

Package ‘sleepr’

November 23, 2017

Title Analyse Activity and Sleep Behaviour

Date 2017-08-17

Version 0.0.0.9000

Description Use behavioural variables to score activity and infer sleep from bouts of immobility.

Depends R (>= 3.00),
behavr

Imports data.table

Suggests testthat,
covr,
knitr

License GPL-3

Encoding UTF-8

LazyData true

URL <https://github.com/rethomics/sleepr>

BugReports <https://github.com/rethomics/sleepr/issues>

RoxygenNote 6.0.1

Roxygen list(markdown = TRUE)

R topics documented:

| | |
|----------------------------|----------|
| bout_analysis | 2 |
| motion_detectors | 3 |
| sleep_annotation | 4 |
| Index | 6 |

| | |
|---------------|--|
| bout_analysis | <i>Find "bouts" in categorical time series</i> |
|---------------|--|

Description

This function is used to find contiguous regions of unique value in a – potentially irregular/heterogeneous – univariate categorical time series.

Usage

```
bout_analysis(var, data)
```

Arguments

| | |
|------|---|
| var | name of the variable to use from data |
| data | data.table containing behavioural variable from or one multiple animals. When it has a key, unique values, are assumed to represent unique individuals (e.g. in a behavr table). Otherwise, it analysis the data as coming from a single animal. data must have a column t representing time. |

Value

an object of the same type as data (i.e. [data.table::data.table](#) or [behavr::behavr](#)). Each row is a specific bout characterised by three columns.

- t – its *onset*
- duration – its length
- <var> – a column with the same name as var. The value of var for this bout.

See Also

[todo](#)

Examples

```
#TODO
```

| | |
|------------------|---|
| motion_detectors | <i>Motion detector for Ethoscope data</i> |
|------------------|---|

Description

Defines whether a *single animal* is moving according to:

Usage

```
max_velocity_detector(data, time_window_length,
    velocity_correction_coef = 0.003, masking_duration = 6)

max_velocity_detector_legacy(data, velocity_threshold = 0.006)

virtual_beam_cross_detector(data, time_window_length)
```

Arguments

| | |
|--------------------------|--|
| data | data.table::data.table containing behavioural variables of <i>a single animal</i> (no id). It must have the columns xy_dist_log10x1000(for computing subpixel velocity), x(beam cross), t and has_interacted (whether a stimulus was delivered). |
| time_window_length | number of seconds to be used by the motion classifier. This corresponds to the sampling period of the output data. |
| velocity_correction_coef | an empirical coefficient to correct velocity with respect to variable framerate. |
| masking_duration | number of second during which any movement is ignored (velocity is set to 0) after a stimulus is delivered (aka interaction). |
| velocity_threshold | uncorrected velocity above which an animal is classified as ‘moving’ (for the legacy version). |

Details

- Validated and corrected subpixel velocity ([max_velocity_detector](#)), the most rigorous
- Uncorrected subpixel velocity ([max_velocity_detector_legacy](#))
- Crossing a virtual beam in the middle of the region of interest ([virtual_beam_cross_detector](#))

[max_velocity_detector](#) is the default movement classification for real-time ethoscope experiments. It is benchmarked against human-generated ground truth.

These functions are *rarely called directly*, but typically used is in the context of [sleep_annotation](#).

Value

an object of the same type as data (i.e. `data.table::data.table` or `behavr::behavr`) with additional columns:

- `moving` Logical, TRUE iff. motion was detected.
- `beam_crosses` The number of beam crosses (when the animal crosses $x = 0.5$ – that is the midpoint of the region of interest) within the time window
- `max_velocity` The maximal velocity within the time window. The resulting data is sampled at a period equals to `time_window_length`.

See Also

TODO

- [sleep_annotation](#) – which requires a motion detector

| | |
|------------------|--|
| sleep_annotation | <i>Score sleep behaviour from immobility</i> |
|------------------|--|

Description

This function first uses a motion classifier to decide whether an animal is moving during a given time window. Then, it defines sleep as contiguous immobility for a minimal duration.

Usage

```
sleep_annotation(data, time_window_length = 10, min_time_immobile = 300,
  motion_detector_FUN = max_velocity_detector, ...)
```

```
sleep_dam_annotation(data, time_window_length = 60, min_time_immobile = 300)
```

Arguments

| | |
|----------------------------------|--|
| <code>data</code> | <code>data.table</code> containing behavioural variable from or one multiple animals. When it has a key, unique values, are assumed to represent unique individuals (e.g. in a <code>behavr</code> table). Otherwise, it analysis the data as coming from a single animal. data must have a column <code>t</code> representing time. |
| <code>time_window_length</code> | number of seconds to be used by the motion classifier. This corresponds to the sampling period of the output data. |
| <code>min_time_immobile</code> | Minimal duration (in s) of a sleep bout. Immobility bouts longer or equal to this value are considered as sleep. |
| <code>motion_detector_FUN</code> | function used to classify movement |
| <code>...</code> | extra arguments to be passed to <code>motion_classifier_FUN</code> . |

Details

The default `time_window_length` is 300 seconds also known as the "5 minute rule". `sleep_annotation` is typically used for ethoscope data, whilst `sleep_dam_annotation` only works on DAM2 data. These functions are *rarely used directly*, but rather passed as an argument to a data loading function, so that analysis can be performed on the go.

Value

a [behavr](#) table similar to data with additional variables/annotations (i.e. moving and asleep). The resulting data will only have one data point every `time_window_length` seconds.

See Also

- [motion_detectors](#) – options for the `motion_detector_FUN` argument
- [bout_analysis](#) – to further analyse sleep bouts in terms of onset and length

Examples

```
#todo
```

Index

behavr, [2](#), [4](#), [5](#)
behavr::behavr, [2](#), [4](#)
bout_analysis, [2](#), [5](#)

data.table, [2](#), [4](#)
data.table::data.table, [2-4](#)

max_velocity_detector, [3](#)
max_velocity_detector
 (motion_detectors), [3](#)
max_velocity_detector_legacy, [3](#)
max_velocity_detector_legacy
 (motion_detectors), [3](#)
motion_detectors, [3](#), [5](#)

sleep_annotation, [3](#), [4](#), [4](#)
sleep_dam_annotation
 (sleep_annotation), [4](#)

virtual_beam_cross_detector, [3](#)
virtual_beam_cross_detector
 (motion_detectors), [3](#)