Genetic Algorithm Research Project

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1 Introduction

The purpose of our program is to confirm the results published in an infamous paper about genetic algorithms and the Baldwin Effect: "How Learning Can Guide Evolution". Further, we will be performing a simple experiment based on how implementing a different fitness function half-way through the experiment will change the overall evolution of a population.

2 Basic Experiments

2.1 How Different Measures of Fitness Evolve Over Time

In this experiment, we will try and visualize if there is a difference in evolution when the fitness function is switched halfway through evolution. We hypothesize that if we switch from our simple fitness function that simply counts how many 1 alleles in a chromosome to a fitness function that counts the number of 1's that are in consecutive groupings there will be little change. This is our hypothesis because half way through evolution the fitness of the group is already high and not much can be done to change that. For the purposes of this experiment we will only be testing the first 100 generations. This is because the average fitness of a population will have either plateaued or reached the maximum fitness value in 150 generations. Our results are as follows:

Specifications: Genome Length = 100 Population Size = 100 Number of Generations = 100 Mutation = 1 or 3 Selection Type = Truncation for 50 generations then Roulette for final 50 generations Crossover = None
Figure 1 shows the results of running a simulation with the above specifications. As expected the overall fitness of the population grows and plateaus in the high 90's. Figure 2 shows the results of running a simulation with the above specifications. This does not align with our hypothesis as we did not expect a rapid change in the fitness when the selection method changed to roulette. Figure 3 shows the results of running a simulation with the above specifications and the mutation rate set at 3. The rate at which fitness increased went up even higher than it did in the second run seen in figure two.

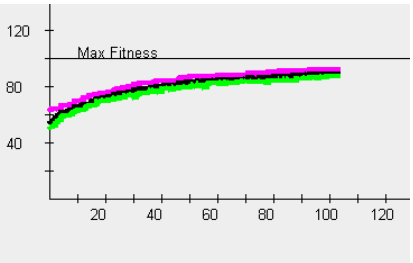

Figure 1: Control- Selection Type is Unchanged During Run

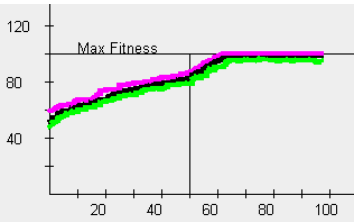

Figure 2: Selection Type is Changed Halfway Through

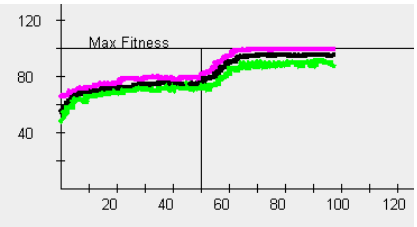

Figure 3: Selection Type is Changed Halfway Through and Mutation rate is changed to 3

2.2 Basic Experiment Conclusion

The experiments we ran did not confirm our hypothesis, it actually revealed that our hypothesis was completely wrong. When the selection method is changed halfway through the fitness of a population increases faster.