**The Effects of Parameter Changes on Comparable Evolutionary Algorithms**

22019799

# Introduction

* Investigating the effects of parameter changes on an EA
* Creating a meta ai to test all parameters in a range
* Graphing data for detailed understandings

Set out to find the optimal configuration for an Evolutionary Algorithm (EA), the experiment attempts to understand each argument and its resultant effect on the solution of the fitness. A well-reasoned thought might suggest trying to use random numbers, and extrapolating your tests from what you initially find, this would, however, not be a very efficient solution. Instead, the experiment focuses on an underlying program which can incrementally test every value in a range, presenting the best results.

With C++ as the backbone for the project, graphics libraries allow for easy processing of data into graphs. This makes it much easier to analyse the results of each generation and see the affect of each argument in greater detail.

# Experimentation

* Describe the process of making the EA
* Describe the parameters and explain how fitness is calculated
* Describe Meta graphs
  + Describe the effect of tournament size
  + Describe the effect of mutation rate
  + Describe the effect of mutation height
* Explain differences between a good result and an optimal result
* Describe how to calculate a solutions fitness

# Comparison

# Conclusions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| %S | %MR | %MH | Ending Fitness | Plateau | Solution Fitness Rating |
| 9 | 0.06 | 0.02 | 0.002006 | 69 | 214.559723 |
| 9 | 0.18 | 0.01 | 0.002955 | 84 | 384.724152 |
| 7 | 0.11 | 0.02 | 0.003436 | 76 | 404.759644 |
| 9 | 0.28 | 0.01 | 0.004092 | 63 | 399.564514 |
| 7 | 0.26 | 0.01 | 0.004227 | 74 | 484.875610 |

(Article 1 – Top 5 solutions by fitness, Minimisation One)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| %S | %MR | %MH | Ending Fitness | Plateau | Solution Fitness Rating |
| 9 | 0.06 | 0.02 | 0.002006 | 69 | 214.559723 |
| 7 | 0.04 | 0.03 | 0.003839 | 46 | 273.748596 |
| 7 | 0.13 | 0.01 | 0.002646 | 72 | 295.326141 |
| 7 | 0.19 | 0.01 | 0.002517 | 89 | 347.189606 |
| 9 | 0.18 | 0.01 | 0.002955 | 84 | 384.724152 |

(Article 2 – Top 5 solutions by solution fitness rating, Minimisation One)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| %S | %MR | %MH | Ending Fitness | Plateau | Solution Fitness Rating |
| 2 | 0.01 | 0.21 | 0 | 64 | 0.009920 |
| 2 | 0.01 | 0.29 | 0 | 89 | 0.013794 |
| 3 | 0.01 | 0.09 | 0 | 83 | 0.012865 |
| 3 | 0.01 | 0.1 | 0 | 86 | 0.013330 |
| 3 | 0.01 | 0.19 | 0 | 57 | 0.008835 |

(Article 3 – Top 5 solutions by fitness, Minimisation Two)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| %S | %MR | %MH | Ending Fitness | Plateau | Solution Fitness Rating |
| 9 | 0.01 | 0.27 | 0 | 30 | 0.004650 |
| 4 | 0.01 | 0.2 | 0 | 34 | 0.005270 |
| 5 | 0.01 | 0.14 | 0 | 36 | 0.005580 |
| 5 | 0.01 | 0.17 | 0 | 26 | 0.005580 |
| 5 | 0.01 | 0.19 | 0 | 36 | 0.005580 |

(Article 4 – Top 5 Solutions by solution fitness rating, Minimisation Two)