

Evolutionary Simulation

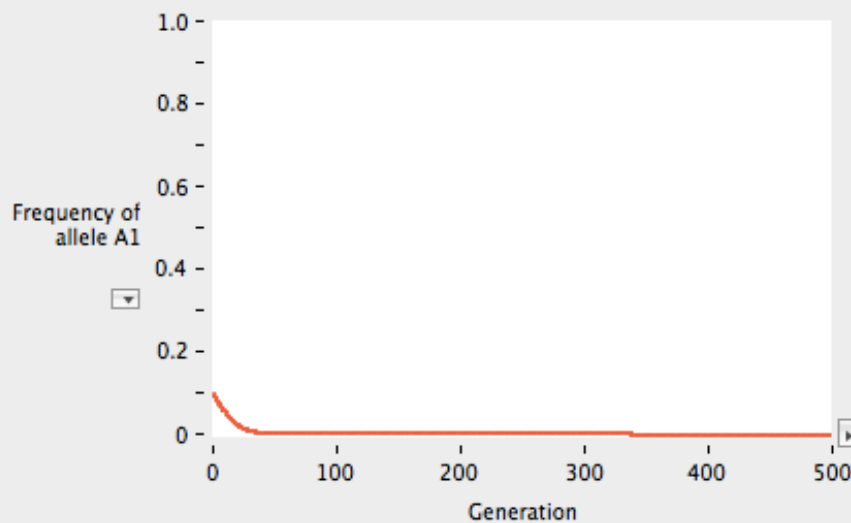
of some sort

Evolutionary Algorithms

- applications of artificial intelligence
- inspired by biological evolution: reproduction, mutation, recombination, selection
- “In a genetic algorithm, a population of candidate solutions (called individuals, creatures, or phenotypes) to an optimization problem is evolved toward better solutions. Each candidate solution has a set of properties (its chromosomes or genotype) which can be mutated and altered.”

Implementation of biological processes

1. Generate the initial population of individuals generated randomly — first generation
2. Evaluate the fitness of each individual in that population
3. Repeat on this generation until termination (time limit, sufficient fitness achieved, etc.):
 - a. Select the best-fit individuals for reproduction - parents
 - b. Breed new individuals through crossover and mutation operations to give birth to offspring
 - c. Evaluate the individual fitness of new individuals
 - d. Replace least-fit population with new individuals



Final frequencies

A1: 0

A2: 1

A1A1: 0

A1A2: 0

A2A2: 1

Starting frequency of allele A1:

Fraction migrants each generation:

Fitness of genotype A1A1:

Frequency of A1 in source pop'n:

Fitness of genotype A1A2:

Population size:

Fitness of genotype A2A2:

Inbreeding coefficient (F):

Mutation rate from A1 to A2:

Mutation rate from A2 to A1:

Graph lines:

☒ Single

☐ Multiple

☐ Auto



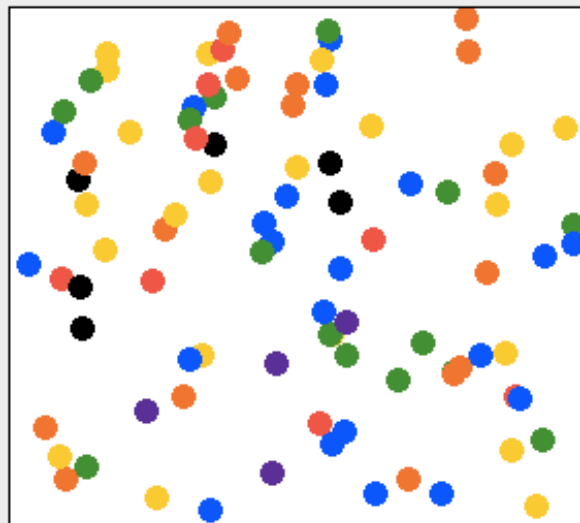
Run



Clear



Reset

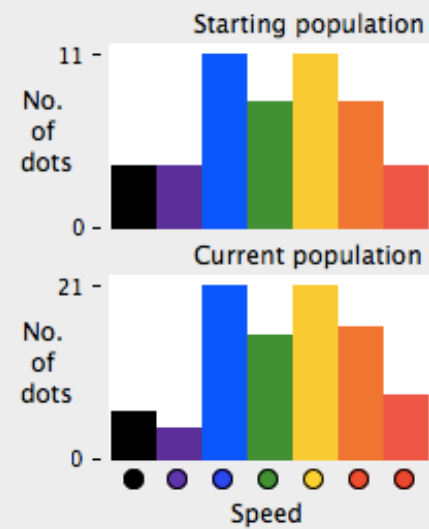


Number remaining: 91

New Population

Run

Reproduce

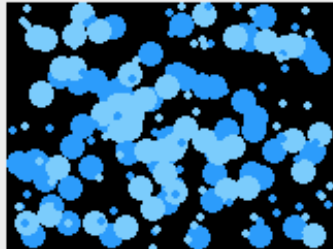


Speed of dots is: ☒ Variable
☒ Heritable

Survival is: ☒ Selective

Frequency of A: 0.54

Enter new value,
then hit return key:



Gene pool

Egg:

Sperm:

Zygote:

Done

Ideal

0 0 0

Number
of
zygotes

Total = 0

AA Aa aa

Mutation rates:

Done

A to a

a to A

Survival rates:

Done

AA Aa aa

0 0 0

Number
of
adults

Total = 0

AA Aa aa

Add migrants:

AA

Aa

aa

Done

0 0 0

Number
of
juveniles

Total = 0

AA Aa aa

Computation Intelligence Car Evolution Using Box2D Physics (v3.2)

60 fps average
Physics step: 1 ms (732 fps)
23 MB used

Hide

Input Seed / Choose Terrain

Generation: 3 Max Score: 400

Copy All

Copy Selected

Car	Score	Time
0	400	0:25
1	337.8	0:24
2	2.3	0:03
3	0.2	0:00
4	9.9	0:05
5	6	0:04
6	2	0:02
7	12.8	0:05
8	0.2	0:00
9	4.7	0:10
10	8.8	0:04
11	3.5	0:01
12	259.8	0:22
13	400	0:25
14	2.3	0:03
15	0.1	0:00
16	3.3	0:01
17	12.4	0:05
18	4.3	0:02
19	1.7	0:02

400

200

Up

Next

Down

Copy Current

Copy Best

Time: 3:47

Score: 196.3

Torque: 147

Score Cache

2

max wheels

50

wheel freq.

Tournament

Elite Selection

5

mutation rate

[Design a Car](#)

Technologies to be used

- Java for software development
- possibly JavaScript