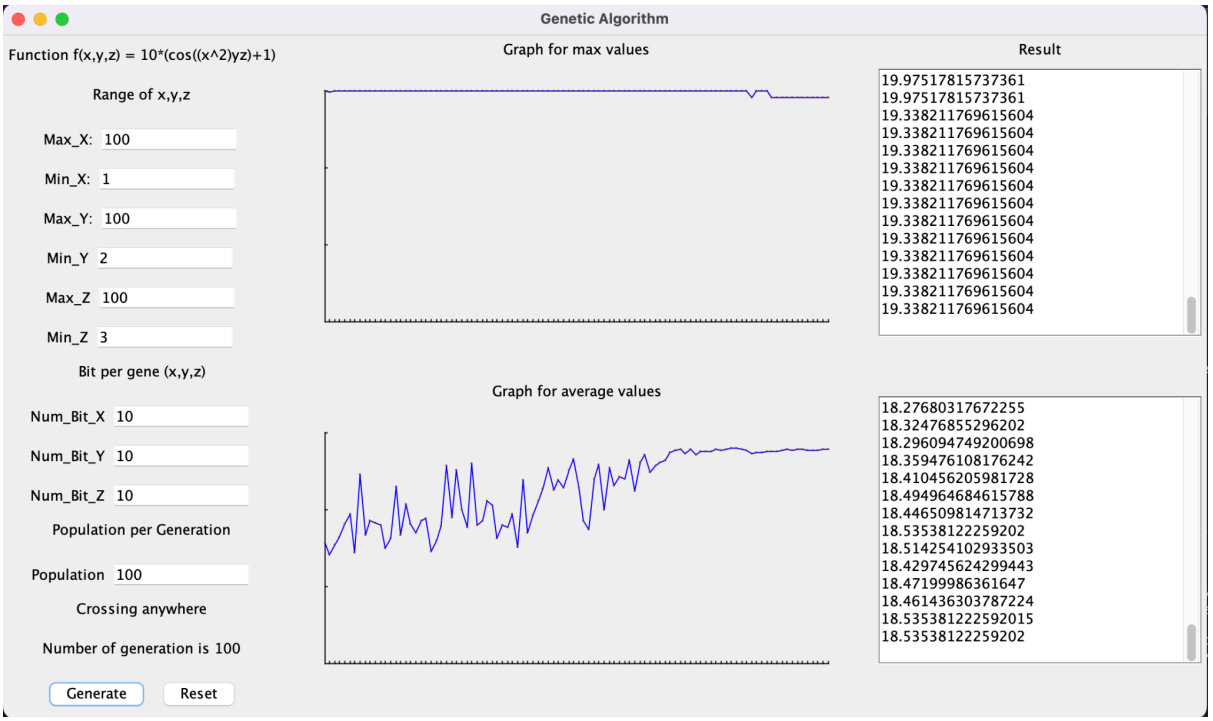
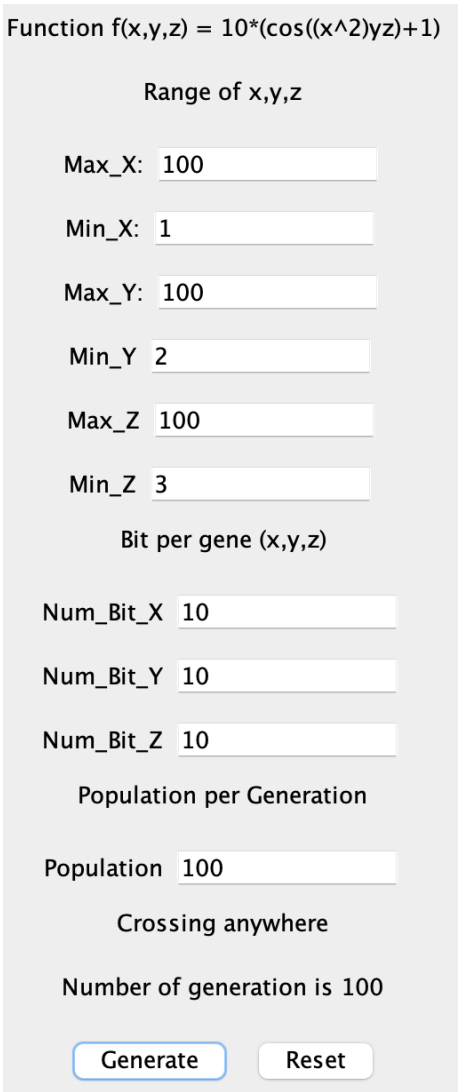
Genetic Algorithm - Instruction

This is the window for exploring Genetic Algorithm



We have three part: **Inputs**, **Graphing (Plotting)**, and **Result** (**Outputs**)

1. **Input**



In the **Input** part, we fixed the function we want to maximize is

$$f(x, y, z) = 10(cos(x^2yz) + 1)$$

This function varies from 0 to 20. There are many local maxima in every domain of x,y,z. Also, the density of maxima is high, so the best value of random individuals (chromosomes) in each generation nearly reaches the maximum (20). Therefore, to investigate the evolution of the algorithm, we may evaluate the average value of a generation also.

You can input the ranges for x,y,z by entering the values for **Max_X, Min_X, Max_Y, Min_Y, Max_Z, Min_Z**. Note that the evolution will highly vary (fluctuate) if the ranges of x,y,z are very large.

Next, we enter the number of bits for each gene x,y,z by **Num_Bit_X, Num_Bit_Y, Num_Bit_Z**. Note: since we just can generate the binary number less than 31 bits **Num_Bit_X+Num_Bit_Y+Num_Bit_Z** <31 and they have to be positive.

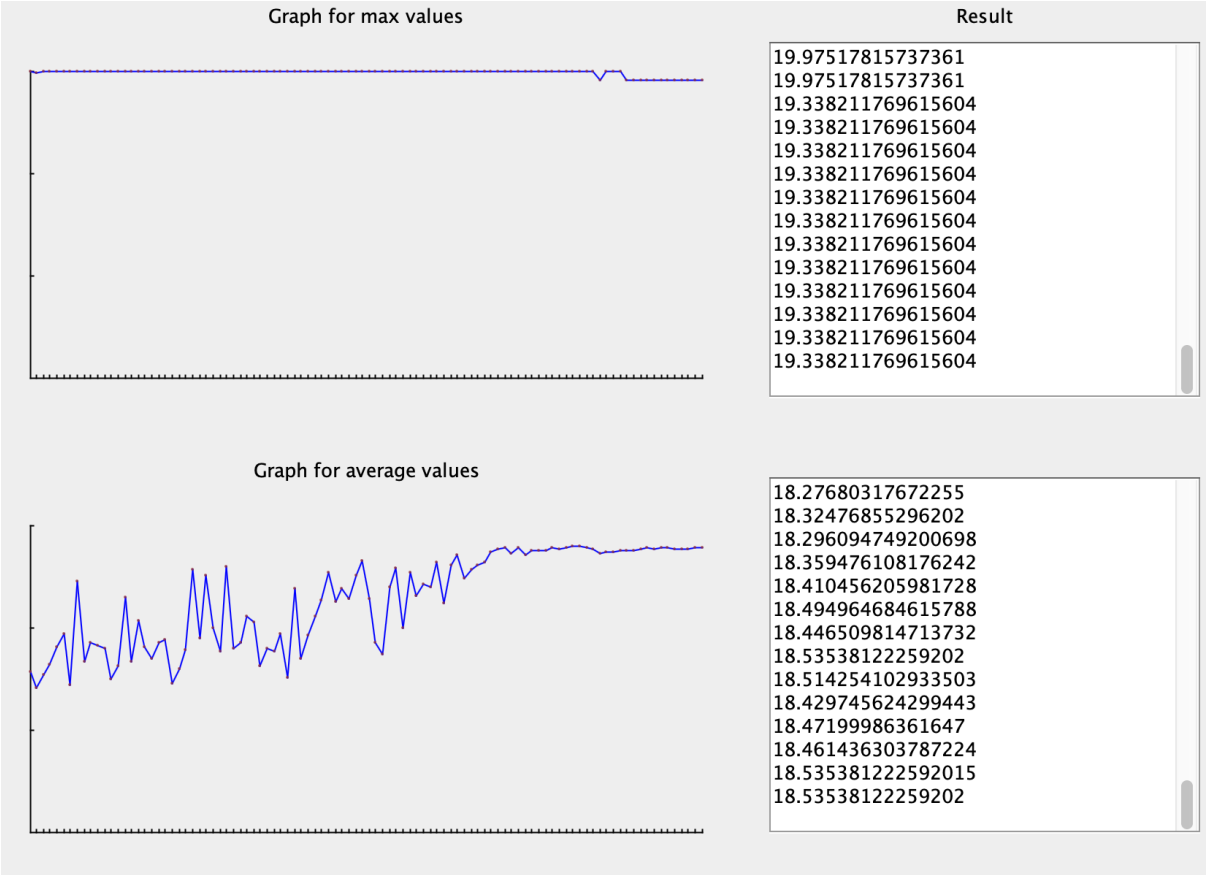
In this algorithm, we will **fix** the number of individuals in each generation (or population). Ex: number of individuals = Population = 100

Also, we can see the conditions for crossing over and the number of generations. For each selected pair, we can choose a random number for the cross-over position.

Click the button **Generate** to generate the algorithm. Note: You can generate the algorithm with the same inputs multiple times to see the variance of the algorithm.

Click the button **Reset** to reset all data

2. **Plotting+Result**



When we run the genetic algorithm for 100 generations, we record the best value and average value of individuals in each generation (population). The range of the vertical axes of the graphs are from 0 to 20.

+) The top graph and the top text area is the plotting and the result for best values of 100 generations. Since the frequency of maxima of the function is high, the best value may not change over evolution. It can also decrease.

+) The bottom graph and the bottom text area is the plotting and the result for the average values of 100 generations. We can see that this value tends to increase over time. Also, in the few last generations, the average value is nearly maximum (20), which means that most of the individuals in those generations are nearly maximum (bad individuals have been eliminated).

Lastly, in this program, I use the graphing program from from the account "Hovercraft Full Of Eels" on stackoverflow.com
Here is the link: https://stackoverflow.com/a/8693635