λ Lounge

Evolutionary Algorithms

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Why Use and Evolutionary Algorithm?

The Evolutionary Algorithm

1. Population Initialization: generate a new population.
2. Fitness Evaluation: rate each member of the population.
3. Repeatedly:
   (a) Parent Selection: choose who to breed.
   (b) Recombination: cross the parents.
   (c) Mutation: applied to the offspring.
   (d) Fitness Evaluation: usually just the new offspring.
   (e) Survivor Selection: kill off the weak.

Population Initialization

"It's turtles all the way down ... until it's not."

- Intelligently seed the population: think Adam and Eve. This is common if you are fine-tuning a solution you already have, either generated from your EA in a previous run, or from some different system.
  Pro: you can start off the population somewhere useful.
  Con: you have to know where *"somewhere useful"* is.
- Randomly generate the population.
  This is usually easy and usually doesn't cost too many generations.
- Doing both at the same time isn't uncommon.

Fitness Evaluation

"I'm so much more beautiful/intelligent/strong/fast/rich than you could ever hope to be."

We need to determine the fitness of our solutions.

- Minimum or maximum direct value.
- Simulation of an environment.
- Some fitness heuristic.
- Head-to-head competition.

Parent Selection

"Who's your Daddy?"

Recombination

(Pretend that 1970's porn music is playing.)

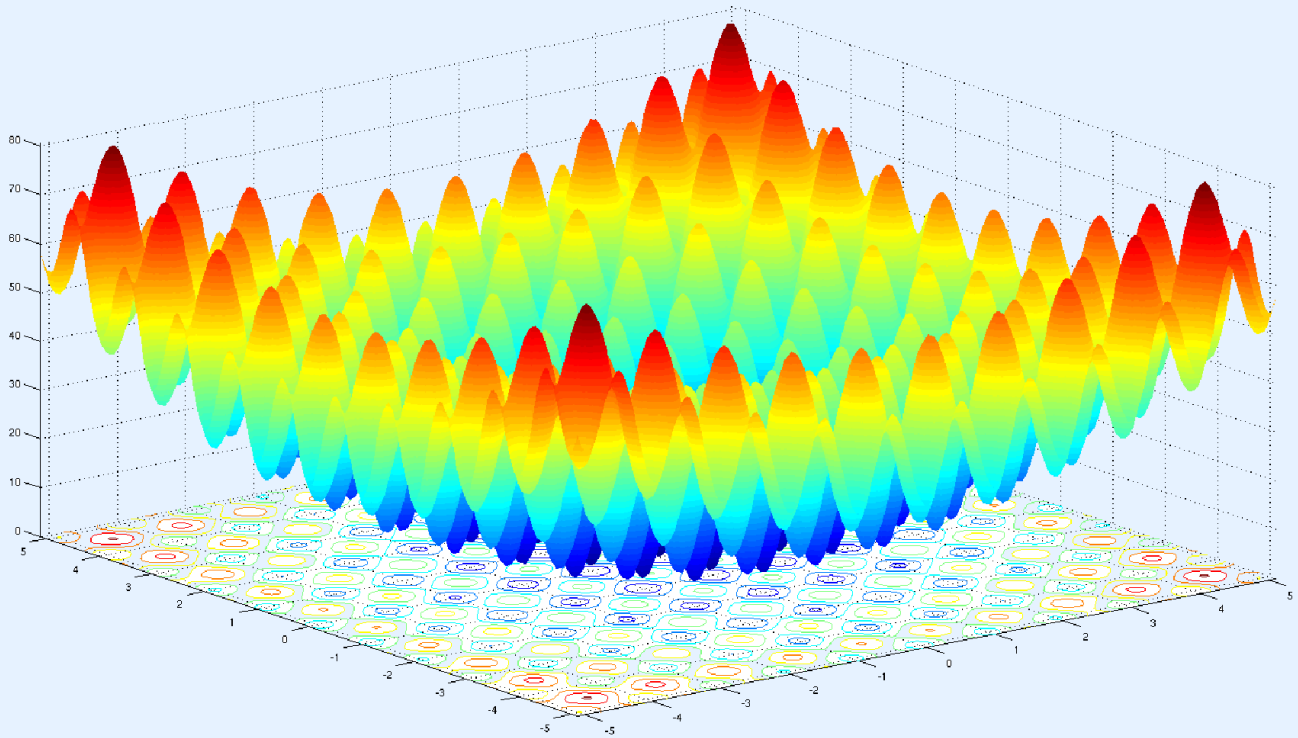
Mutation

Survivor Selection

"I brought you into this world, and I can take you out of it."

The Rastrigin Function

$$f(\mathbf{x}) = An + \sum_{i=1}^{n} \left[x_i^2 - A\cos\left(2\pi x_i\right) \right]$$



Let's Look at Some Code!

This is intentionally simple code

- I want you to learn about evolutionary algorithms in this talk, not anything cool about Common Lisp.
- I want it to be an explanation, not an implementation.
- I want it to be as short and readable as possible.
- I want it to not use anything non-standard.

So in short, no, this isn't the best way to do things in the real world.

Questions?