Analyze Animal Behavior Data Using:

Animal

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1 Introduction

The `Animal` package is a collection of functions for analyzing animal behavior data originating from a variety of sources. The package was originally created to analyze data files from CowLog (open source software for coding behaviors from digital video), but the functionality has been extended to cover also other data sources. This document is still very much under development, but the aim is to describe some the key features of the package via simple examples.
Animal has been created in the Research Centre of Animal Welfare [1].

2 CowLog data

The package has basic analysis functions for analyzing time coded behavioral data coded with CowLog [1] [2]. The main function in the package is *cowAnalyze*. The function takes the data file name, labels of the codes and the type (event or state) of the codes as inputs, and gives a summary table and plot of the results as output. The function also removes double state (duplicated) errors for state codes.
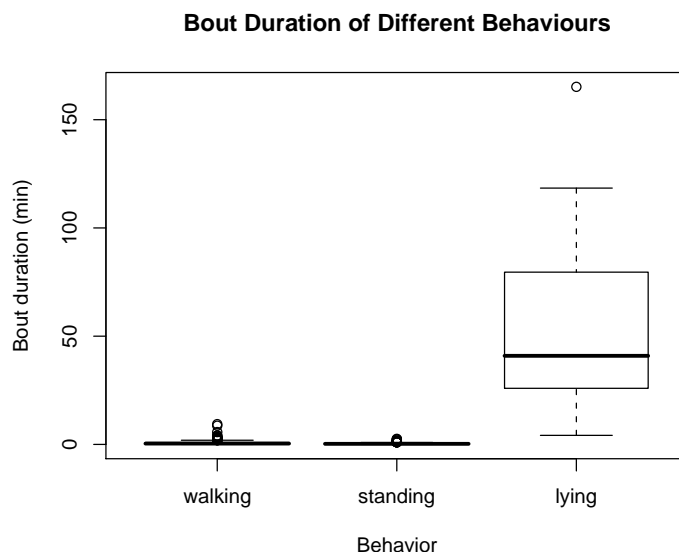
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[1]http://http://www.vetmed.helsinki.fi/hyvinvointikeskus/english/index.htm
[2]http://www.mm.helsinki.fi/~mpastell/CowLog

Here is a short example on how to use the function in R: Analyze CowLog datafile named calf1.bh1: Define codes 1-3 and give them names walking, standing and lying. The descriptive statistics will appear on screen and they are also saved to variable analyzed.

```
> library(Animal)
> analyzed <- cowAnalyze(file = "calf1.bh1", states = c(1,
+     2, 3), state.names = c("walking", "standing", "lying"))

Event results
Frequency        0 times
State results        walking standing lying
Frequency        270 269 21 times
Bout                0.8 0.37 54.98 minutes
Total                214.81 99.35 1154.62 minutes
```

Bout Duration of Different Behaviours

3 RIC data

The Animal package has several functions for working with the data produced by Insentec RIC feed measurement system. The basic function `read.RIC` can be used to read in RIC log files and they can be processed using `clean.RIC` and `bouts.RIC` functions.

Example data has been read in by using read.RIC with option clean=F It is included in the package as dataset RIC.

```
> data(RIC)
```

First we clean the data from zero rows and negative feed intakes, then we merge the feeding bouts that are less than 5 minutes apart.
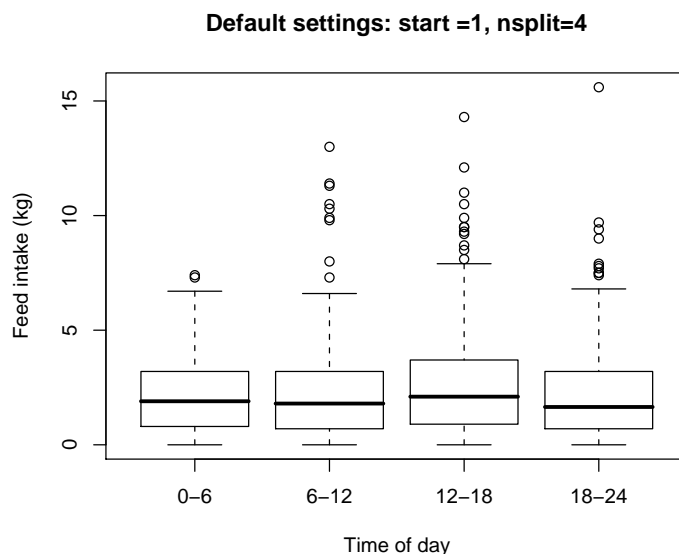
```
> RIC2 <- clean.RIC(RIC)
> bouts <- bouts.RIC(RIC2)
> head(bouts, 5)

  cowID trough              begin                end intake
1   320     11 2009-03-17 23:47:02 2009-03-18 00:12:03    4.8
2   320     11 2009-03-18 00:40:57 2009-03-18 00:51:53    2.6
3   320     11 2009-03-18 03:02:20 2009-03-18 03:22:30    2.9
4   320     11 2009-03-18 05:10:23 2009-03-18 06:24:27    9.8
5   320     11 2009-03-18 07:51:23 2009-03-18 07:56:11    1.0
  bout.duration intake.duration
1 25.01667 mins        24.51667
2 10.93333 mins        10.93333
3 20.16667 mins        15.81667
4 74.06667 mins        63.13333
5  4.80000 mins         4.80000
```

We can plot the feed intake distribution during different hours of the day with the help of partOfDay function.

```
> boxplot(intake ~ partOfDay(begin), data = bouts, ylab = "Feed intake (kg)",
+     xlab = "Time of day", main = "Default settings: start =1, nsplit=4")
```


Default settings: start =1, nsplit=4

4 Summarizing time series

We are frequently interested in summarising events by an hour, day, week or a month. Say how many times a cow has visited the feeding trough during the day or what is the hourly sum of the feed intake for each animal. Animal provides functions to calculate these things easily with functions `hourly, daily, weekly and monthly`.[3]

The basic syntax for all functions is similar: We need to specify the data vector we want to analyze, the time stamps for the data in POSIXct format, the summarizing function and optionally the subject.
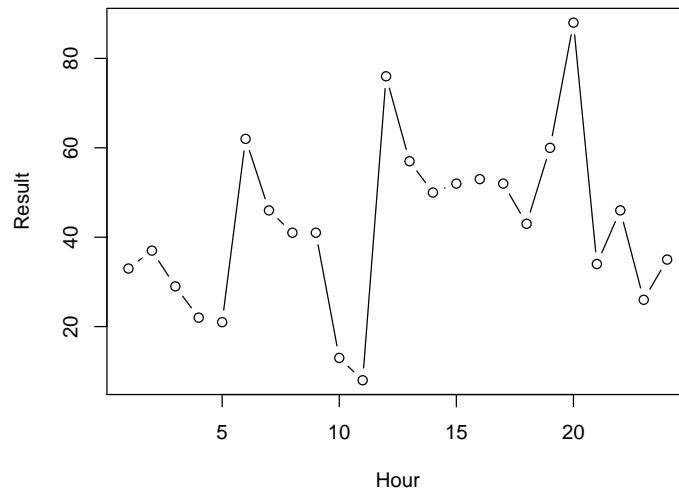
For instance, we are intersted in what is the hourly (*summarized according to the start time of feeding event*) number of visits in the dataset **bouts** (created in RIC data chapter).

```
> attach(bouts)
> hourly.visits <- hourly(intake, begin, fun = length)
> head(hourly.visits)

  Hour Result
1    1     33
2    2     37
3    3     29
4    4     22
5    5     21
6    6     62

> plot(Result ~ Hour, data = hourly.visits, type = "b")
```

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[3]These are just simple wrapper functions to aggregate, but I feel these are easier to remember and more convinient in frequent use
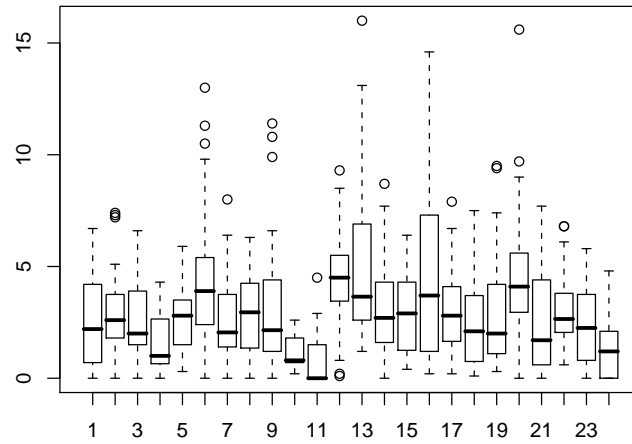
Similarly we can summarize the hourly intake for each cow:

```
> cow.intake <- hourly(intake, begin, fun = sum, subject = cowID)
> head(cow.intake)

  Hour Subject Result
1    1     320    2.6
2    4     320    2.9
3    6     320    9.8
4    8     320    1.0
5    9     320    3.8
6   11     320    4.5

> boxplot(Result ~ Hour, data = cow.intake)
> detach(bouts)
```

References

[1] Hänninen, L. & Pastell, M. 2009. CowLog: Open source software for coding behaviors from digital video. Behavior Research Methods. 41(2), 472-476.