Evolution of morphology II

Exercise of the course “Bio-inspired Adaptive Machines” by Prof. Dario Floreano

Artificial evolution is driven by a fitness function. The way of defining a fitness function has a strong influence on the evolutionary process and can radically change the results of an evolutionary process. The goal of this exercise session is to understand how fitness can be set, and which effects can be observed by defining the same goal with different fitnesses.

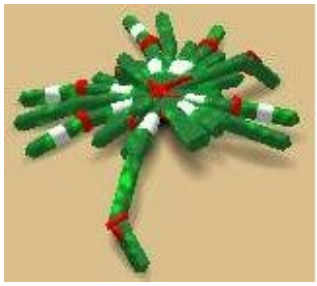
In part 2 you will use FRAMSTICKS to evolve more complex creatures and gain some hands-on experience in designing fitness functions for multi-objective problems.

Part 1. Evolving a simple creature

Try to evolve a small, fast underwater swimmer. Select suitable parameters for your experiment (genepool capacity, mutation and crossover rate, selection method, neurons to add...). You can either start evolution from scratch or on all or some of the predefined genomes, whichever you think is a better choice. Try to define a suitable fitness function. You can create simple additive functions with different weights (Experiment-Parameters-Fitness), or view and edit the fitness formula (Experiment-Gene Pools-Genotypes). Experiment with different fitness functions and compare your results. To accelerate evolution you can turn off the OpenGL viewer and run in an optimized Layout (Interface-Layout).

Part 2. Evolving complex morphologies with a multi-objective fitness function

Try to evolve a moving tower: We want to obtain a creature that moves around as much as possible, keeping its center of gravity as high as possible. Try to define a suitable fitness function. Simple additive functions will not be sufficient to solve these problems - experiment to find a suitable solution!



Try to evolve a very large (or very small), fast creature. Experiment with seeding your initial genepool with different evolved creatures.Can you effectively use recombination and duplication operators to find successful solutions?

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