 p2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	c1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 c2: (1101011011011111110010) = (0.6784;0.9873) z=0.1068	0.6100	0.0000	1111110111011111110010 1111110111011111110010
p1: (1101101000011111110010) = (0.7038;0.9873) z=0.1110 p2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	c1: (1101101000011111110010) = (0.7038;0.9873) z=0.1110 c2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	0.0000	0.5591	1111110111011111110010 1111110111011111110010

Generation 5				
selected parents & fitness	created children & fitness	d(p1,c1) + d(p2,c2)	d(p1;c2) + d(p2;c1)	new chromosomes
p1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 p2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	c1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 c2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	0.0000	0.0000	1111110111011111110010 1111110111011111110010
p1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 p2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	c1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 c2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	0.0000	0.0000	1111110111011111110010 1111110111011111110010
p1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 p2: (1111110100011101001001) = (0.9775;0.8221) z=0.1264	c1: (1111110111011101001001) = (0.9834;0.8221) z=0.1264 c2: (1111110100011111110010) = (0.9775;0.9873) z=0.1352	0.3304	0.0117	1111110111011111110010 1111110100011111110010
p1: (1111110100011101001001) = (0.9775;0.8221) z=0.1264 p2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	c1: (1111110100011101110010) = (0.9775;0.8622) z=0.1299 c2: (1111110111011111001001) = (0.9834;0.9472) z=0.1345	0.0802	0.2505	1111110111011111001001 1111110111011111110010
p1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 p2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	c1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 c2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	0.0000	0.0000	1111110111011111110010 1111110111011111110010

Generation 6				
selected parents & fitness	created children & fitness	d(p1,c1) + d(p2,c2)	d(p1;c2) + d(p2;c1)	new chromosomes
p1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 p2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	c1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 c2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	0.0000	0.0000	1111110111011111110010 1111110111011111110010
p1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 p2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	c1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 c2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	0.0000	0.0000	1111110111011111110010 1111110111011111110010
p1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 p2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	c1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 c2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	0.0000	0.0000	1111110111011111110010 1111110111011111110010
p1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 p2: (1111110100011111110010) = (0.9775;0.9873) z=0.1352	c1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 c2: (1111110100011111110010) = (0.9775;0.9873) z=0.1352	0.0000	0.0117	1111110111011111110010 1111110111011111110010
p1: (11111101110111111001001) = (0.9834;0.9472) z=0.1345 p2: (1111110111011111110010) = (0.9834;0.9873) z=0.1352	c1: (1111110111011111110010) = (0.9834;0.9873) z=0.1352 c2: (1111110111011111001001) = (0.9834;0.9472) z=0.1345	0.0802	0.0000	1111110111011111110010 1111110111011111110010