CMSC 173 Initial Population (Chaotic Maps)

OBJECTIVE : To be able to generate initial population using chaotic-maps

OUTPUT : Source code and Short-Write ups with screenshots

TYPE OF PROJECT: Individual or Pair only

PROGRAM SPECIFICATIONS

1. Choose ONE from any of the three functions to use for your assignment. Make sure that you code the function correctly using Python.

$$f(x,y) = 0.5 + \frac{\cos^2\left[\sin\left(|x^2 - y^2|\right)\right] - 0.5}{\left[1 + 0.001\left(x^2 + y^2\right)\right]^2}$$

Optimal objective function value is 0.292579.
The bounds of x and y are below. You may set to whatever large value in place for +infinity while any small negative value for -infinity.

$$x \in [-100.0, +\infty]$$
$$y \in [-\infty, 100]$$

$$f(x,y) = -(y+47)\sin\sqrt{\left|\frac{x}{2} + (y+47)\right|} - x\sin\sqrt{|x-(y+47)|}$$

Optimal objective function value is -959.6407.
The bounds of x and y are below. You may set to whatever large value in place for +infinity while any small negative value for -infinity.

$$x \in [-512.0, +\infty]$$
$$y \in [-\infty, 512]$$

$$f(x,y) = \sin^2 3\pi x + (x-1)^2\left(1 + \sin^2 3\pi y\right) + (y-1)^2\left(1 + \sin^2 2\pi y\right)$$

Optimal objective function value is 0.0.
The bounds of x and y are below. You may set to whatever large value in place for +infinity while any small negative value for -infinity.

$$x \in [-10.0, +\infty]$$
$$y \in [-\infty, 10]$$

2. Review the lecture videos on Chaotic Maps from our LMS. You may retype the source code in the lecture videos to replicate the experiments required in this assignment.
3. Using only TWO of the chaotic maps as presented in class (sinusoidal, gauss, tent or logistic) and your chosen function from above, do the ff experiments:
    a) Generate, for each chaotic map, an initial population with 500 solutions. Provide screenshots (top view and side view) for each chaotic map generated. For this item, you should have 4 screenshots total (2 for each chaotic map)
    b) Generate, for each chaotic map, an initial population with 2000 solutions. Provide screenshots same as instructions in letter a.
    c) Provide visual analysis/write-up comparing each chaotic map for 500 solutions and for 2000 solutions. You may have one paragraph for this write up. Aside from the (1) spread of the generated solutions, also allocated discussion on (2) how those solutions are closer/farther from the optimal solution/obj function value. The optimal obj function value is already given to you in item #1 for your chosen function.
    d) All the screenshots and write ups in this section must be submitted in a pdf file and uploaded in our LMS assignment bin.
    e) Please make sure to label the sections in your pdf file on what chaotic maps you used before putting in the screenshots for easiness of marking your assignment.
    f) Filename of pdf must be <familyname>_initpop.pdf (e.g. gamot_initpop.pdf)
    g) Submit the source code using the filename <familyname>_initpop.py (e.g. gamot_initpop.py). You may have one source code for both the chaotic maps, just make a function for each chaotic map.