Let and denote the step length and turning angle bins, respectively, that observation i falls into. We assume that:

where is the latent cluster memberships of observation i for data type 1 and 2, respectively. We assume that this latent variable is given by:

Finally, our priors are:

In this last expression, refers to a truncated stick-breaking prior, given by:

#-----------------------------------

How do we calculate the likelihood of this model?

#-----------------------------------

The FCD’s are given by:

where is the total number of bins in . Let be the number of observations that fall in bin b and that were assigned to cluster k:

As a result, we have that:

This implies that

where is the total number of bins in . Let be the number of observations that fall in bin b and that were assigned to cluster k:

Therefore, we have that:

This implies that

We are going to integrate out and and then sample from a categorical distribution with the following probability:

Let and . Therefore:

This implies that: