t=time

P=pixel

Say that we have three pixels

We are interested in the probability of reaching each pixel given a particular timeframe. More specifically, we need , and and these probabilities have to sum to one. Notice that these are exactly the probabilities that are needed for Rob Fletcher’s model.

Our speed model is focused on the time it takes to reach each pixel. In other words, our speed model provides , , and and these probabilities do not sum to one.

We can relate these probabilities using Bayes rule:

As a result, if we want to model resource selection, we can assume that:

Notice that we can ignore pixels for which is very small because

For this to work, we can use a two-stage approach:

1. Estimate time model.
2. Estimate resource selection function (parameters in the above expression) using the posterior distribution for the time model (or posterior mean to make things less computationally intensive) to quantify

Notice that distance is explicitly incorporated because directly depends on distance.

To avoid massive datasets (and autocorrelation problems), data might have to be sampled. Ideally sampling would be done strategically to obtain observations when the animal is in a diverse area. In this situation (instead of when the animal is in a homogeneous landscape), it will be easier for the model to estimate the effect of different environmental characteristics.