



n -Dimensional Surface Mapping using Genetic Programming

- What is Surface Mapping?
- What is Genetic Programming?
- Why use GP for surface mapping?
- How am I going to apply it?
- What are my project goals?



Surface Mapping

- Finding a model, given the data
- Regression
- Curse of Dimensionality

- $y = f(x_1, x_2 \dots x_n)$



Genetic Programming I

- Evolution of computer programs
- Domain-independent
- New & rapidly changing technique



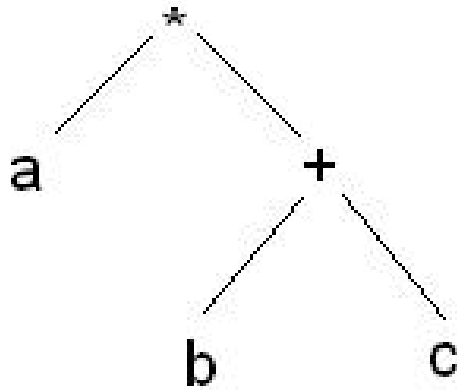
Genetic Programming II

- Population of programs
- Crossover and Mutation
- Selection



Program Trees

- Infix: $a * (b + c)$
- Reverse Polish: $abc+*$
- Tree:





Why Use Genetic Programming?

- Conventional maths too complex
- Approximate solutions are acceptable
- No need to encode problem



Specific Methods

- Memory / Culture
- Speciation
- Develop new functions



Memory and Culture

➤ Memory

- Local to each GP member
- Read and write functions

➤ Culture

- Global to entire population
- Depends on interactions



Speciation

- Parallel populations
- Limited transfer between populations
- Maybe for different dimensions



New Functions

- Hill function
- Embedded Neural Networks
- Suggestions from Unilever



My Project Goals

- Model 20 dimensional data (!)
- Investigate limits of GP regression
- Develop data-specific GP system



Conclusion

- Evolve equations
- Increase dimensions from 1 to 20
- Develop data-specific functions



Conclusions