國立交通大學 最佳化理論與應用 作業四

2019/12/15

Due on 23:59, Dec. 23, 2019

1. **(200 points)**

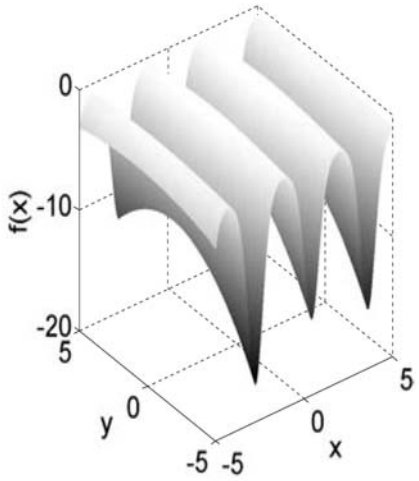
(1.1) **(100 points)** (Exercise 14.12 in the textbook) Write a Matlab®/C/C++/R/python program to implement a real-number genetic algorithm. Test your implementation on the maximum of function $f(\boldsymbol{x}) = x_1\sin(x_1) + x_2\sin(5x_2)$ with the constraint set $\Omega = \{\boldsymbol{x}: 0 \le x_1 \le 10, 4 \le x_2 \le 6\}$. Refer to the plot of Example 14.4 (i.e., Fig. 14.12), Page 299, plot the best, average, and worst objective function values in the population for every iteration (generation) of the real-number genetic algorithm in this problem. Explain your GA codes and discuss the effects of *population size* and *mutation rate* on the optimized solution of the tested function. Compress and send your homework #4 including codes by email to TA and cc teacher. Only results without discussion will get 70 points at most. TA will email all of you a copy of sample Matlab® codes for this homework.

(1.2) **(100 points)** Modify your GA codes to minimize the following functions (a) and (b). Discuss your results with the similar way in the question (1.1).

$$-e^{0.2\sqrt{(x-1)^2+(y-1)^2}+\cos(2x)+\sin(2x)}$$

Minimum: $f(-2.7730,-5) = -16.947$

For $-5 \le x, y \le 5$

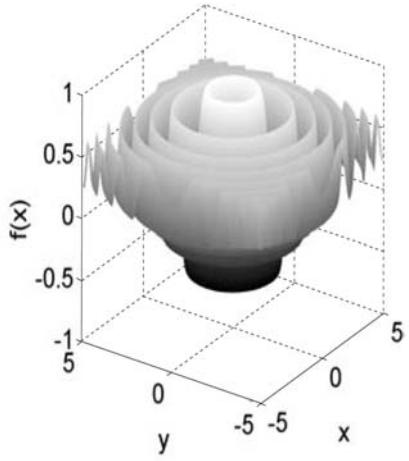


(a)

$$0.5 + \frac{\sin(x^2+y^2)-0.5}{1+0.1(x^2+y^2)}$$

Minimum: $f(1.897,1.006) = -0.5231$

For $-\infty \le x, y \le \infty$



(b)

- **No cheating in the homework 4.**
- **You have to write your own Matlab®/C/C++/R/Python codes to do this homework.**
- **Late report will get 0 points.**