Homework #7 due Friday May 13

There was a diverse set of answers for homework #6. Some folks coded up MCMC over a model with no dependence on the previous state (so, a first order Markov model). Others, allowed the move transition probabilities to be a function of both the current and previous state (a second order Markov model).

Whichever type of model you coded up for hw#6, do the opposite for hw#7 and implement the pair of models as reversible jump MCMC.

Once again, I'll give you a lot of freedom in choosing the pairs of models to integrate over. It is probably easiest to have your second order process be a simple model that only cares about whether the previous sector was different sector than the current sector. In other words, a model that does not introduce dependence on the previous height. But I will accept any sort of model jumping MCMC, as long as you can:

1. explain in words what hypothesis you would be testing when you do the model comparison between your Model #1 and your Model #2;
2. can implement the models; and
3. report the posterior probability of Model #2 if you run your sampler with a prior that gives each model a 50% chance.

Hints

It can be really tricky to get reversible jump MCMC to mix when the models greatly in dimensionality. This homework will be easiest if your richer model only has one or a few parameters that the simple model lacks.

Running the program with an empty data set (or hard-coding a log-likelihood of 0 for all parameters) can be helpful. You should then get sampled parameter values that approximate the priors.

If you can't achieve good mixing, make sure that your sampler passes the "running on empty gives me the priors" test, and just turn it in. I'm happy to talk to you about how to improve mixing, but we reach a point of diminishing returns on these homework exercises.