Problem 1:

Problem 2:

Using PSO algorithm, we can find the minimizer:

$$x_0 = 0.000279321964182$$
$$x_1 = 0.000193196456243$$
$$f(x_0, x_1) = 2.28836604776e - 07$$

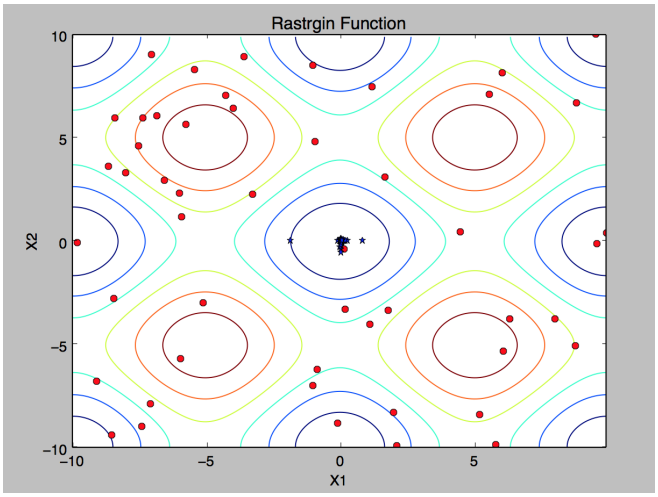

Figure 1: PSO Algorithm: circle points are randomly generated 50 initial points. Stars indicate the positions after 50 iterations.

Problem 3:

Problem 4:

Population size: 50
Number of iterations: 50
For canonical number genetic algorithm, the minimizer is:

$$x_1 = 0.0408935546875$$
$$x_2 = 0.0390625$$
$$f(x_1, x_2) = 0.00634456702034$$

For real number genetic algorithm, the minimizer is :

$$x_1 = 0.018313265874$$
$$x_2 = 0.0286761643909$$
$$f(x_1, x_2) = 0.00229673023909$$

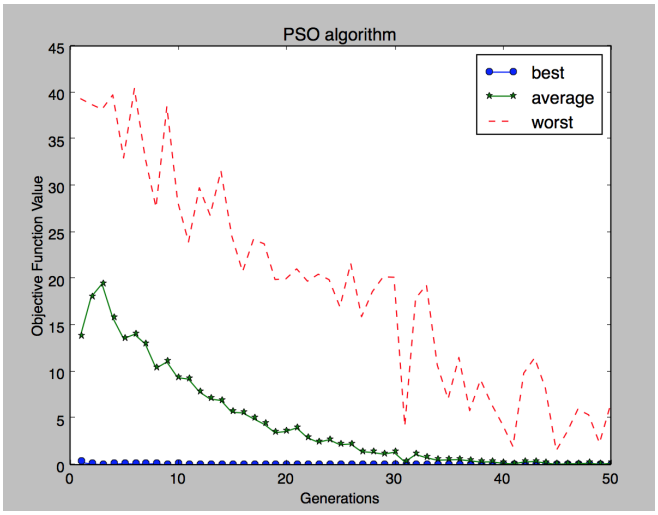

Figure 2: PSO Algorithm: plots of the best, average, and the worst objective function values in the population for 50 generations

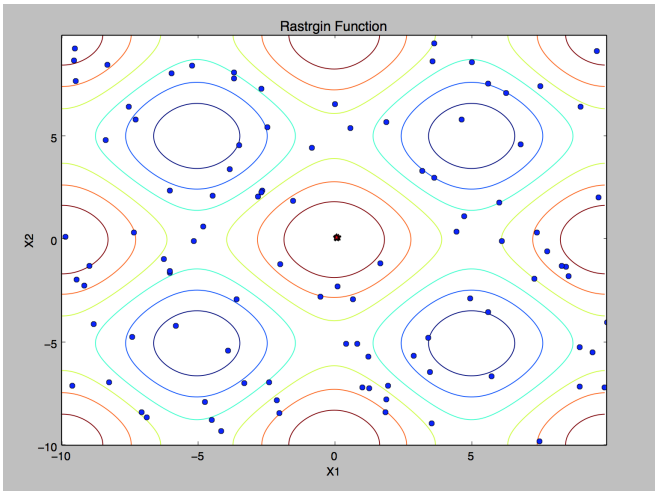

Figure 3: Canonical Genetic Algorithm: circle points are randomly generated 50 initial points. Stars indicate the positions after 50 iterations.

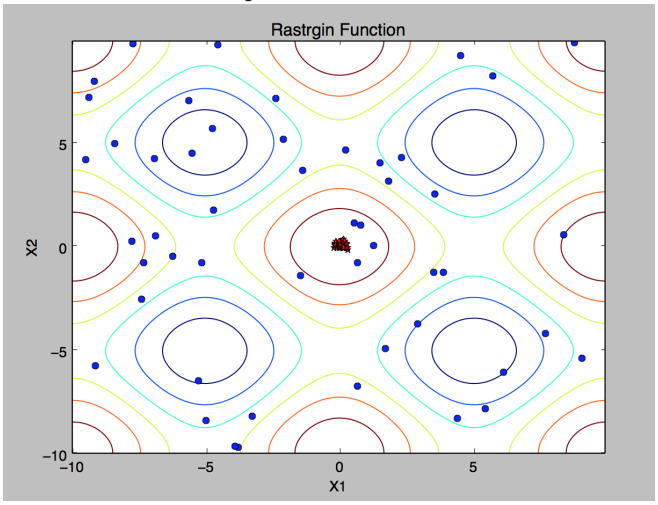

Figure 4: Real Number Genetic Algorithm: circle points are randomly generated 50 initial points. Stars indicate the positions after 50 iterations.

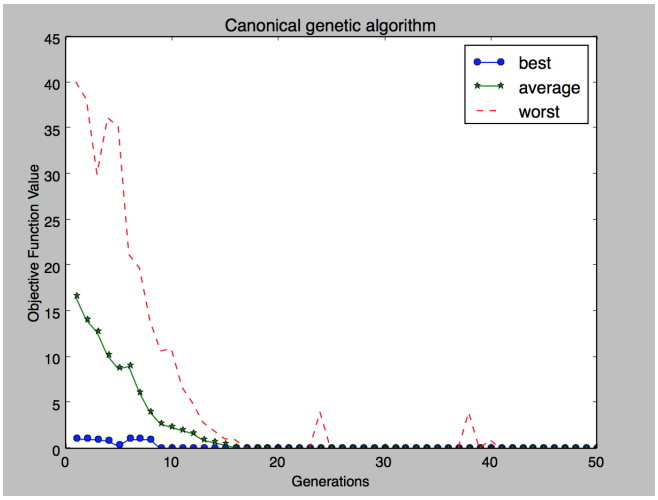

Figure 5: Canonical Genetic Algorithm: plots of the best, average, and the worst objective function values in the population for 50 generations

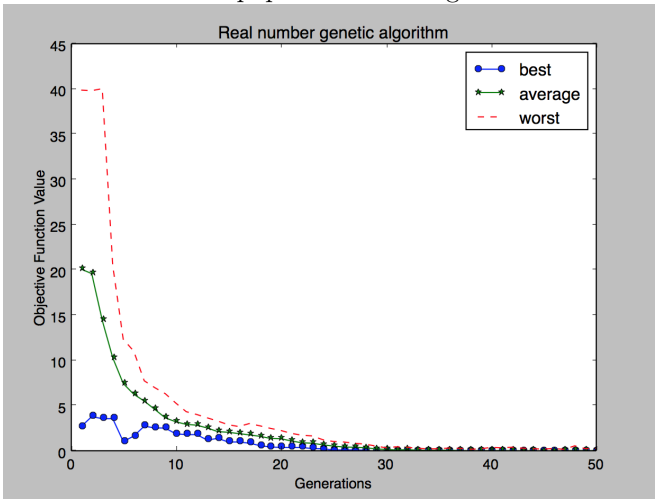

Figure 6: Real Number Genetic Algorithm: plots of the best, average, and the worst objective function values in the population for 50 generations