Hardy Weinberg Simulation

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Prologue

This was not what we originally planned to do.

Original Plan: Study cyanobacterial evolution.
Problem: Cyanobacteria grows too slow. (generation time: 2.7 days)
Resolution: Since we are in a time crunch, we've made a computer simulation, but we've not abandoned the cyanobacterial experiment.

What is our Model?

Model

Hardy Weinberg Equilibrium.

Mathematical model which predicts that allele frequencies will be in equilibrium, provided no **mutation, selection and migration** takes place, provided we have random mating, with a large population.

Kind of a *null hypothesis*

Model

Hardy-Weinberg for two alleles, one locus:

Punnett Square

	P	p
P	PP	Pp
p	pP	pp

Procedure similar to our earlier experiment with coloured balls.

Procedure

Population will have 10 loci, 2 alleles per loci and 2 “chromosomes”
Dominant: 1, Recessive: 0

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1100110001,1101010010

- Create the mother population (starting frequency can be varied)
- Pick two individuals randomly from the population.

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So a individual's genome could be like this:
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- Create the mother population (starting frequency can be varied)
- Pick two individuals randomly from the population.
- Randomly choose an allele from each of the parents – Combined to create the **genotype** of the offspring. The number of offspring per mating can also be varied.
- Procedure repeated till we reach desired population size.

Experiments with the simulation

What kind of experiments can be done with our simulation?

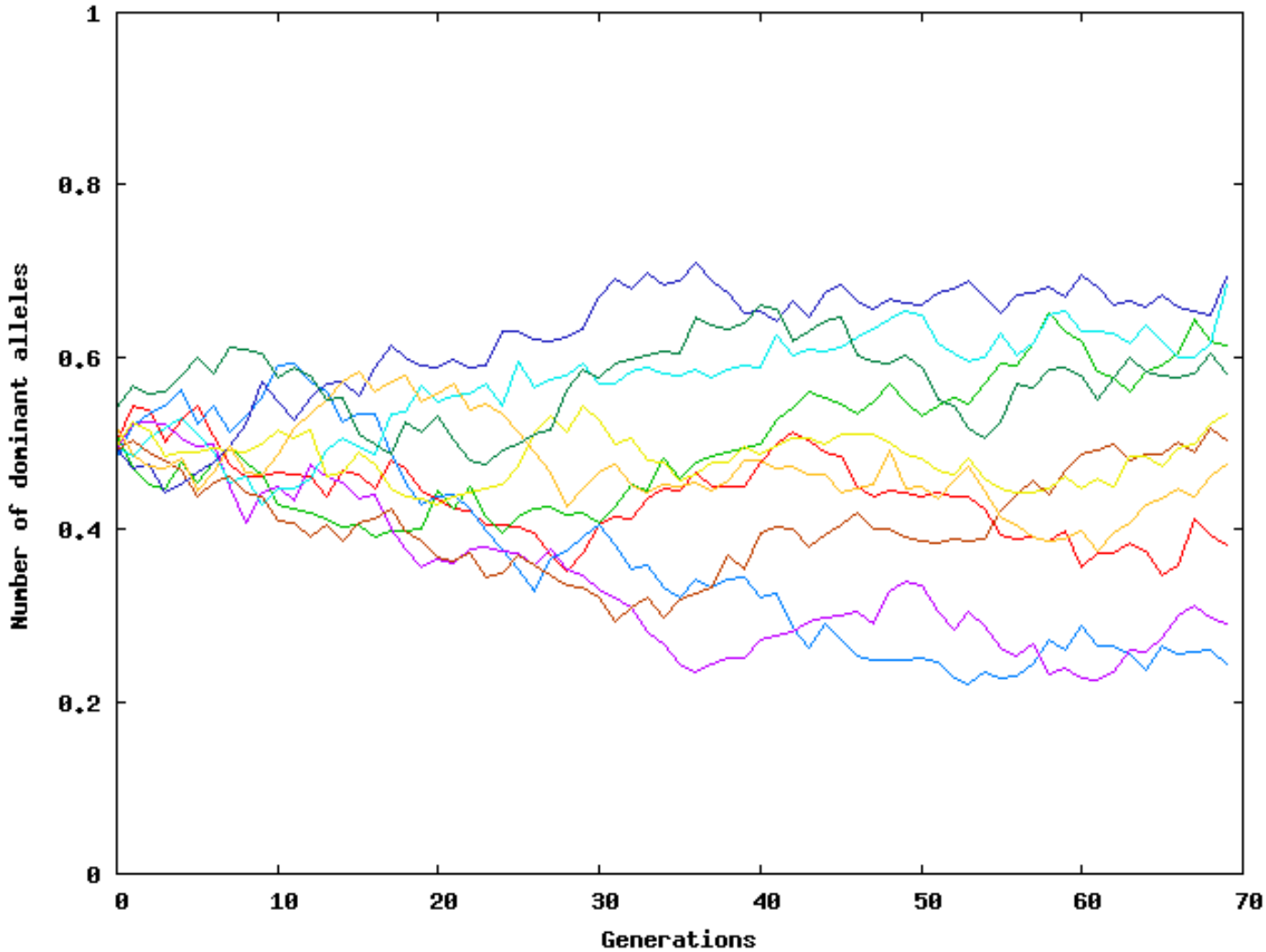
- Visual demonstration of Hardy-Weinberg equilibrium.
- Vary population size and see random genetic drift.
- Vary number of offspring to see if any effect is there.
- Change the starting frequency.

Simulation Help

Population Size 1000

Offspring 5 Starting Frequency 0.50

Generations 70



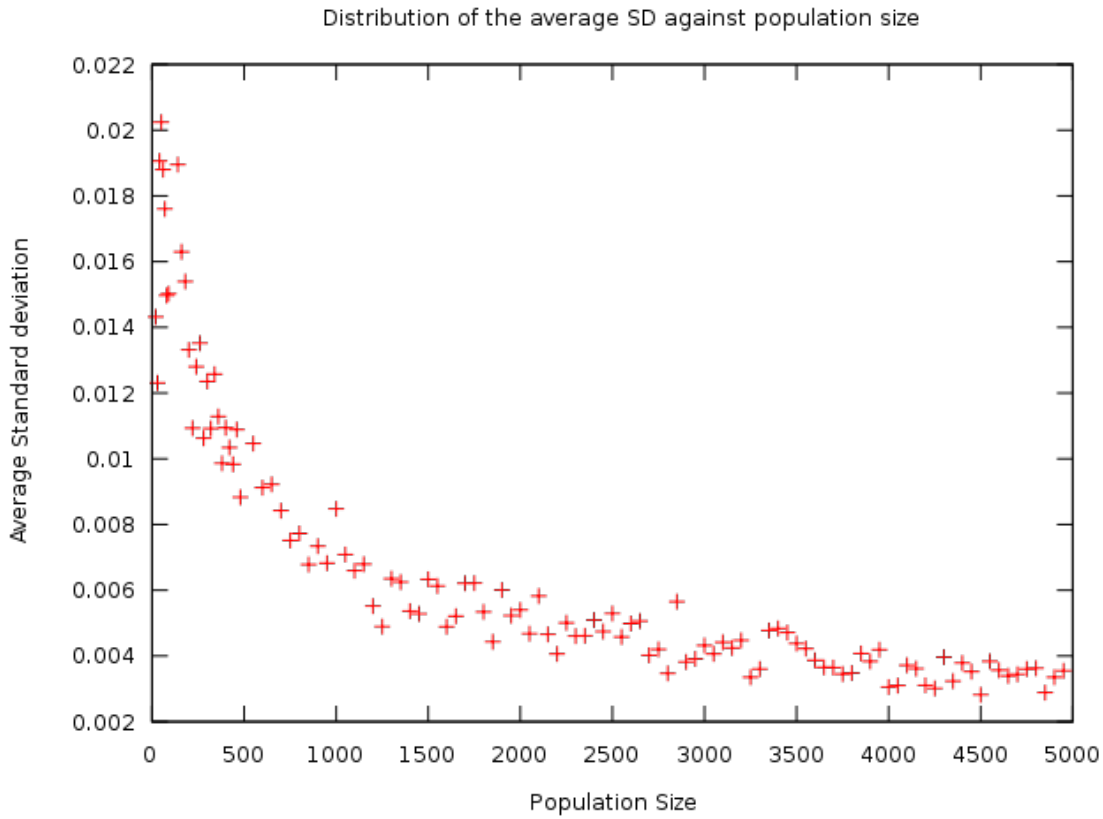
Export Data

Authors: Abhishek Dasgupta and Sambit Bikas Pal

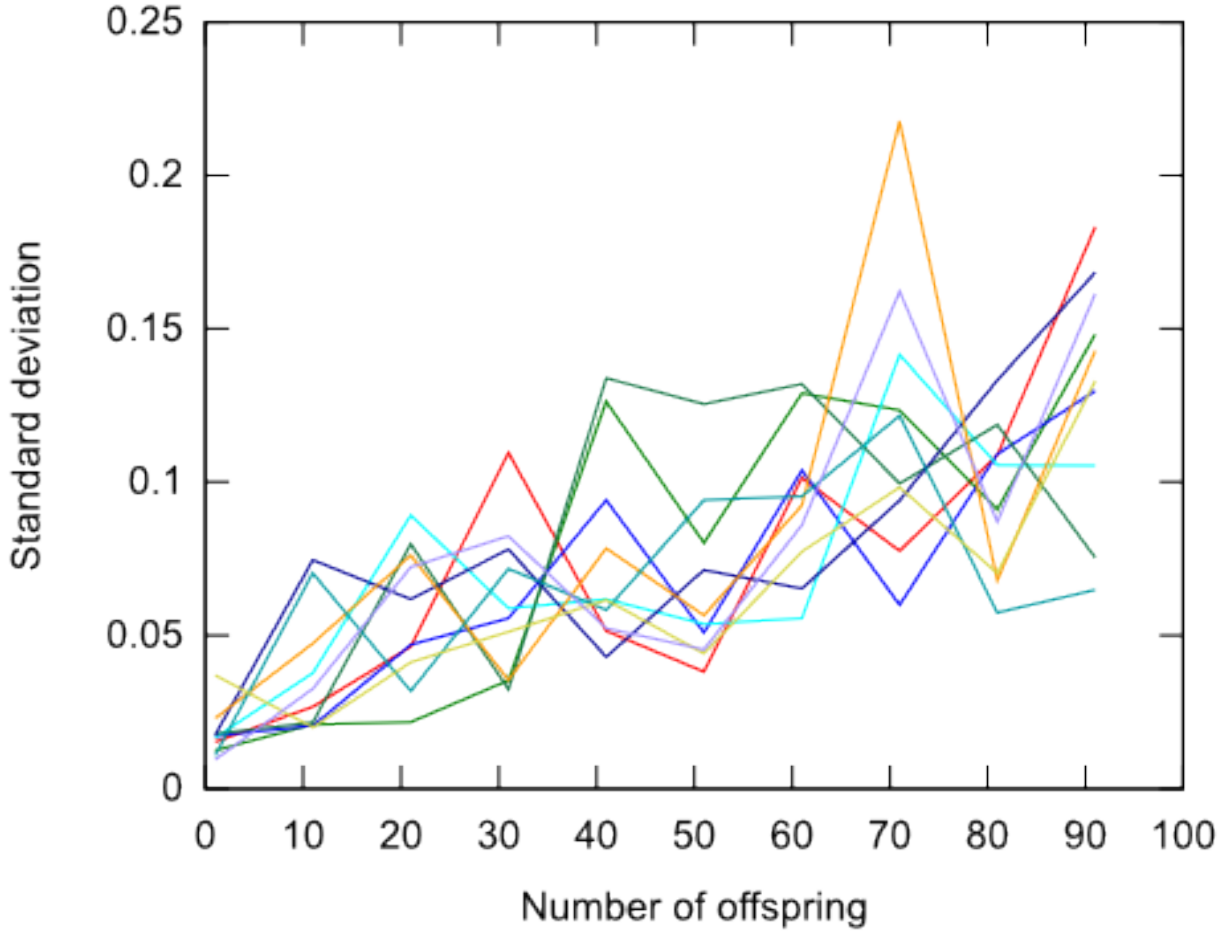
See Wiki

Experiment: Study on Drift

Using data from our program. Standard deviation used to quantify drift.



Experiment: Vary number of offspring



Could be because the number of matings decrease as number of offsprings/mating goes up, thus reducing effective population size. So similar to drift.

Future work

This application can be improved further:

- Add support for selection
- Add mutation
- Calculate linkage disequilibrium value.

Acknowledgements

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