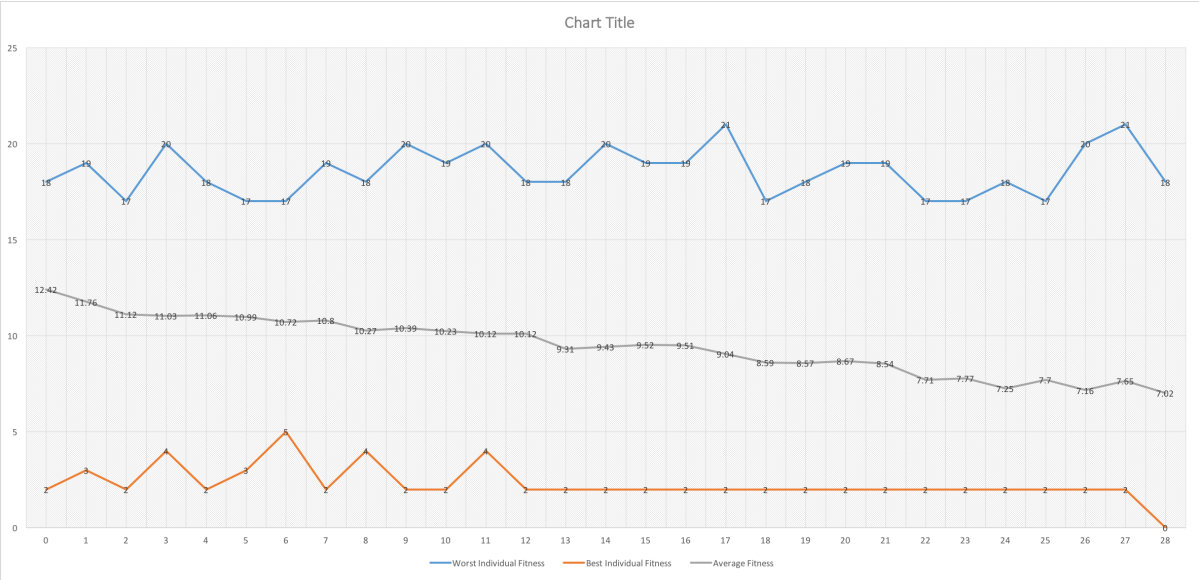
Reports:

Report 1:

In the first experiment we run the app with population size 100, 50 generation, crossover probability 0.8 and 0.2 for the mutation probability. And we can see in the chart that the average fitness getting better (smaller is a better fitness) in every generation, and after 28 generation the app succeed to solve the sudoku board.

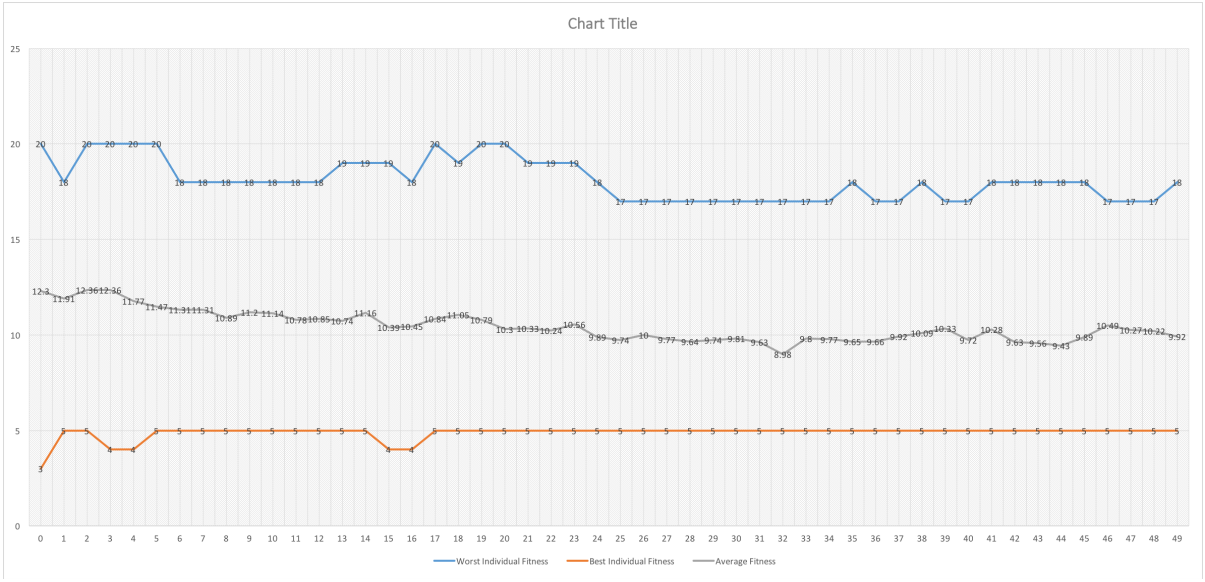


Genetic Sudoku Experiment	
Experiment Time: 23/06/2016 17:17:36	
Experiment Parameters:	
Original Empty Cells:	55
Population Size:	100
Max Generations:	50
Crossover Probability:	0.8
Mutation Probability:	0.2
Percent of good individuals from population:	0.5

Generation	Worst Individual Fitness	Best Individual Fitness	Average Fitness
0	18	2	12.42
1	19	3	11.76
2	17	2	11.12
3	20	4	11.03
4	18	2	11.06
5	17	3	10.99
6	17	5	10.72
7	19	2	10.8
8	18	4	10.27
9	20	2	10.39
10	19	2	10.23
11	20	4	10.12
12	18	2	10.12
13	18	2	9.31
14	20	2	9.43
15	19	2	9.52
16	19	2	9.51
17	21	2	9.04
18	17	2	8.59
19	18	2	8.57
20	19	2	8.67
21	19	2	8.54
22	17	2	7.71
23	17	2	7.77
24	18	2	7.25
25	17	2	7.7
26	20	2	7.16
27	21	2	7.65
28	18	0	7.02

Report 2:

In the second experiment we tried to solve the sudoku without mutation, in other words with mutation probability 0. And we can see that the fitness average is getting better, but the app failed to solve the sudoku board. And this may happen because the individuals become similar after a few generations, they become better individual but NOT good enough to solve the sudoku board. And there NO mutation to make a change that lead to solve the sudoku board.



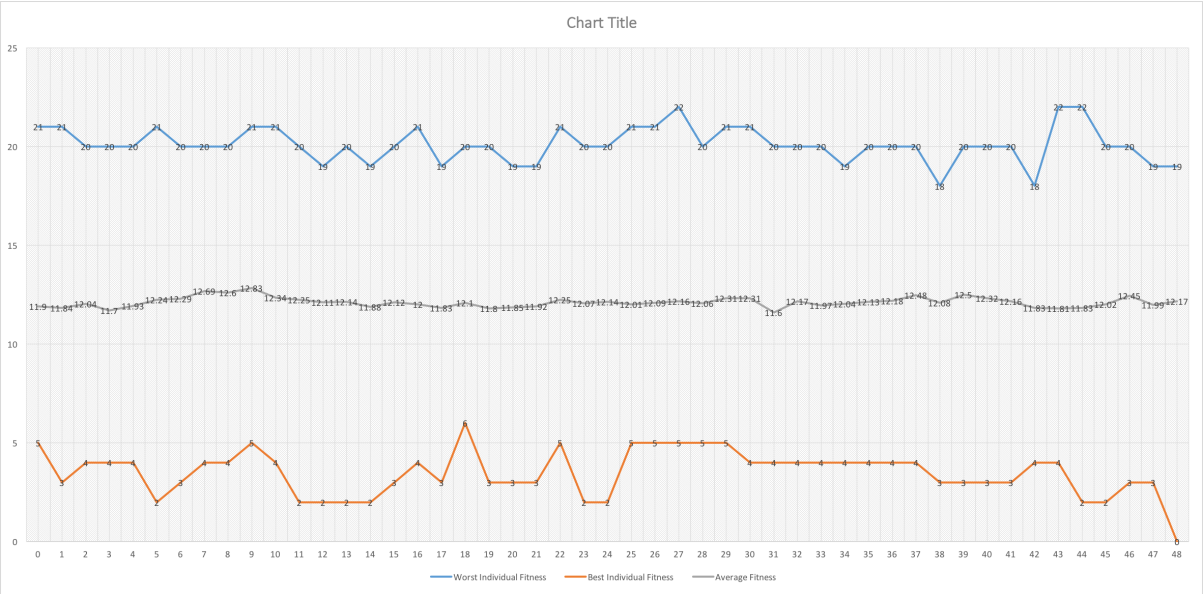
Genetic Sudoku Experiment	
Experiment Time: 23/06/2016 17:30:46	
Experiment Parameters:	
Original Empty Cells:	55
Population Size:	100
Max Generations:	50
Crossover Probability:	0.8
Mutation Probability:	0
Percent of good individuals from population:	0.5

Generation	Worst Individual Fitness	Best Individual Fitness	Average Fitness
0	20	3	12.3
1	18	5	11.91
2	20	5	12.36
3	20	4	12.36
4	20	4	11.77
5	20	5	11.47
6	18	5	11.31
7	18	5	11.31
8	18	5	10.89
9	18	5	11.2
10	18	5	11.14
11	18	5	10.78
12	18	5	10.85
13	19	5	10.74
14	19	5	11.16
15	19	4	10.39
16	18	4	10.45
17	20	5	10.84
18	19	5	11.05
19	20	5	10.79
20	20	5	10.3
21	19	5	10.33
22	19	5	10.24
23	19	5	10.56
24	18	5	9.89
25	17	5	9.74
26	17	5	10
27	17	5	9.77
28	17	5	9.64
29	17	5	9.74
30	17	5	9.81
31	17	5	9.63
32	17	5	8.98
33	17	5	9.8
34	17	5	9.77
35	18	5	9.65
36	17	5	9.66

37	17	5	9.92
38	18	5	10.09
39	17	5	10.33
40	17	5	9.72
41	18	5	10.28
42	18	5	9.63
43	18	5	9.56
44	18	5	9.43
45	18	5	9.89
46	17	5	10.49
47	17	5	10.27
48	17	5	10.22
49	18	5	9.92

Report 3:

In the third experiment we tried to solve the sudoku without crossover, in other words with crossover probability 0. And we can see that the fitness average is NOT getting better, you can notice the gaps in the fitness. So, the fitness average is NOT improved in consecutive way, it's more like staying constant. Although the app succeeds to solve the sudoku board after 48 generations, and I think it's just a chance.



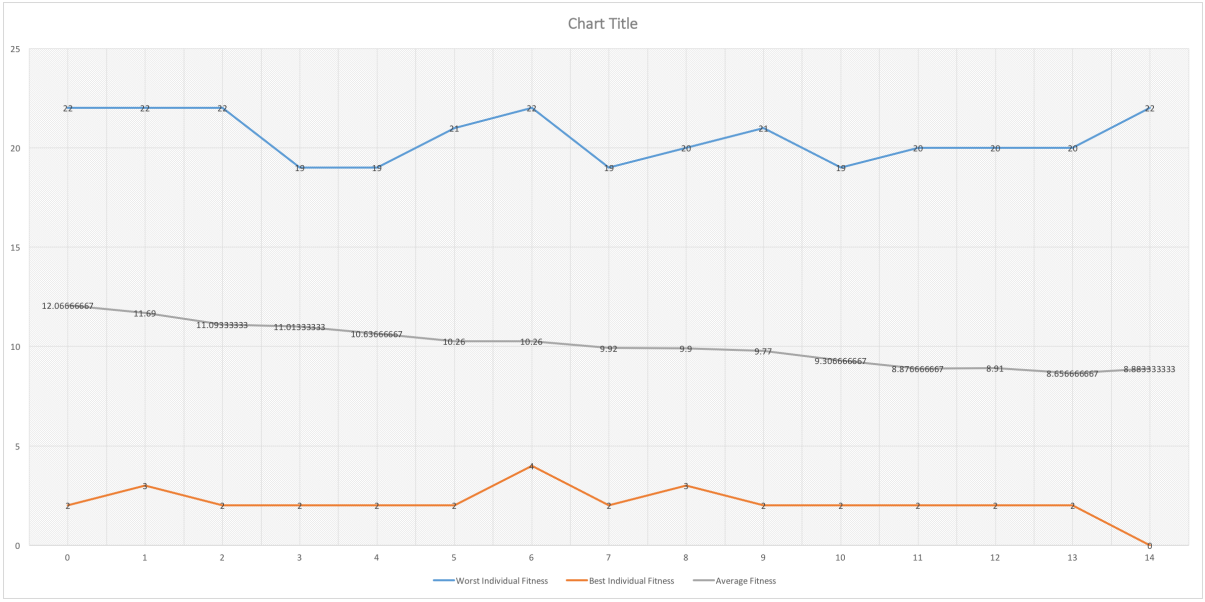
Genetic Sudoku Experiment	
Experiment Time: 23/06/2016 17:37:11	
Experiment Parameters:	
Original Empty Cells:	55
Population Size:	100
Max Generations:	50
Crossover Probability:	0
Mutation Probability:	0.8
Percent of good individuals from population:	0.5

Generation	Worst Individual Fitness	Best Individual Fitness	Average Fitness
0	21	5	11.9
1	21	3	11.84
2	20	4	12.04
3	20	4	11.7
4	20	4	11.93
5	21	2	12.24
6	20	3	12.29
7	20	4	12.69
8	20	4	12.6
9	21	5	12.83
10	21	4	12.34
11	20	2	12.25
12	19	2	12.11
13	20	2	12.14
14	19	2	11.88
15	20	3	12.12
16	21	4	12
17	19	3	11.83
18	20	6	12.1
19	20	3	11.8
20	19	3	11.85
21	19	3	11.92
22	21	5	12.25
23	20	2	12.07
24	20	2	12.14
25	21	5	12.01
26	21	5	12.09
27	22	5	12.16
28	20	5	12.06
29	21	5	12.31
30	21	4	12.31
31	20	4	11.6
32	20	4	12.17
33	20	4	11.97
34	19	4	12.04
35	20	4	12.13
36	20	4	12.18

37	20	4	12.48
38	18	3	12.08
39	20	3	12.5
40	20	3	12.32
41	20	3	12.16
42	18	4	11.83
43	22	4	11.81
44	22	2	11.83
45	20	2	12.02
46	20	3	12.45
47	19	3	11.99
48	19	0	12.17

Report 4:

The fourth experiment is similar to the first one but with population size 300 instead of 100. And we can see that the fitness average is improved, and the app succeeds to solve the sudoku board after 14 generations instead of 28.

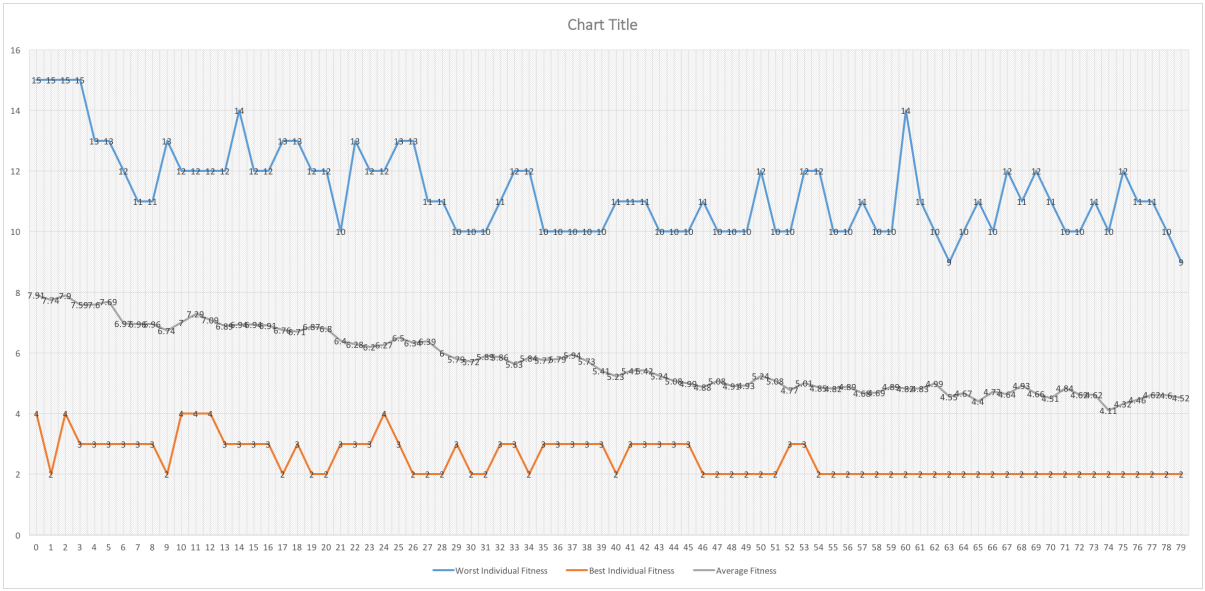


Genetic Sudoku Experiment	
Experiment Time: 23/06/2016 17:51:31	
Experiment Parameters:	
Original Empty Cells:	55
Population Size:	300
Max Generations:	50
Crossover Probability:	0.8
Mutation Probability:	0.2
Percent of good individuals from population:	0.5

Generation	Worst Individual Fitness	Best Individual Fitness	Average Fitness
0	22	2	12.06666667
1	22	3	11.69
2	22	2	11.09333333
3	19	2	11.01333333
4	19	2	10.63666667
5	21	2	10.26
6	22	4	10.26
7	19	2	9.92
8	20	3	9.9
9	21	2	9.77
10	19	2	9.306666667
11	20	2	8.876666667
12	20	2	8.91
13	20	2	8.656666667
14	22	0	8.883333333

Report 5:

The Fifth experiment we tried to run the app with just on primitive option in the tree that's individuals include, and that primitive is: plus. The app fails to solve the sudoku board even after 80 generation. The interesting point that the fitness average is improved as well as the fitness of the individual.



Genetic Sudoku Experiment	
Experiment Time: 23/06/2016 17:57:51	
Experiment Parameters:	
Original Empty Cells:	55
Population Size:	100
Max Generations:	80
Crossover Probability:	0.8
Mutation Probability:	0.2
Percent of good individuals from population:	0.5

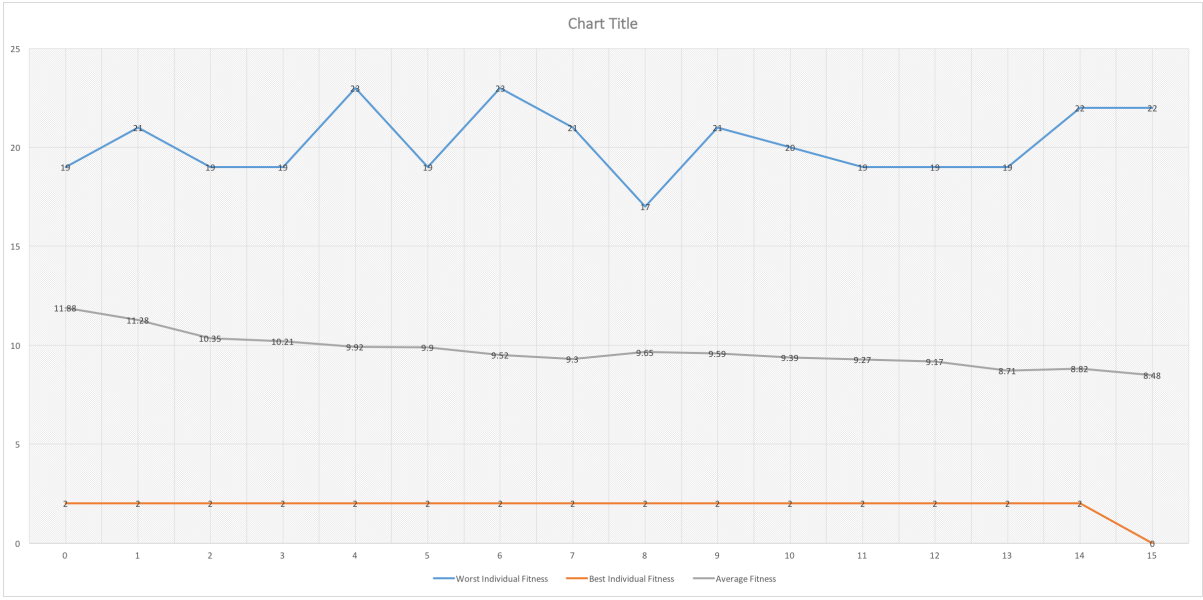
Generation	Worst Individual Fitness	Best Individual Fitness	Average Fitness
0	15	4	7.91
1	15	2	7.74

2	15	4	7.9
3	15	3	7.59
4	13	3	7.6
5	13	3	7.69
6	12	3	6.97
7	11	3	6.96
8	11	3	6.96
9	13	2	6.74
10	12	4	7
11	12	4	7.29
12	12	4	7.09
13	12	3	6.89
14	14	3	6.94
15	12	3	6.94
16	12	3	6.91
17	13	2	6.76
18	13	3	6.71
19	12	2	6.87
20	12	2	6.8
21	10	3	6.4
22	13	3	6.28
23	12	3	6.2
24	12	4	6.27
25	13	3	6.5
26	13	2	6.34
27	11	2	6.39
28	11	2	6
29	10	3	5.79
30	10	2	5.72
31	10	2	5.89
32	11	3	5.86
33	12	3	5.63
34	12	2	5.84
35	10	3	5.77
36	10	3	5.79
37	10	3	5.94
38	10	3	5.73
39	10	3	5.41
40	11	2	5.23

41	11	3	5.41
42	11	3	5.42
43	10	3	5.24
44	10	3	5.08
45	10	3	4.99
46	11	2	4.88
47	10	2	5.08
48	10	2	4.91
49	10	2	4.93
50	12	2	5.24
51	10	2	5.08
52	10	3	4.77
53	12	3	5.01
54	12	2	4.85
55	10	2	4.82
56	10	2	4.89
57	11	2	4.68
58	10	2	4.69
59	10	2	4.89
60	14	2	4.82
61	11	2	4.83
62	10	2	4.99
63	9	2	4.55
64	10	2	4.67
65	11	2	4.4
66	10	2	4.72
67	12	2	4.64
68	11	2	4.93
69	12	2	4.66
70	11	2	4.51
71	10	2	4.84
72	10	2	4.62
73	11	2	4.62
74	10	2	4.11
75	12	2	4.32
76	11	2	4.46
77	11	2	4.62
78	10	2	4.6
79	9	2	4.52

Report 6:

The sixth experiment we run the app with less Terminals, with the good well-defined Terminals, we select the best Terminals.
We can see that the fitness average is improved, and the app succeed to solve the sudoku board after 15 generation instead of 28 in the first experiment.



Genetic Sudoku Experiment	
Experiment Time: 23/06/2016 18:05:31	
Experiment Parameters:	
Original Empty Cells:	55
Population Size:	100
Max Generations:	80
Crossover Probability:	0.8
Mutation Probability:	0.2
Percent of good individuals from population:	0.5

Generation	Worst Individual Fitness	Best Individual Fitness	Average Fitness
0	19	2	11.88
1	21	2	11.28
2	19	2	10.35
3	19	2	10.21
4	23	2	9.92
5	19	2	9.9
6	23	2	9.52
7	21	2	9.3
8	17	2	9.65
9	21	2	9.59
10	20	2	9.39
11	19	2	9.27
12	19	2	9.17
13	19	2	8.71
14	22	2	8.82
15	22	0	8.48