

# momentuHMM\_test.R

*akane*

*Wed Oct 18 18:58:48 2017*

```
# Storm Petrel Movement Code
```

```
# clean everything first
```

```
rm(list=ls())
```

```
# careful not to load moveHMM alongside momentuHMM
```

```
library(momentuHMM)
```

```
## Warning: package 'momentuHMM' was built under R version 3.3.3
```

```
## Loading required package: splines
```

```
## Loading required package: splines2
```

```
## Warning: package 'splines2' was built under R version 3.3.3
```

```
library(rgdal)
```

```
## Loading required package: sp
```

```
## rgdal: version: 1.1-10, (SVN revision 622)
```

```
## Geospatial Data Abstraction Library extensions to R successfully loaded
```

```
## Loaded GDAL runtime: GDAL 2.0.1, released 2015/09/15
```

```
## Path to GDAL shared files: C:/Program Files/R/R-3.3.1/library/rgdal/gdal
```

```
## Loaded PROJ.4 runtime: Rel. 4.9.2, 08 September 2015, [PJ_VERSION: 492]
```

```
## Path to PROJ.4 shared files: C:/Program Files/R/R-3.3.1/library/rgdal/proj
```

```
## Linking to sp version: 1.2-3
```

```
library(adehabitatLT)
```

```
## Loading required package: ade4
```

```
## Loading required package: adehabitatMA
```

```
## Loading required package: CircStats
```

```
## Loading required package: MASS
```

```
## Loading required package: boot
```

```
setwd("C:\\Users\\akane\\Desktop\\Science\\Manuscripts\\Storm Petrels\\Tracking data")
```

```
stormData <- read.table("908test.csv", header=T, sep=",")
```

```
head(stormData)
```

```
##   BirdID      DateTime Latitude Longitude Departure.time location
## 1    908 21/08/2016 05:00 53.36166 -10.46549             NA ireland
## 2    908 21/08/2016 05:30 53.30945 -10.56293             NA ireland
## 3    908 21/08/2016 06:00 53.28371 -10.72518             NA ireland
## 4    908 21/08/2016 06:30 53.25131 -10.88045             NA ireland
## 5    908 21/08/2016 07:00 53.22146 -11.05856             NA ireland
## 6    908 21/08/2016 07:30      NaN      NaN             NA ireland
##   bathymetry
## 1   -97.33946
## 2  -105.29145
## 3 -111.39491
```

```

## 4 -124.99630
## 5 -138.51612
## 6      NaN

stormData<-stormData[,c("Latitude","Longitude","DateTime", "BirdID","location")]
names(stormData)[names(stormData) == 'Longitude'] <- 'lon'
names(stormData)[names(stormData) == 'Latitude'] <- 'lat'
names(stormData)[names(stormData) == 'BirdID'] <- 'ID'
names(stormData)[names(stormData) == 'DateTime'] <- 'time'

stormData$time<-as.POSIXct(stormData$time, format= "%d/%m/%Y %H:%M", tz = "UTC")
#head(stormData)
length(stormData$lat)

## [1] 129

stormData<-stormData[complete.cases(stormData[,1:2 ]),]
length(stormData$lat)

## [1] 124

stormData <- stormData[,c(2,1,3,4)]

# create a trajectory object using adehabitatLT
tr<-as.ltraj(data.frame(X=stormData$lon,Y=stormData$lat),date=stormData$time,id=stormData$ID,typeII=T)
tstep<-1800 #time step we want for the interpolation, in seconds, 1800 secs = 30 mins
newtr<-redisltraj(tr, u=tstep, type = "time")
#head(newtr)
#head(newtr[[1]])

# convert object of class ltraj to a dataframe
df<-ld(newtr)
names(df)[names(df) == 'x'] <- 'lon'
names(df)[names(df) == 'y'] <- 'lat'
#head(df)

# prepare data with moveHMM
trackData <- df[,c(1,2,3)]
#head(trackData)
trackData <- prepData(trackData,type="LL",coordNames=c("lon","lat"))

# label states
stateNames <- c("exploratory","encamped")
# distributions for observation processes
dist = list(step = "gamma", angle = "vm")
# initial parameters
Par0_m1 <- list(step=c(10,5,1,2),angle=c(10,5)) # # it's mean1, mean2, sd1, sd2 for step lengths

# fit model
m1 <- fitHMM(data = trackData, nbStates = 2, dist = dist, Par0 = Par0_m1,
             estAngleMean = list(angle=FALSE), stateNames = stateNames, retryFits = 10)

## =====
## Fitting HMM with 2 states and 2 data streams
## -----

```

```

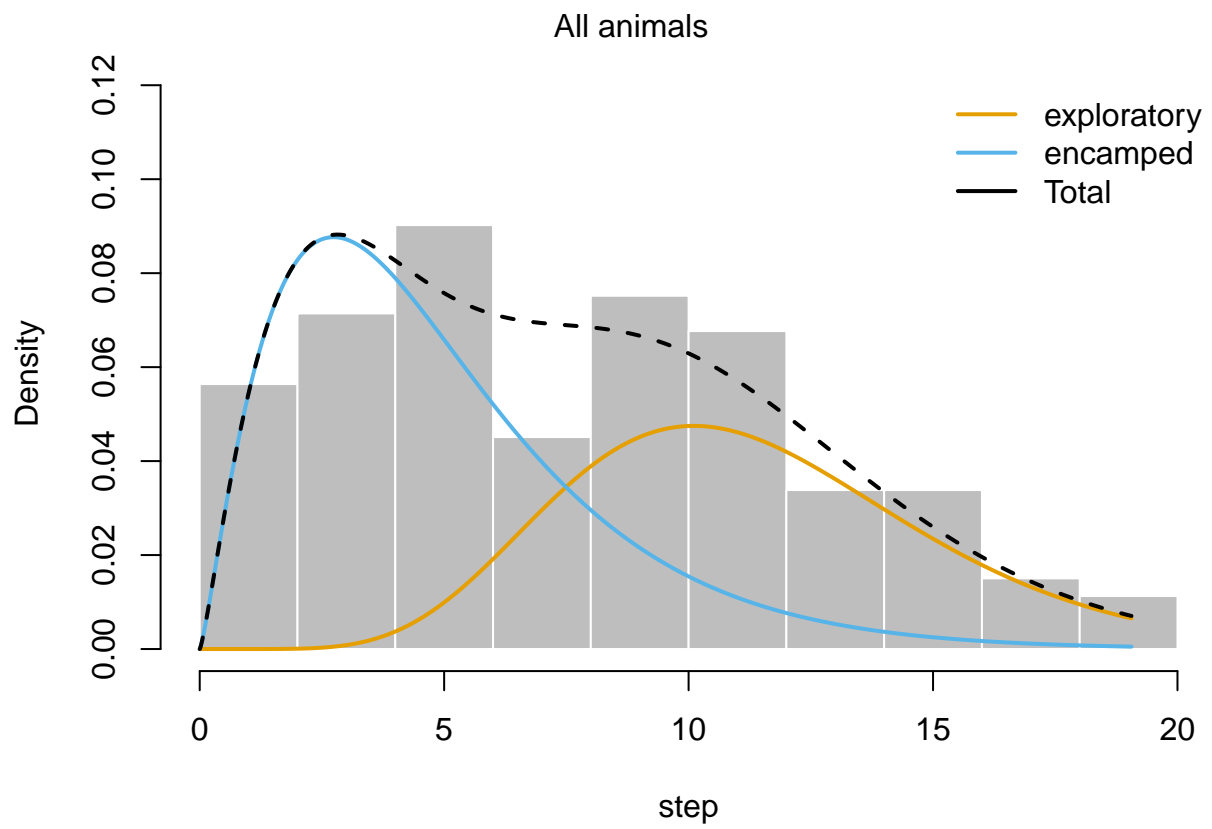
## step ~ gamma(mean=~1, sd=~1)
## angle ~ vm(concentration=~1)
##
## Transition probability matrix formula: ~1
## =====
## Attempting to improve fit using random perturbation. Press 'esc' to force exit from 'fitHMM'
##
## Attempt 1 of 10 -- current log-likelihood value: -447.788
## Attempt 2 of 10 -- current log-likelihood value: -447.788
## Attempt 3 of 10 -- current log-likelihood value: -447.788
## Attempt 4 of 10 -- current log-likelihood value: -447.788
## Attempt 5 of 10 -- current log-likelihood value: -447.788
## Attempt 6 of 10 -- current log-likelihood value: -447.788
## Attempt 7 of 10 -- current log-likelihood value: -447.788
## Attempt 8 of 10 -- current log-likelihood value: -447.788
## Attempt 9 of 10 -- current log-likelihood value: -447.788
## Attempt 10 of 10 -- current log-likelihood value: -447.788
## DONE
m1

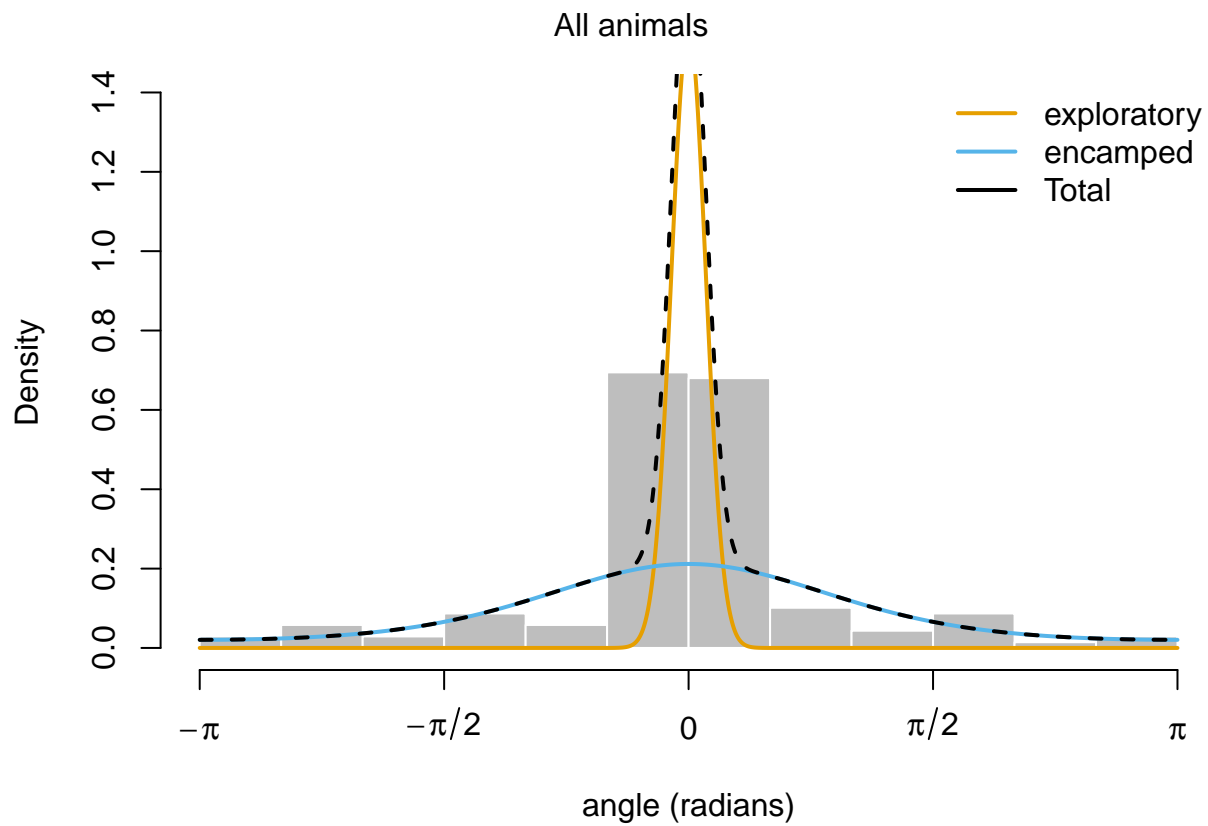
## Value of the maximum log-likelihood: -447.788
##
##
## step parameters:
## -----
##          exploratory encamped
## mean    11.387160 4.878901
## sd       3.819154 3.231955
##
## angle parameters:
## -----
##          exploratory encamped
## mean           0.00000 0.000000
## concentration  82.14927 1.168139
##
## Regression coeffs for the transition probabilities:
## -----
##          1 -> 2    2 -> 1
## (Intercept) -1.796497 -1.95216
##
## Transition probability matrix:
## -----
##          exploratory encamped
## exploratory    0.857722 0.142278
## encamped       0.124318 0.875682
##
## Initial distribution:
## -----
##          exploratory    encamped
## 5.134006e-07 9.999995e-01

```

```
plot(m1)
```

```
## Decoding states sequence... DONE
```





Animal ID: Animal1

