
ANIMOVE
P1.y=diag(c(0, 0.001, 0.001))
playPar(mov.model=~1, err.model=list(x=~errX, y=~errY),
data=nfsNew, fixPar=c(NA, 1, NA, 1, NA, NA, NA, NA))
<- crwMLE(mov.model=~1, err.model=list(x=~errX, y=~errY),
data=nfsNew, coord=c("longitude", "latitude"),
Time.name="Time", initial.state=initial.drift,
fixPar=c(NA, 1, NA, 1, NA, NA, NA, NA),
control=list(maxit=2000,trace=1, REPORT=10),

September 2022

Movement data in R

Introduction into movement data collection

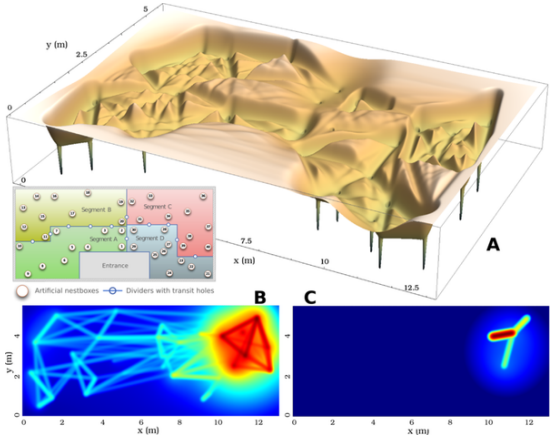
Data types

Two fundamental types of movement data

- Lagragian methods
  - Radio tracking
  - Satellite tracking
  - GPS
  - Geo-locators
- Eulerian methods
  - Camera traps
  - Rings and bands
  - RFID tags
  - Microphon arrays

Data structures: Eulerian

Eulerian methods are posing great challenges. Most methods and analysis assume unbiased sampling (more to follow). Eulerian methods are violating the unbiased sampling assumption in the spatial domain. However, the data they provide allow often in specific systems quite a reliable reconstruction of paths. Especially in movements along grids (fish in rivers). Nicolas Perony has a nice example: doi.org/10.1371/journal.pcbi.1002786



Data structures: Lagragian

Movement is defined as a sequence of locations in time. Usually we think of and work with movement data where the position of an animal is collected through a device attached to the animal that allows in principle knowing where the animal is at any time: Lagragian data. The different methods differ mainly in their precision. The error in location estimation needs to be accounted for and we have to be aware of it, when we analyse data.

Data structures: Lagragian

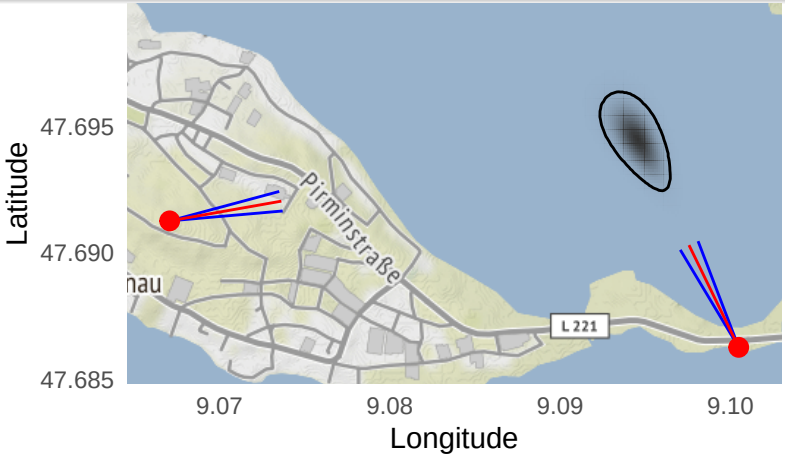


Figure: Estimating the error of triangulation using standard functions in geosphere assuming 95% of the locations fall within 5 degree of the true direction of the signal. The black line contains 95% of the randomized locations, this area is 8.14 hectares, the black shading shows the denstiy of points.

Data structures: Lagragian

Ironically, most methods of analysis did/do not explicitly take into account location error. New methods take error into account (we'll deal with that later). Due to the ubiquity of movement data collected as a sequence of locations in time, most analytical and even data bases concentrate on Lagragian type of data. One important aspect preceding all analyses is data standardisation and data stratification. For this course, we will concentrate on movebank.org. There are other data bases, of course.

movebank.org

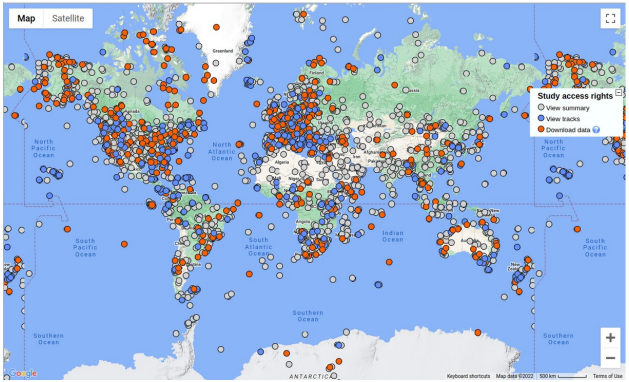
March 2022

Taxa: >1170
Locations: >3.5 bil.
NonLoc: >3.6 bil.

Live feeds: >16000 tags
Studies: >6900
Data owners: >3000

ADVANTAGES

- Data are safe
- Data are standardized
- User defines privacy settings
- Easy visualization
- Makes data sharing easy
- Environmental annotation (EnvData)
- Access directly through R
- Repository with DOI



Data sets

We will be working, depending on the context and suitability, with a few different sample data sets.

- Bat radio tracking data
- African buffalo GPS data
- "Leo" the vulture
- "Leroy" and "Ricky" two fishers from Albany
- "Sierit" the stork

These data sets can be all found on movebank, or as data associated with the R library `move`.