

Example 2

Using genetic algorithm maximize $f(x) = x^2$
over $\{0, 1, 2, \dots, 15\}$ with initial x value
of $\{1, 6, 8, 10\}$

	x -value	Initial	$f(x) = x^2$	$\%P_i = f_i / \sum f_i * 100$
S_1	1	0001	1	0.49
S_2	6	0110	36	17.91
S_3	8	1000	64	31.84
S_4	10	1010	100	49.75
Σ			201	

Reproduction

- Roulette wheel selection is used for generating four chromosomes for the next generation
- Suppose after performing selection, we get the following population

$$S'_1 = 1000 (S_3)$$

$$S'_2 = 1010 (S_4)$$

$$S'_3 = 0110 (S_2)$$

$$S'_4 = 1010 (S_4)$$

Crossover

- Suppose that we decide to perform crossover for couples (s_2', s_3')

⇒ Before crossover

$$s_2' = 1 \mid 0 \mid 1 \mid 0$$

$$s_3' = 0 \mid 1 \mid 1 \mid 0$$

⇒ After crossover

$$s_2'' = 1 \mid 1 \mid 1 \mid 0$$

$$s_3'' = 0 \mid 0 \mid 1 \mid 0$$

Mutation

Before applying mutation

$$s_1'' = 1 \underline{0} 0 0$$

$$s_2'' = 1 1 1 0$$

$$s_3'' = 0 \underline{0} 1 0$$

$$s_4'' = 1 0 1 0$$

After applying mutation

$$s_1''' = 1 1 0 0$$

$$s_2''' = 1 1 1 0$$

$$s_3''' = 0 1 1 0$$

$$s_4''' = 1 0 1 0$$

Mutation
x-value

$$f(x) = x^2$$

$$\%PI = f_i / \sum f_i \times 100$$

12

144

30.25

14

196

41.18

6

36

7.56

10

100

21

476