3.2 Movement Trajectories

Manual of Applied Spatial Ecology

3/11/2022

We will start with simply creating trajectories between successive locations. As stated previously, there are 2 types of trajectories but their are also 2 forms of Type II trajectories if we have time recorded. Depending on the duration between locations we can have uniform time lag between successive relocations termed regular trajectories and non-uniform time lag that results in irregular trajectories. We will begin this section with simply creating irregular trajectories from relocation data because, even though we set up a time schedule to collection locations at uniform times, climate, habitat, and satellites do not always permit such schedules of data collection.

1. Exercise 3.2 - Download and extract zip folder into your preferred location

2. Set working directory to the extracted folder in R under Session - Set Working Directory...

3. Now open the script "MovementScript.Rmd" and run code directly from the script

4. First we need to load the packages needed for the exercise

```
library(adehabitatLT)
library(chron)
library(spatstat)#for "duplicate" function
```

5. We are again going to be using more of the mule deer dataset than from the earlier exercises

```
muleys <-read.csv("DCmuleysedited.csv", header=T)
```

6. Check for duplicate locations in dataset. The reason for this is very important and will be apparent shortly.

```
#Check for duplicate locations in dataset
summary(duplicated(muleys))
```

```
##    Mode   FALSE
## logical    9752
```

```
#Sort data to address error in code if needed
#muleys <- muleys[order(muleys$id),]

### Conversion of the date to the format POSIX
#Date <- as.character(muleys$GPSFixTime)
#Date <- as.POSIXct(strptime(as.character(muleys$GPSFixTime),"%Y.%m.%d %H:%M:%S"))
#muleys$Date <- Date
```

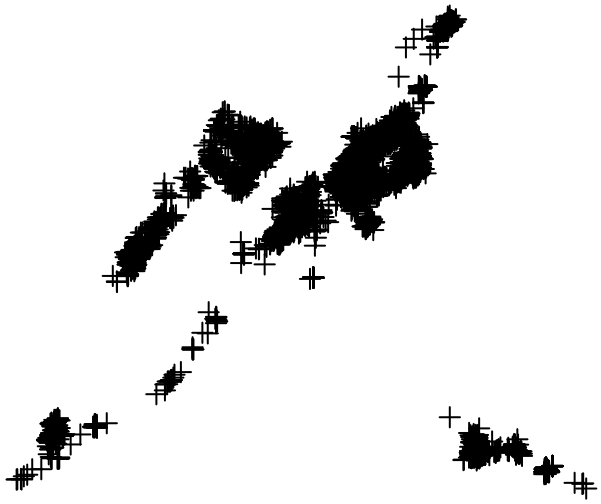
7. For trajectories of type II (time recorded), the conversion of the date to the format POSIX needs to be done to get proper digits of date into R.

```
da <- as.POSIXct(strptime(muleys$GPSFixTime,format="%Y.%m.%d %H:%M:%S"))
muleys$da <- da

timediff <- diff(muleys$da)*60
muleys <-muleys[-1,]
```

```
muleys$timediff <-as.numeric(abs(timediff))

newmuleys <-subset(muleys, muleys$X > 599000 & muleys$X < 705000 & muleys$Y > 4167000
  & muleys$timediff < 14401)
muleys <- newmuleys
```

8. Now create a Spatial Points Data Frame in UTM zone 12 adding ID, time diff, burst to xy coordinates

```
data.xy = muleys[c("X","Y")]
#Creates class Spatial Points for all locations
xysp <- SpatialPoints(data.xy)
#Creates a Spatial Data Frame from
sppt<-data.frame(xysp)
#Creates a spatial data frame of ID
idsp<-data.frame(muleys[2])
#Creates a spatial data frame of dt
dtsp<-data.frame(muleys[24])
#Creates a spatial data frame of Burst
busp<-data.frame(muleys[23])
#Merges ID and Date into the same spatial data frame
merge<-data.frame(idsp,dtsp,busp)
#Adds ID and Date data frame with locations data frame
coordinates(merge)<-sppt
plot(merge)
```

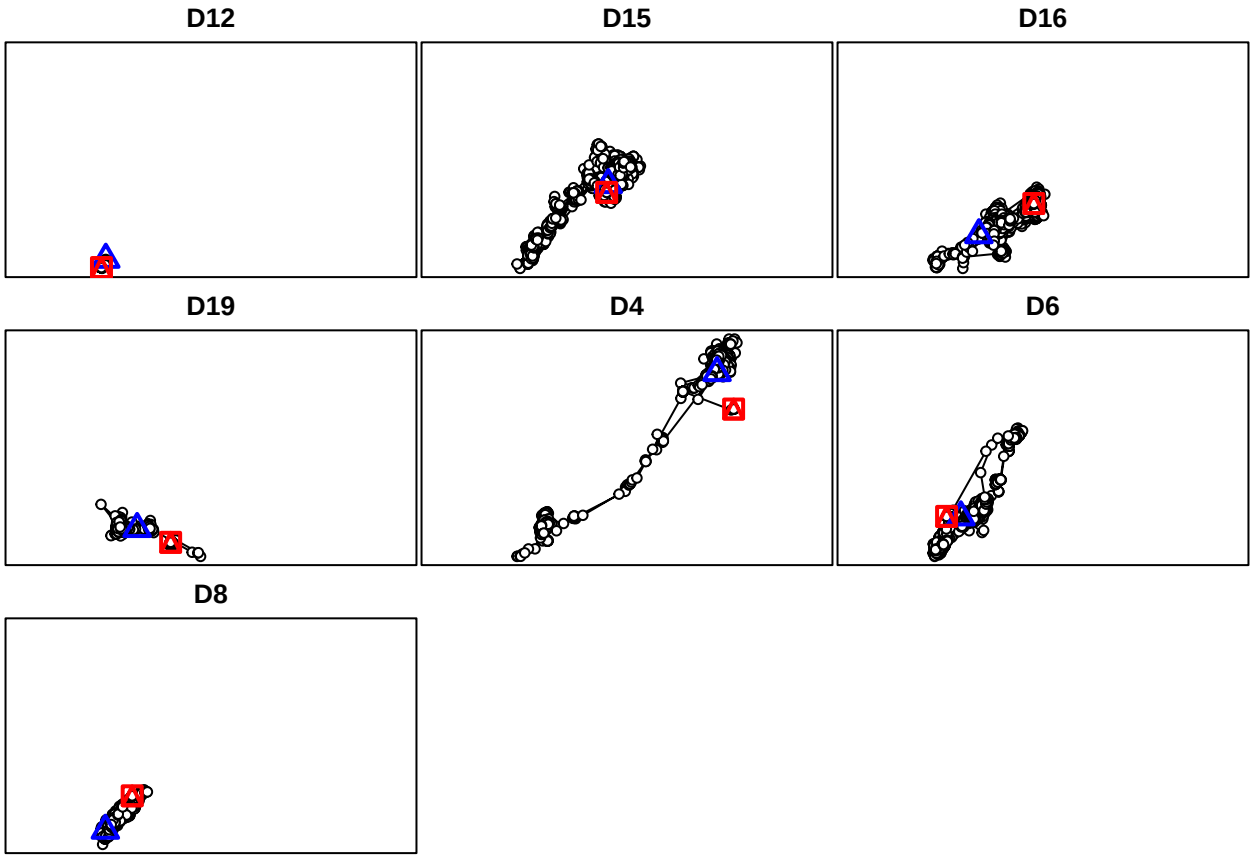


9. Now create an object of class "ltraj" by animal using the ID field and display by each individual (i.e., ltraj[1]).

```
ltraj <- as.ltraj(coordinates(merge),merge$da,id=merge$id)
head(ltraj[1])#Describes the trajectory
```

```
##
## ********** List of class ltraj **********
##
## Type of the traject: Type II (time recorded)
## * Time zone unspecified: dates printed in user time zone *
## Irregular traject. Variable time lag between two locs
##
## Characteristics of the bursts:
##    id burst nb.reloc NAs          date.begin            date.end
## 1 D12   D12       98   0 2011-10-12 06:00:52 2011-10-24 21:00:48
##
##
##  infolocs provided. The following variables are available:
## [1] "pkey"
```

```
plot(ltraj)#plot all trajectories created
```




```
#Plot each trajectory separately
plot(ltraj[1])
plot(ltraj[2])
plot(ltraj[3])
plot(ltraj[4])
```

```
plot(ltraj[5])
plot(ltraj[6])
plot(ltraj[7])
```

10. Create a histogram of time lag (i.e., interval) and distance between successive locations for each deer. This is a nice way to inspect the time lag between locations as you don't want to include a location if too much time has passed since the previous and it also shows why a trajectory is irregular.

```
hist(ltraj[1], "dt", freq = TRUE)
hist(ltraj[1], "dist", freq = TRUE)
hist(ltraj[2], "dt", freq = TRUE)
hist(ltraj[2], "dist", freq = TRUE)
hist(ltraj[3], "dt", freq = TRUE)
hist(ltraj[3], "dist", freq = TRUE)
hist(ltraj[4], "dt", freq = TRUE)
hist(ltraj[4], "dist", freq = TRUE)
hist(ltraj[5], "dt", freq = TRUE)
hist(ltraj[5], "dist", freq = TRUE)
hist(ltraj[6], "dt", freq = TRUE)
hist(ltraj[6], "dist", freq = TRUE)
hist(ltraj[7], "dt", freq = TRUE)
hist(ltraj[7], "dist", freq = TRUE)
```