Anh Vu, James Mitchell & Joel Kahn

Assignment 3: Evolving Design
Instructor: Luis E. Fraguada
Assistant: Rodrigo Aguirre

Topic Abstract:

Evolutionary Computation is a branch of computation that is quite unique. For one, it is not specific to any problem or task. It is a framework for solving generic problems. This offers interesting capacities for the design process where we are usually the ones iterating over a design decision in order to evaluate its effectiveness. If we could abstract the forces which guide a design decision, then we could potentially utilize Evolutionary computation, and specifically Genetic Algorithms, to assist us in finding optimal solutions given a number of design criteria.

For this to work, we must know the design task very well. It's parameters must be well defined into a 'solution space' bound by the ranges of our parameters. This is a space where good and bad solutions exist, and the Evolutionary Solver will search through it to find the best solutions.

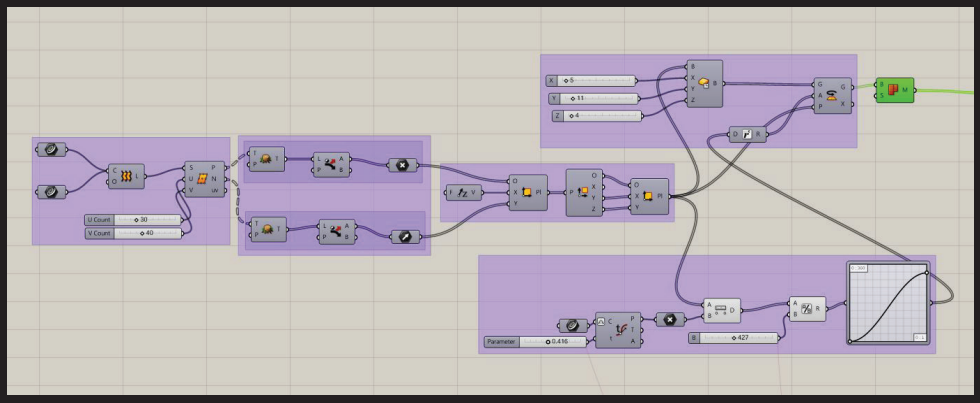
Assignment Tasks:

Your task is to utilize Evolutionary Computation in your studio projects. Define a design task to abstract, define a solution space, and deploy Galapagos, Goat*, or Octopus* to search the solution space for the most optimal solutions. You are to define clearly the parameters and how you are trying to maximize, minimize, or reach a certain fitness. The result of the exercise should be a series of optimized elements which can help to drive your studio project forward. We will also see how to connect Galapagos with Ecotect, so this is also an option for those looking to utilize environmental forces as a driver for design.

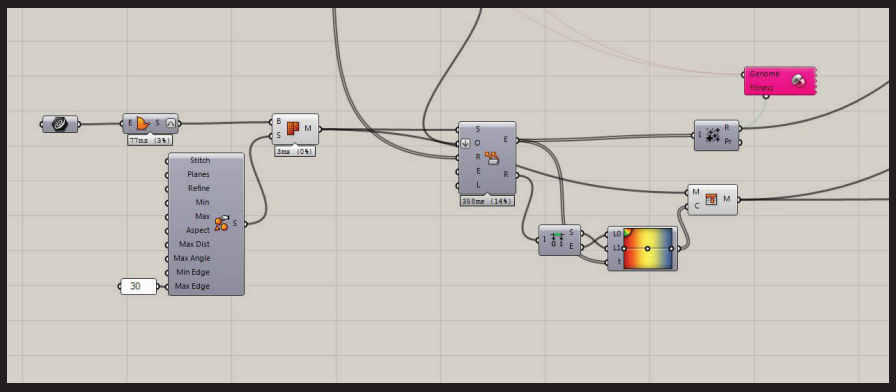
1. Define: Define the problem, the variables (genomes), the fitness, and the solution space. How do you prioritize when solving for multiple objectives in a design task?
2. Evolve: Evolve your design task to reach optimal solutions. Be sure to utilize the matrix technique I showed in class in order to track the evolution of your system.
3. Iterate: Show how adding objectives to your design task might change the results of the optimization.

Process

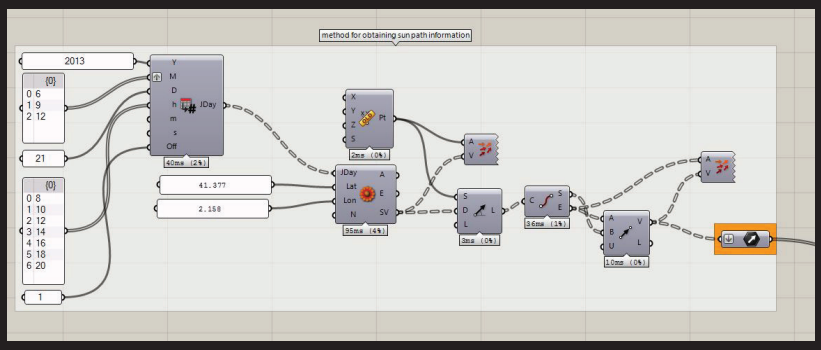
Create a different kind of wall



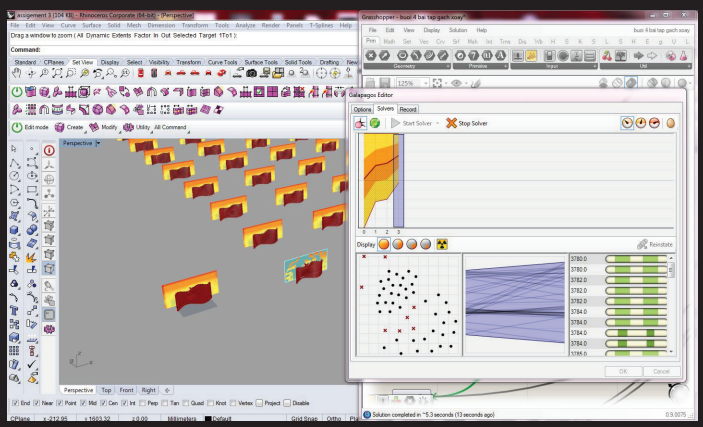
Fitness



Obtaining sun path information



Galapagos processing



Final product

Maximum numbers of shadow

Minimum numbers of shadow