3.4. SGA Example : $f(x) = x^2$

Q : max $f(x) = x^2$

$x \in N$ & $x \in [0, 31]$

Step ① Encoding

$2^5 = 32$, So 0 - 31 → encoding in 5 bits

② Initial population

PE
- ③ de coding
  binary → Integer → $f(x)$
- ④ Computing fitness proportion
  roulette wheel %
- ⑤ cross over
  cross site.
- ⑥ mutation

Solution ① Table show below

1 String No.	2 Initial Popn	3 x	4 f(x)	5 % of Total	6 No Sel	7 Mating Pool	8 Mate	9 Cover Site	10 New Popn.	11 x	12 f(x)
1	01101						2	4			
2	11000						1	4			
3	01000						4	2			
4	10011						3	2			
Sum											
Average											

② computation

1 String No.	2 Initial Popn	3 x	4 f(x)	5 % of Total	6 No Sel	7 Mating Pool	8 Mate	9 Cover Site	10 New Popn.	11 x	12 f(x)
1	01101	13	169	14.4	1	01101	2	4			
2	11000	24	576	49.2	2	11000	1	4			
3	01000	8	64	5.5	0	11000	4	2			
4	10011	19	361	30.9	1	10011	3	2			
Sum			1170								
Average											

③ $2^4\ 2^3\ 2^2\ 2^1\ 2^0$ $\quad 8+4+1=13$

16 8 4 2 1 $\quad$ 16 + 8 = 24

16 + 2 + 1 = 19

④ Step 6 & 7 ROULETTE WHEEL

we must iterate 4 times due to we have 4 strings.

Every iteration, the highese number will minus 25, which is established by usage.

From step 5, we get

14.4	0
49.2	0
5.5	0
30.9	0

iteration 1

49.2 − 25 = 24.2

14.4	0
24.2	1
5.5	0
30.9	0

iteration 2

30.9 − 25 = 5.9

14.4	0
24.2	1
5.5	0
5.9	1

iteration 3

24.2 − 25 < 0

14.4	0
\	2
5.5	0
5.9	1

iteration 4 →

14.4 − 25 < 0	5.5	0
	5.9	1

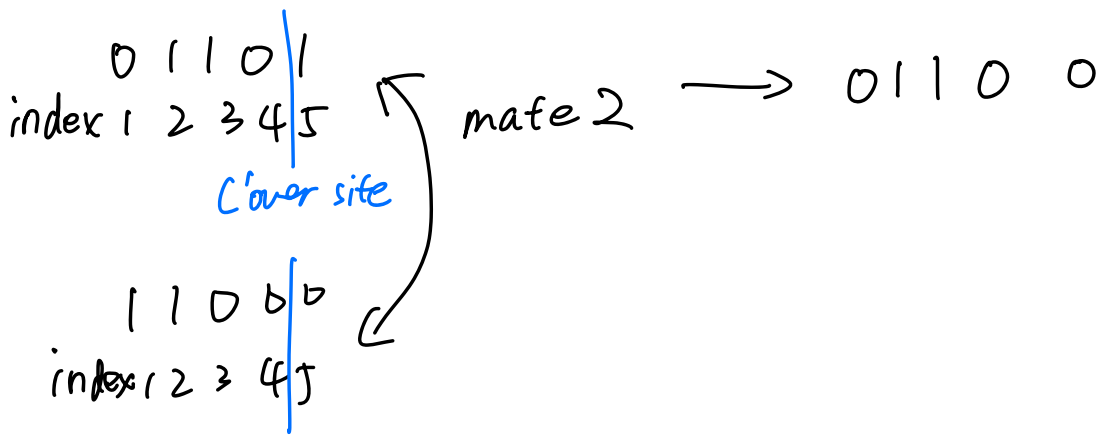
So column 6 is 1 2 0 1

So column 7 will show col. 6 times from initiation population

(I)

1 String No.	2 Initial Popn	3 x	4 f(x)	5 % of Total	6 No sel	7 Mating Pool	8 Mate	9 Cross site	10 New Popn.	11 x	12 f(x)
1	01101	13	169	14.4	1	01101	2	4	01100	12	144
2	11000	24	576	49.2	2	11000	1	4	11001	25	625
3	01000	8	64	5.5	0	11000	4	2	11011	27	729
4	10011	19	361	30.9	1	10011	3	2	10000	16	256
Sum			1170	100	4						1754
Average			293								439

16 8 4 2 1


0 1 1 0 1
index 1 2 3 4 5
Cover site
1 1 0 0 0
index 1 2 3 4 5
mate 2
0 1 1 0 0