SIMULATED SONGBIRDS WITH GENES FAVOURING MODERATE AMOUNTS OF FEAR ARE MORE LIKELY TO EVOLVE

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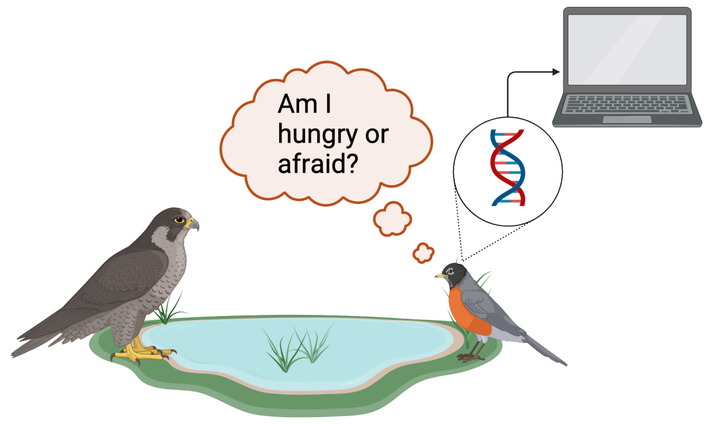
SCAN ME

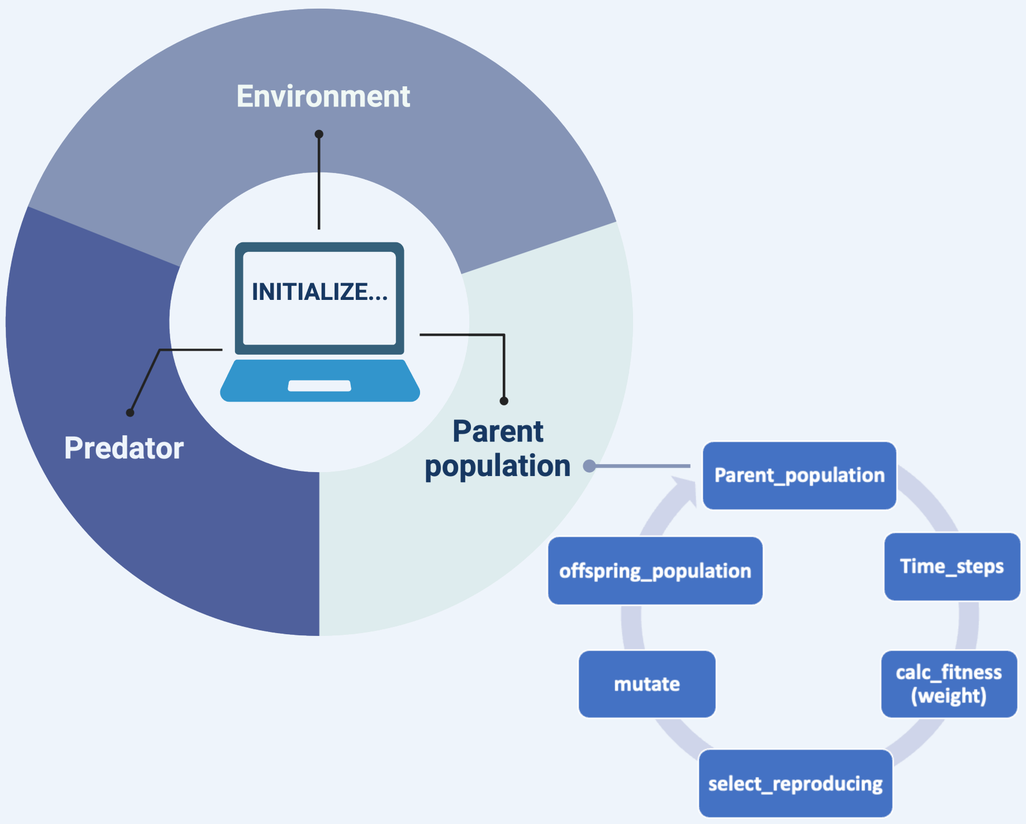
THE AIM OF THE CODE

We created a model depicting evolution in songbirds. The two selection-pressures are hunger and fear, reflected in the genotype of our digital bird; the *gene* for hunger and fear. In our model, these two emotions work as opposites. While the bird is very hungry, it is not especially afraid of predation and vice versa.

Our aim is to simulate evolution by running the program through 100 generations of numerous songbirds, to see whether the genomic values change. Our simulation showed rapid evolution, despite the limitations of bird mass set by the algorithm.



THE GENETIC ALGORITHM: THE ENVIRONMENT, THE PREDATOR AND THE BIRD POPULATION



ENVIRONMENT

The environment consists of 100 different cells – e.g., habitats - with unique, randomly assigned values for food-availability and risk of predation. This is where our bird will fly around looking to eat, while being under the potential risk of meeting and perhaps even killed by a predator.

PREDATOR

Predation relates directly to our predator. Through chance, it may occupy the same cell as the bird. If the predator fails to catch and kill the bird, the bird will escape with an elevated value of fear.

PARENT- & OFFSPRING POPULATION

The parent-/offspring-population are our birds sorted by fitness. Fitness is measured by mass, where a selection of the birds with the highest mass-value will be “allowed” to pass on their genes to the next generation. To maintain genetic variation in the future population, a few less fit birds are also selected for mating.

THE SONGBIRDS GROW, AND THUS SHOW EVOLUTION

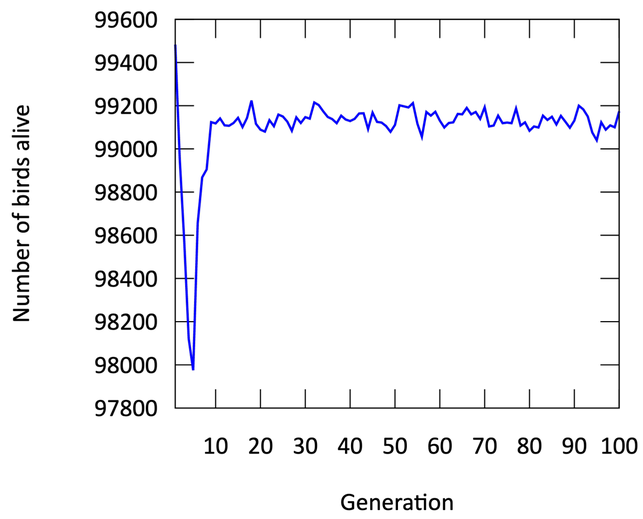


FIGURE 1: SHOWING THE NUMBER OF BIRDS ALIVE THROUGH THE 100 GENERATIONS.

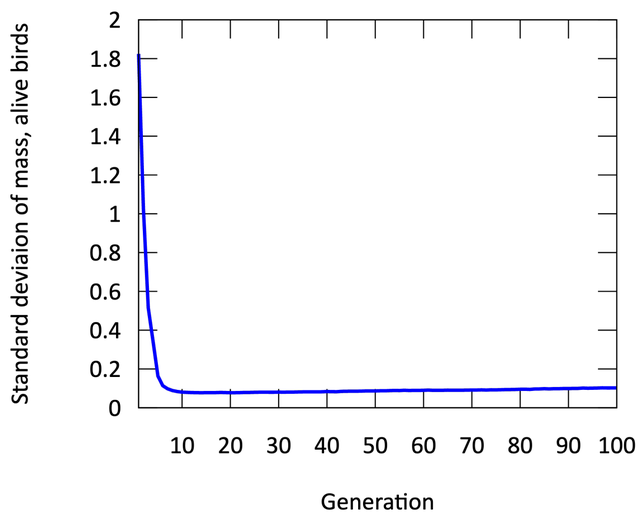


FIGURE 2: SHOWING THE STANDARD DEVIATION IN THE MASS OF THE SURVIVING BIRDS.

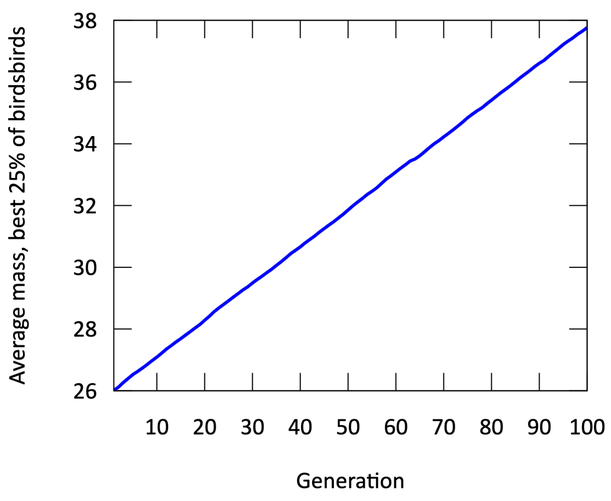


FIGURE 3: THE MASS OF THE 25% OF THE BIRDS WITH THE BEST FITNESS OF EACH GENERATION.

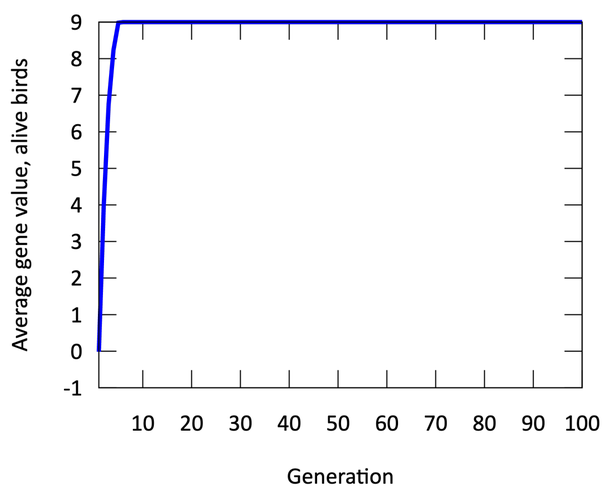


FIGURE 4: SHOWING THE AVERAGE GENE VALUE. GENOTYPE 9 CORRESPONDS TO "SLIGHTLY FEARFUL".

FOR THE FUTURE?

For the future it would be of interest to expand the code in several directions:

- Adding more genes.
- Adding gene flow from the "outside-in."
- Investigating effects of the mutation rate.
- Adding new notions of fitness in the genetic algorithm.

CHECK OUT THE CODE

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