

jsEvolution

Idea: The idea is to simulate evolution in nature using JavaScript. I recently got fascinated by the field of Computational Biology, and took this project as an opportunity to start venturing into the field. So far, I have understood and implemented two of the several forces that drive evolution of species. They are *genetic drift* and *mutation*. At present, simple models of the two have been implemented in separate vacuums, while in nature, all the forces act together.

Technology used: JavaScript and HTML have been used. HTML Canvas is used to plot graphs. No libraries were used.

Implementation details:

1. Genetic drift

- Variables like initial allele frequency, population size and number of generations to be observed are taken from the user through prompt.
- For every new generation, new allele frequencies are calculated through random sampling, and are pushed into an array (initially empty). Few assumptions have been made while calculating these values, including generation overlap (i.e when a new generation comes into existence, the previous generation completely disappears).
- The values in the array are now plotted in a graph against the current generation number. HTML Canvas is used for this purpose.

2. Mutation

- Values of the following variables are taken from the user through prompt: desired length of DNA sequences, number of such sequences, number of generations such that result for the last generation is observed. Also, mutation rate per base and generation.
- The initial sequence of desired length is generated randomly. For subsequent generations, mutations are performed as per the entered mutation rate.
- All the sequences are then printed.

Screenshots:



tanmay-chanakya.github.io says

enter length of sequence

tanmay-chanakya.github.io says

enter mutation rate

```
Generation 0:
AAGTACAATTGGACCGGGAG
AAGTACAATTGGACCGGGAG
AAGTACAATTGGACCGGGAG
AAGTACAATTGGACCGGGAG
AAGTACAATTGGACCGGGAG
AAGTACAATTGGACCGGGAG
AAGTACAATTGGACCGGGAG
AAGTACAATTGGACCGGGAG
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AAGTACAATTGGACCGGGAG

After 100 generations:
AAGTACAATTGACCGGGAG
AAGGACGTTTGGACCGGGAG
ACGTACAATTGCACCGGAAG
AAGACAAATTGGACCGGGAG
AAGTACAATTGGATCGGGAG
AAGTACAATTGGCCCGGGAG
AAGCACAAAGTGGACCATGAG
ACATACAATTGGACCGGGGG
AAGTACAATTGGTCCGGGAG
AAGCACAAATTGGACCTGGAG
AAGTACAATTGACCGGGAG
ATGTACAGTTGGACCGGGAG
AAGTACAATTGGATCGGGTG
AAGTACAATTGGACCGGGAG
AAGTACAGATGGACCGGGAG
AAGTACAATTGGACCGGTAG
AAGTACAATTGGACCGGGCG
AAGTACAATTGGACCGGAAG
AAGTACAATTGGACCGGGAG
AAGTGCCACTGAAGCGGCAC
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Link to video:
<https://youtu.be/6AyJZJjNx0A>

Couldn't get the audio. Will add subtitles.

Future scope: In recent future, more forces of evolution (like natural selection) can be implemented. Later they can be made to interact with each other and work together, like in the real world, instead of being independent.

Overall experience: Working on the project was a good experience, mainly because it made me sure about my interest in the fields that lie at the intersection of computer science and biology, although the project involved just a very basic implementation. I would like to dive deeper into the exciting field of computational biology and related subjects. Also learnt to appreciate the power of JavaScript, as it can be run on web browsers. This enables us to run it on millions of devices across the world.