

AI DIARY

Sudoku 9×9

(Aim for 5-10 secs)

1

- Finished Crude implementation
 - With everything mainly based on random, the program always got stuck on local optimum (100%... can't find even one valid solution)
 - Testing with 20 mins
 - Fitness check for duplicated row, col, table and illegal move with each +10fitness the program got stuck around fitness=200 in 5 minutes fitness=180 @ 14 mins
 - I think the time taken to get better fitness will increase exponentially. (Inversely proportional)
 - fitness = 160 @ 25 mins, 120 @ 35 mins, 100 @ 58 mins
Ran the program for 75 mins and still got stuck at 100
 - Each iteration Remain: Crossover : Mutate : Random = 50 : 30 : 10 : 10

#2

3

- Change Ratio to 50:20:20:10

- Time

4

- 30:20:30:20

- random for crossover order
(make $i, i+1$ swap place b4 Xover)

Time	Fitness
3 secs	460
5 secs	440
5 mins	440 (Struck)

#5

- Test by 9×9 25 Undefined \rightarrow 1 sec solved.
 - Test by 35 \cup $_$ 5 secs \rightarrow 220 (struck)
 - 30 \vee $_$ 5 secs \rightarrow 140 (struck)

- After changed CrossOver/Mutation to do only first k-th individual/pair we got struck everytime because we keep using those same pool of population which got stuck on local optimum

→ Newly randomly created indiv can't really affect the pool because it generated from prototype which still has high fitness
→ Those all new rnd tend to get eliminated as soon as they are generated!

#6

- change crossover & mutate back to randomly select

Time (Small Case)

3 secs
5 secs
2 mins

Fitness * Not Struck anymore after choose randomly

80
40
0

Time (Original Case)

5 secs
10 secs

400
260

1 min
5 mins

160
160 (struck)

#7

- changed ratio to 30:20:20:30 (more random fill trying to fix struck)

Time (original)

1 sec
10 secs
20 secs
45 secs
1 min
1:45 min
1:55 min
3 min

Fitness

340
320
260
200
200
140
120
120 (struck?)

#8

- 10x Population (1000 Individuals now)

Time

5 secs	400
20 secs	320
1 min	320 (struck)

#9

- Changed population back to 100 → 1000 for this test

- When get struck > LOCAL_STRUCK_TIMES ⇒ Re all population

Time (Best Ans) Fitness

1 sec	2200
5 secs	360
20 secs	300 (re)
1 min	280 (re)
1:50 min	160
5 mins	160

(Low prob to all rnd and get better result)

#10

- Reinitialize with 10 from old generation if struck

Time

5 secs	360
20 secs	320 (re)
1 min	300

#11

- Reinitialize with 5 from old gen.

Time

5 secs	340
20 secs	300
1 min	240
1:47 mins	220
3 mins	160
5 mins	160
10 mins	160
30 mins	160
...	(still 140 after 3 hrs) 140

#12

- Observe that Sudoku's Solution will always be in the form of $\{ \text{Permutation of } 1, 2, \dots, 9 \}, \text{perm}_1, \dots, \text{perm}_m, \dots, \}$
- Change Duplicate_Table_cost from 100 to 1000
- GA tends to converge slower

Time	Fitness
5 secs	660
20 secs	580
30 secs	(Re) 400
1:05 min	(long struck) 400
1:30 min	260
1:50 min	(re) 240
2:30 mins	220
3 mins	(struck) 220
3:23 mins	220
5 mins	(struck) 200
6:14 mins	160
6:20 mins	140
7:30 mins	100
13 mins	(struck) 100
17:30 mins	(Has many valid but wrong filling) 100
20 mins	100

#13

- change ratio to 30:20:30:20
Rec: X:Mut:Rnd

Time	Fitness
1 sec	560
10 secs	420
30 secs	(re) 360
45 secs	240
1 min	(re) 220
1:19 min	180
7:45 min	(re) 180
2 mins	160
2:15 mins	140
2:30 mins	100
3 mins	100
4 mins	100
5 mins	(struck) 100

- Test with partial prob → Found Sol!, 2:05, 2:22 mins, 1:15 min

* Bug sometimes without completely finished filling
→ Got Wrong Answer

#14

- Added check Unset with 100 Fitness for each 0 in Gene
- 1 Remaining from old Gen after Re

→ Found Solution^(partial #2) (Correct One)

1:10, 3:28, →^s(Struck), 3:08
- Struck (> 7 mins)

#15

- Increase LOCAL_STRUCK_TIMES (1000 to 100000)

* Observation

7 8 1 3 2 6 9 4 5
(should swap 1 to 5)
7 8 1 3 5 6 9 4 2

the action that change 2,5 in this case is random newval for them but we will end up get duplicated 2,5 which tends to get eliminated

* Found Sol^(partial #2) somewhere < 15 mins, < 9 mins, 2 mins, > (135 mins)

#15

- Completely new Pop after Re
- can't find a Sol.
- * Pop re when approach the correct solution

#17

- changed UNSET_COST 100 → 1

- changed DUPLICATED_TABLE 1000 → 100

→ Individuals tend to change fitness more frequently

⇒ Struck at 2 × Unfilled

#ORIGINAL

5	9	6	4	5	7	6
3	8			9	4	
5	4	8	5	9	4	
1	4			3	1	
6	7			2		
6				3		

#Partial 2 (35 missing)

7	8	0	3	0	6	9	4	0
2	0	6	9	7	0	1	3	8
4	0	3	0	1	0	0	7	0
0	6	0	1	0	5	0	9	0
9	0	5	0	0	8	0	2	0
0	4	2	7	0	9	0	0	5
1	3	4	5	0	0	2	6	0
6	0	0	0	9	3	0	5	1
0	2	0	6	0	1	7	0	3