

Genetic simulation program exercise

Get the genetic simulation program and get it working on your computer. Detailed instructions are in the documentation file (which is a web page, `popg.html`, that accompanies it). This web page is also reached from a link on the main course web page.

Start by playing around with the parameters. Can you make a run that shows selection with very little genetic drift? Drift with very little or no selection? Mutation with little drift or selection?

The exercise that should be turned in concerns these questions. It is due on **February 9**. It is worth 25 points.

Consider a number of populations (8-10 is fine) that have their population size (N) being 1000 individuals, and no mutation.

- Try cases in which the selection is underdominant. In particular, when the fitnesses of AA , Aa , and aa are respectively 1, 0.99, and 1.
- Also try different migration rates from 0 up to 0.1. For each, start the population with gene frequency 0.5.
- Describe the outcomes. I am not looking for detailed graphs of all runs but a general verbal description. However, distinguish between what happens with the different parameter values.
- Explain, in terms of evolutionary forces such as selection, genetic drift, and migration, why these results are obtained, including why the different results for different cases are obtained.
- Consider the number of individuals migrating into a typical population in one generation. What is it in terms of the population size N and the migration rate m ?
- Is there some value of this number of new migrants, above which the outcome is different than below it? (i.e. some value that is roughly the border between two kinds of behavior of the simulations). What is the value?
- With nonzero migration rates, do you ever find that the populations permanently fix for different alleles?

You should turn in a report, 2 to 5 pages in length, answering these questions.

In addition to answering the questions, one of the things you can also do (although not to turn in to us) is to explore the effects of various combinations of natural selection, genetic drift, mutation and migration. You might want to start with no mutation and look at the effects of natural selection including overdominance. Then maybe look at the effect of mutation versus selection. You may also want to examine the effect of genetic drift alone by making all fitnesses equal, and the sizes of the other effects necessary to have a noticeable effect on the outcome in the face of drift. *Be creative*, but with some ability to compare results with other cases that differ in useful ways. The object of this exercise is really to give you some feel for how gene frequencies are expected to change in natural populations.