

Contemporary Intelligent Information Technology (CIIT)

11/5/2018

Sorting

Chromosome size – **24 bit**

Population size – **30**

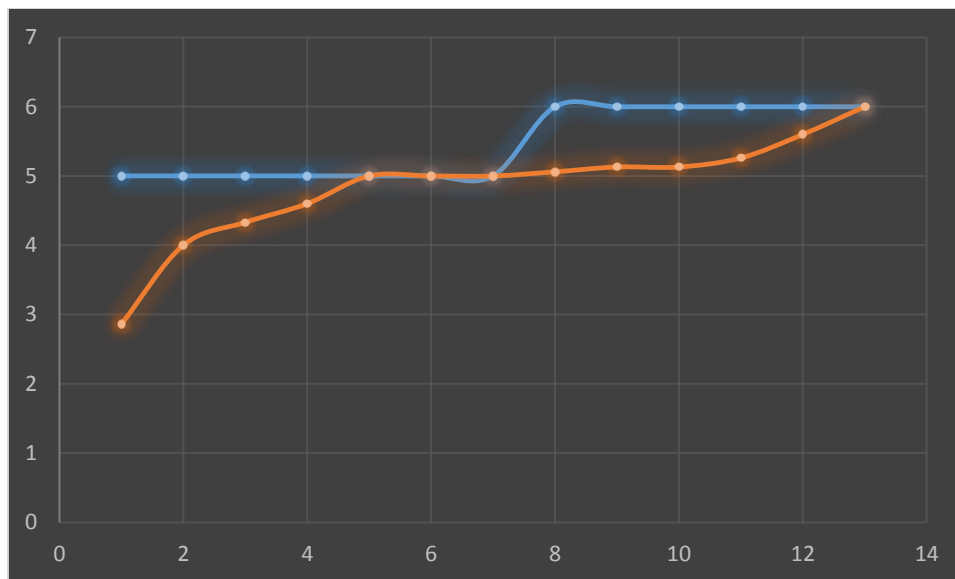
Truncate selection (**15 better**)

The first scenario:

Initial value = **CDBA** (fitness is 1)

Fitness function

(Blue – the best chromosome's fitness, orange – the average fitness)



The 1st generation

Chromosomes in binary mode

'101110110101100010101101', '010011111101010111000111', '000110101100101111111011',
 '001011000011000000111111', '001011011100011100010100', '010111000101010100000011',
 '010011010100110100110100', '001010011010001011111101', '000110010101111100010100',
 '100110100111010100001111', '110111000101111100001001', '111011000011010001010011',
 '000011110000010100010001', '111110100010010110100010', '101101000110011101101111'

Chromosomes as letters

['b', 'a', 'c', 'd'], ['c', 'a', 'b', 'd'], ['a', 'd', 'b', 'c'], ['a', 'd', 'b', 'c'], ['a', 'd', 'b', 'c'], ['a', 'd', 'b', 'c'], ['c', 'a',
 'b', 'd'], ['c', 'a', 'd', 'b'], ['b', 'c', 'd', 'a'], ['c', 'b', 'd', 'a'], ['d', 'b', 'a', 'c'], ['d', 'b', 'a', 'c'], ['c', 'd', 'b', 'a'],
 ['c', 'd', 'b', 'a'], ['d', 'c', 'b', 'a']

The best chromosome - 'b', 'a', 'c', 'd' - its fitness 5

Average fitness 2.8666666666666667

The middle generation

Chromosomes in binary mode

'101110110101100010101101', '001011000010001011111101', '010011000101010100000011',
'000110010101010111000111', '001011000010001011111101', '010011000101010100000011',
'101110010101010111000111', '001011000010001011111101', '000110101100110100000011',
'001011110101100010101101', '010011000101010100000011', '010011000101010100000011',
'001011000010001011111101', '000110101100101011111101', '010011000101010100000011'

Chromosomes as letters

['b', 'a', 'c', 'd'], ['a', 'c', 'b', 'd'], ['a', 'c', 'b', 'd'], ['a', 'b', 'd', 'c'], ['a', 'c', 'b', 'd'], ['a', 'c', 'b', 'd'], ['a', 'b',
'd', 'c'], ['a', 'c', 'b', 'd'], ['a', 'c', 'b', 'd'], ['b', 'a', 'c', 'd'], ['a', 'c', 'b', 'd'], ['a', 'c', 'b', 'd'], ['a', 'c', 'b', 'd'],
['a', 'c', 'b', 'd'], ['a', 'c', 'b', 'd']

The best chromosome - 'b', 'a', 'c', 'd' - its fitness 5

Average fitness - 5.0

The last generation

Chromosomes in binary mode

'101110001100101011111101', '001110001100101011111101', '101110001100110100000011',
'101110001100101011111101', '011110001100101011111101', '000110001100101011111101',
'001110001100101011111101', '001010001100101011111101', '101110001100101011111101',
'000110001100101011111101', '001110001100101011111101', '101110001100101011111101',
'101110001100101011111101', '001010001100101011111101', '101110001100101011111101'

Chromosomes as letters

['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b',
'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'],
['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd']

The best chromosome - 'a', 'b', 'c', 'd' – its fitness 6

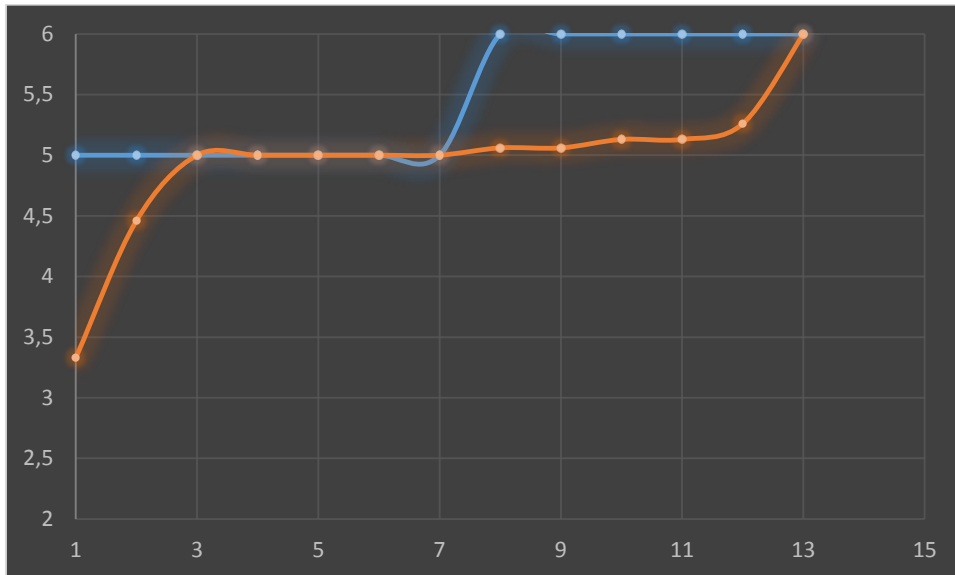
Average fitness 6.0

The second scenario:

Initial value = CDBA (fitness is 1)

Fitness function

(Blue – the best chromosome's fitness, orange – the average fitness)



The 1st generation

Chromosomes in binary mode (by papa/mama single mode crossover)

'000010000001010111010011', '100100001001010101001100', '011101101101000111111000',
'101011110011110100011000', '110110010110110000001000', '101000011100011100001011',
'111100101100000000100010', '110101010000001011101110', '000000101010110110110110',
'110100110111110110000011', '101000010010100010100010', '010001001000001001010000',
'110110000011000101011100', '010110000011111101000110', '101101000001111001101110'

Chromosomes as letters

['b', 'a', 'c', 'd'], ['a', 'c', 'b', 'd'], ['b', 'a', 'c', 'd'], ['b', 'a', 'c', 'd'], ['a', 'b', 'd', 'c'], ['a', 'd', 'b', 'c'], ['a', 'd',
'b', 'c'], ['c', 'a', 'b', 'd'], ['c', 'a', 'b', 'd'], ['b', 'd', 'c', 'a'], ['b', 'd', 'c', 'a'], ['b', 'd', 'c', 'a'], ['d', 'a', 'c', 'b'],
['d', 'b', 'c', 'a'], ['d', 'c', 'b', 'a']

The best chromosome - ['b', 'a', 'c', 'd'] - its fitness 5

Average fitness 3.3333333333333335

The middle generation

Chromosomes in binary mode

Papa '0000 11010001010101010011'

Mama '0010 10000001010111010011'

Child 000010000001010111010011

'000010000001010111010011', '100100001001010101001100', '011101101101000111111000',
'101011110011110100011000', '110110010110110000001000', '011101101101000111111000',
'101101101101000111111000', '110110010110110000001000', '110110010110110000001000',
'111100101101000111111000', '000011110011110100011000', '110110010110110000001000',
'101101101101000111111000', '101101101101000111111000', '011101101101000111111000'

Chromosomes as letters

['b', 'a', 'c', 'd'], ['a', 'c', 'b', 'd'], ['b', 'a', 'c', 'd'], ['b', 'a', 'c', 'd'], ['a', 'b', 'd', 'c'], ['b', 'a', 'c', 'd'], ['b', 'a',
'c', 'd'], ['a', 'b', 'd', 'c'], ['a', 'b', 'd', 'c'], ['b', 'a', 'c', 'd'], ['b', 'a', 'c', 'd'], ['a', 'b', 'd', 'c'], ['b', 'a', 'c', 'd'],
['b', 'a', 'c', 'd'], ['b', 'a', 'c', 'd']

The best chromosome - ['b', 'a', 'c', 'd'] - its fitness 5

Average fitness 5.0

The last generation

The algorithm

For example:

Papa	Mama
0000 10100101 1010 11101101	00011 1011010 10011 1111000
Child - '000011101101	000111111000'

Chromosomes in binary mode

'000011101101000111111000', '000011101101000111111000', '110110010111000111111000',
'110110010110000111111000', '000011101101000111111000', '101011101101000111111000',
'000011101101000111111000', '110110010110000111111000', '110110010111000111111000',
'000011101101000111111000', '101011101101000111111000', '000011101101000111111000',
'110110010111000111111000', '000011101101000111111000', '000011101101000111111000'

Chromosomes as letters

['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b',
'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd'],
['a', 'b', 'c', 'd'], ['a', 'b', 'c', 'd']

The best chromosome - ['a', 'b', 'c', 'd'] - its fitness 6

Average fitness 6.0