Indian Institute of Technology, Guwahati

SOFT COMPUTING ME 674

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Spec. M.Tech (Machine Design)

Coding Assignment 2
Binary GA

Problem statement:

To minimize the following function using Genetic Algorithm.

$$f(x_1, x_2) = x_1 + x_2 - 2x_1^2 - x_2^2 + x_1 x_2$$

Given:

$$0.0 \le x_1 \le 0.5$$

$$0.0 \le x_2 \le 0.5$$

Approach:

Version of Genetic Algorithm : Binary-coded GA

Reproduction scheme : Roulette-wheel selection

Type of crossover : Single point crossover

Mutation : Bit-wise

User inputs:

1) Population size
2) Crossover probability
3) Mutation probability

Input parameters:

1) Fitness function : $\frac{1}{1 + (f(x))^2}$

2) Population size 10
3) Crossover probability : 1
4) Mutation probability : 0.03
5) Number of iterations performed : 500
6) String length for each variable : 5

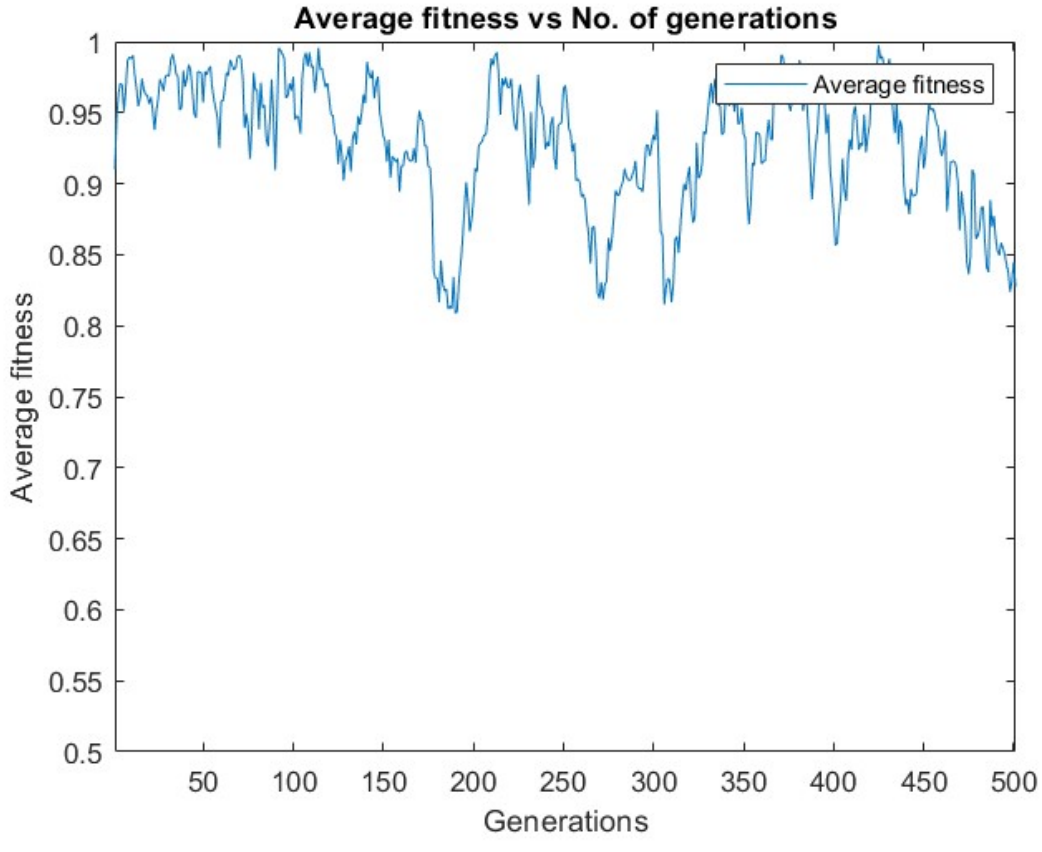
Steps followed:

1) Creating or generating a population of initial solutions at random
2) Calculating decoded values
3) Evaluation of fitness function
4) Reproduction or selection of mating pool using Roulette-wheel selection
5) Two-point crossover
6) Mutation

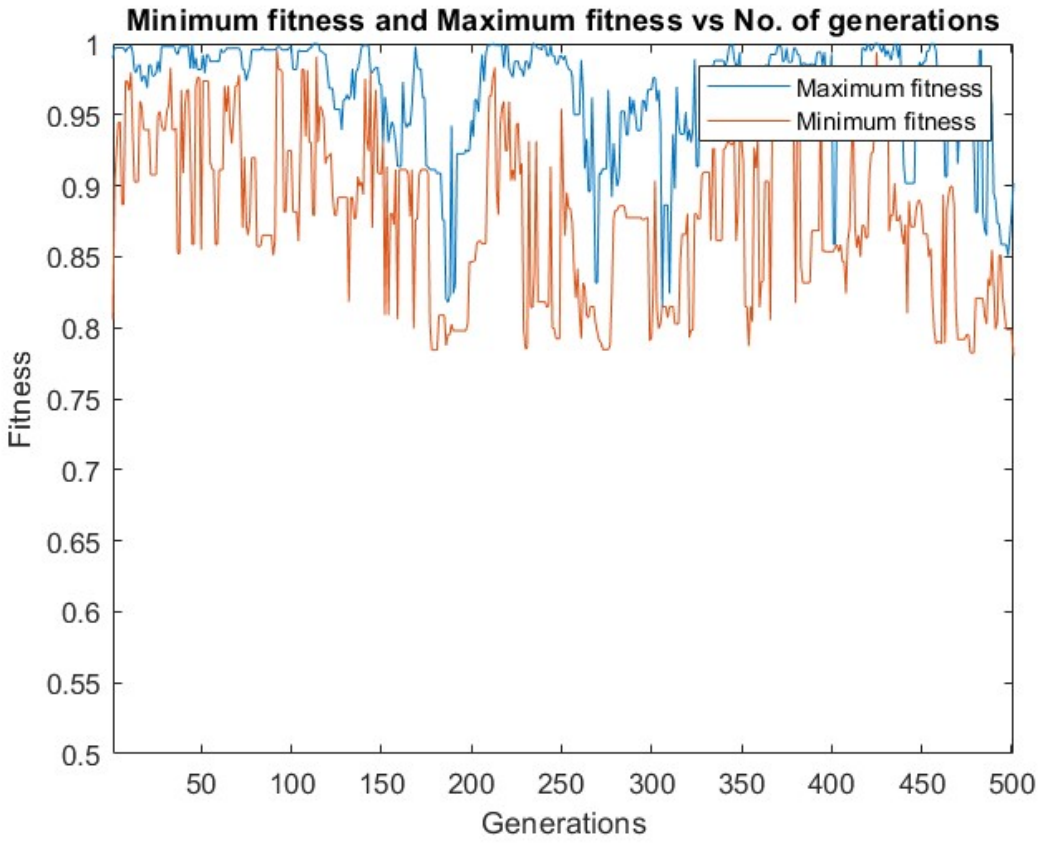
Output:

The following plots were obtained:

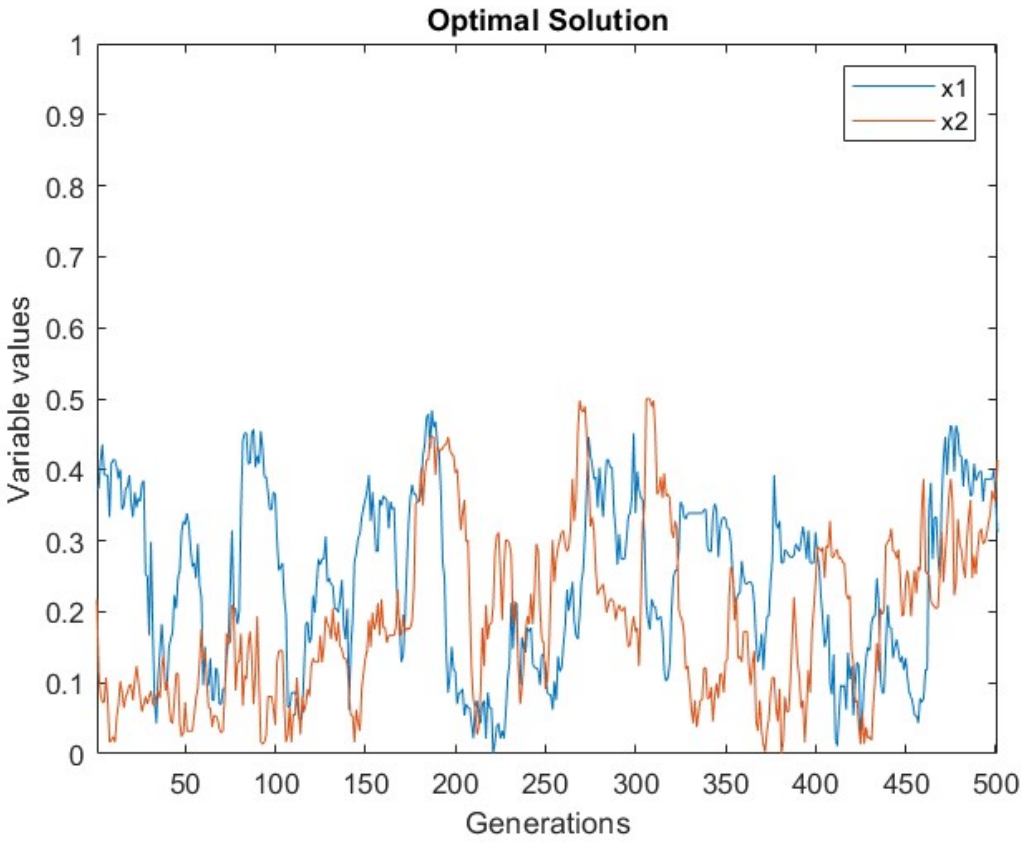
Plot 1:



Plot 2:


Minimum fitness and Maximum fitness vs No. of generations
Maximum fitness
Minimum fitness
Fitness
Generations
1
0.95
0.9
0.85
0.8
0.75
0.7
0.65
0.6
0.55
0.5
50
100
150
200
250
300
350
400
450
500

Plot 3:



Minimum function value = 0.3301

Value of x_1 = 0.1290

Value of x_2 = 0.2742