

Applications of Genetic Algorithms

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Abstract

The purpose of this project is to explore the applications of Genetic Algorithms, an evolutionary computation search technique, to find approximate solutions to optimization problems. This project will focus on computing the minimum point on a three dimensional graph. The goal is to find the minimum point without testing every single point on the graph, a very computational intensive process.

Procedures and Methods

I am using C with OpenGL to write my program. I currently have the OpenGL component (3D graphing) completed and I am writing my genetic algorithm in C.

The graph of $z = x^2 + y^2$ appears on the screen in a gradient of points. Eight randomly-generated yellow points appear on the screen. They consist of the population.

- Page down is pressed. The four worst points (as determined by the fitness function) are highlighted in white and enlarged.
- Page down is pressed again. Those four points have been deleted, because this is the selection process.
- When page down is pressed the third time, new points appear (in this version of the program, they happen to be the points that were deleted, but in the future they will be new points chosen based upon a breeding algorithm).
- The fourth time page down is pressed, the points stay the same but become the permanent new population.

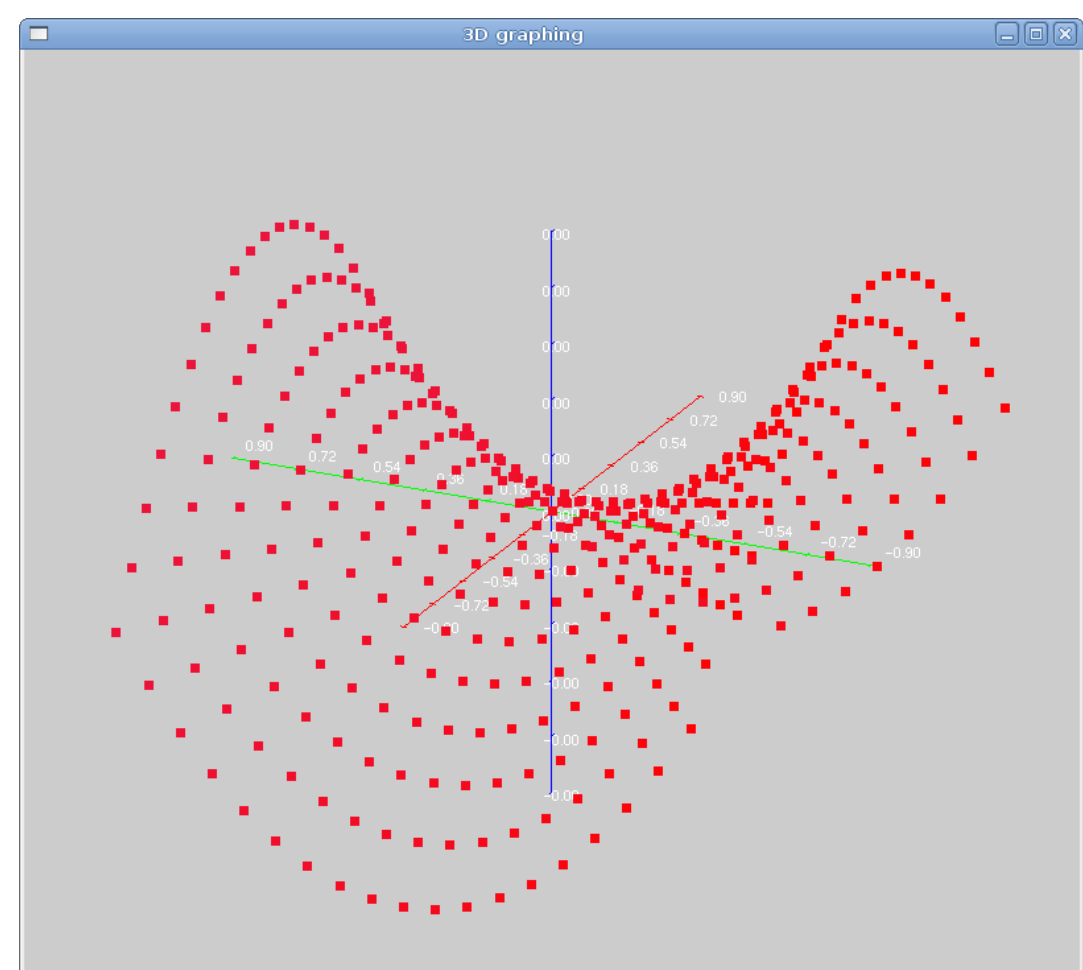
When the page down button is continued to be pressed, the cycle repeats according to the steps above.

Background

Genetic algorithms can reduce the amount of time and computations required to solve a complex problem. Using a “population” of “individuals,” genetic algorithms can approximate the solution to a wide variety of problems. One such problem is finding the minimum of a three-dimensional graph.

Visual

The program displays the results on a 3D graph:



Results and Conclusions

I expect to see results that approximate the exact answer to the minimum point of the graph. I will show the genetic algorithm trial using a 3D graph - and I will analyze the results of many trials using a Ruby script. The Ruby program may also have a visual displaying how well the various trials worked when the random number seed was changed.