

Package ‘pawacc’

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Type Package

Title Physical Activity with Accelerometers

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Depends R (>= 3.0.0)

Imports stats, utils, graphics, SparseM

Description This is a collection of functions to process, format and store accelerometer data.

License GPL (>= 2)

URL <https://CRAN.R-project.org/package=pawacc>

LazyLoad yes

NeedsCompilation no

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pawacc-package	<i>Physical Activity with Accelerometers</i>
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Description

This package provides processing and summary functions.

Details

Package:	pawacc
Type:	Package
Version:	1.2.2
Date:	2017-02-20
License:	GPL (>= 2)
LazyLoad:	yes

Author(s)

Marco Geraci

Maintainer: Marco Geraci <m.geraci@ucl.ac.uk>

References

Geraci M, Rich C, Sera F, Cortina-Borja M, Griffiths LJ, and Dezateux C (2012). Technical report on accelerometry data processing in the Millennium Cohort Study. London, UK: University College London. Available at <http://discovery.ucl.ac.uk/1361699>

aggAccFile	<i>Aggregate Accelerometry Data</i>
------------	-------------------------------------

Description

This function aggregates count values

Usage

```
aggAccFile(object, by, which = "counts",  
x = NULL, keep.error = FALSE)
```

Arguments

object	an object of class accfile.
by	epoch by which count and steps are aggregated. Note: it cannot be less than the accelerometer epoch (object\$info\$epoch).
which	either 'counts' or 'steps' for gt1m files or one of c('x', 'y', 'z', 'steps') for gt3x files.
x	optional argument. If NULL, this is set to counts.
keep.error	logical flag. Should errors be omitted?

Value

outcome	aggregated values
ts_agg	time stamping

Author(s)

Marco Geraci

References

Geraci M, Rich C, Sera F, Cortina-Borja M, Griffiths LJ, and Dezaux C (2012). Technical report on accelerometry data processing in the Millennium Cohort Study. London, UK: University College London. Available at <http://discovery.ucl.ac.uk/1361699>

See Also

[collapse.accfile](#)

Examples

```
data(gt1m_sample)  
  
# aggregate by 30-second epochs  
aggAccFile(gt1m_sample, by = 30)  
  
# aggregate by 5-minute epochs  
aggAccFile(gt1m_sample, by = 300, keep.error = FALSE)
```

collapse.accfile *Collapse raw accelerometer files into a summary dataset*

Description

This function collapses accelerometer data into a dataframe with summary statistics.

Usage

```
collapse(...)
## S3 method for class 'accfile'
collapse(object, which = "counts", palist = list(value = c(0, 100, 1000, 5000, 13000),
rescale.epoch = 60, labels = NULL, extreme = NULL), mwlist = list(value = 20,
nz = 0, rescale.epoch = 60), collapse.by = "%Y-%m-%d", collapse.epoch = 60, aggregate.by =
NULL, FUN.list = list(mean = function(x) mean(x, na.rm = TRUE)),
keep.extreme = FALSE, keep.error = FALSE, ...)
```

Arguments

object	an object of class <code>gt1m</code> .
which	either 'counts' or 'steps' for <code>gt1m</code> files or one of <code>c('x', 'y', 'z', 'steps')</code> for <code>gt3x</code> files.
palist	list of arguments for markpa.accfile .
mwlist	list of arguments for markwear.accfile .
collapse.by	dataset aggregation level. See argument format from strptime for options and details below.
collapse.epoch	epoch by which time spent in different physical activity modes is summarized. See details.
aggregate.by	pre-collapsing aggregation level for accelerometer values. See argument format from strptime for options.
FUN.list	a named list of functions. See fun.collapse .
keep.extreme	logical flag. If FALSE (default) extreme values will be replaced by NAs. See markpa.accfile .
keep.error	logical flag. If FALSE (default) data errors as identified by errorChk will be replaced by NAs.
...	arguments for dateSummary .

Value

A data frame containing the following variables

collapse.by	aggregation factor
fileid	file identifier
...	named columns according to arguments FUN and labels of palist

Author(s)

Marco Geraci

References

Geraci M, Rich C, Sera F, Cortina-Borja M, Griffiths LJ, and Dezaux C (2012). Technical report on accelerometry data processing in the Millennium Cohort Study. London, UK: University College London. Available at <http://discovery.ucl.ac.uk/1361699>

See Also

[markpa.accfile](#), [markwear.accfile](#), [fun.collapse](#)

Examples

```
## Not run:

data(gt1m_sample)

collapse(gt1m_sample, palist = list(value = c(0, 100, 2000, 4000, 11000),
rescale.epoch = 60, labels = c("sedentary", "light", "moderate", "vigorous", "extreme_values"),
extreme = "last"), mwlist = list(value = 20,
nz = 0), collapse.by = "%Y-%m-%d", collapse.epoch = 60,
FUN.list = list(mean = function(x) round(mean(x, na.rm = TRUE), 2)),
keep.extreme = FALSE, keep.error = FALSE)
$outcome
  collapse.by fileid outcome.mean sedentary light moderate vigorous
1 2011-12-08 test 117.63 293.75 243.75 29.75 4.00
2 2011-12-09 test 157.83 349.75 143.25 33.50 24.50
3 2011-12-10 test 79.75 468.25 177.25 24.25 6.25
4 2011-12-11 test 57.96 355.50 126.00 8.50 3.25
5 2011-12-12 test 70.05 455.50 157.25 19.50 6.00
6 2011-12-13 test 72.99 475.50 181.50 15.25 8.00
7 2011-12-14 test 79.94 476.25 210.50 20.25 8.50
8 2011-12-15 test 232.50 0.00 0.50 0.00 0.00
9 2011-12-16 test NaN 0.00 0.00 0.00 0.00
  extreme_values non-wear
1 0.00 388.75
2 6.00 883.00
3 0.50 763.50
4 0.25 946.50
5 0.00 801.75
6 0.25 759.50
7 1.50 723.00
8 0.00 1439.50
9 0.00 187.50

$call
collapse.accfile(object = gt1m_sample, palist = list(value = c(0,
100, 2000, 4000, 11000), rescale.epoch = 60, labels = c("sedentary",
"light", "moderate", "vigorous", "extreme_values"), extreme = "last"),
mwlist = list(value = 20, nz = 0), collapse.by = "
```

```

collapse.epoch = 60, FUN.list = list(mean = function(x) round(mean(x,
  na.rm = TRUE), 2)), keep.extreme = FALSE, keep.error = FALSE)

attr("class")
[1] "accfile.collapse"
Warning message:
In collapse.accfile(gt1m_sample, palist = list(value = c(0, 100, :
  NAs imputed where extreme counts found

## End(Not run)

## Not run:

collapse(gt1m_sample, palist = list(value = c(0, 100, 2000, 4000, 11000),
rescale.epoch = 60, labels = c("sedentary", "light", "moderate", "vigorous", "extreme_values"),
extreme = "last"), mwlist = list(value = 20,
nz = 0), collapse.by = "%Y-%m-%d", collapse.epoch = 60,
FUN.list = list(mean = function(x) round(mean(x, na.rm = TRUE), 2),
sd = function(x) round(sd(x, na.rm = TRUE), 2),
"95th" = function(x) round(quantile(x, probs = .95, na.rm = TRUE), 2)),
keep.extreme = TRUE, keep.error = FALSE)
$outcome
  collapse.by fileid outcome.mean outcome.sd outcome.95th sedentary light
1 2011-12-08 test      117.63    216.12      529.40    293.75 243.75
2 2011-12-09 test      201.10    567.65    1085.60    349.75 143.25
3 2011-12-10 test       81.97    221.33     465.50    468.25 177.25
4 2011-12-11 test       59.80    172.08     320.35    355.50 126.00
5 2011-12-12 test       70.05    188.49     401.00    455.50 157.25
6 2011-12-13 test       74.08    207.55     386.85    475.50 181.50
7 2011-12-14 test       87.42    275.27     415.30    476.25 210.50
8 2011-12-15 test      232.50    222.74     374.25      0.00  0.50
9 2011-12-16 test        NaN         NA         NA      0.00  0.00
  moderate vigorous extreme_values non-wear
1    29.75     4.00      0.00    388.75
2    33.50    24.50      6.00    883.00
3    24.25     6.25      0.50    763.50
4     8.50     3.25      0.25    946.50
5    19.50     6.00      0.00    801.75
6    15.25     8.00      0.25    759.50
7    20.25     8.50      1.50    723.00
8     0.00     0.00      0.00   1439.50
9     0.00     0.00      0.00    187.50

$call
collapse.accfile(object = gt1m_sample, palist = list(value = c(0,
  100, 2000, 4000, 11000), rescale.epoch = 60, labels = c("sedentary",
  "light", "moderate", "vigorous", "extreme_values"), extreme = "last"),
mwlist = list(value = 20, nz = 0), collapse.by = "
collapse.epoch = 60, FUN.list = list(mean = function(x) round(mean(x,
  na.rm = TRUE), 2), sd = function(x) round(sd(x, na.rm = TRUE),
  2), `95th` = function(x) round(quantile(x, probs = 0.95,
  na.rm = TRUE), 2)), keep.extreme = TRUE, keep.error = FALSE)

```

```
attr(,"class")
[1] "accfile.collapse"

## End(Not run)
```

dateSummary

Date summary for accelerometer files

Description

This function provides a date summary for Actigraph GT1M accelerometer files.

Usage

```
dateSummary(object, wear, timestamp, minval = 0,
  rescale.epoch = 60, keep.error = FALSE)
```

Arguments

object	an object of class <code>gt1m</code> .
wear	a vector that classifies wear and non-wear time. See markwear.accfile .
timestamp	a timestamp vector for accelerometer values that can be provided by <code>tsFormat</code> .
minval	threshold defining the minimum number of minutes to identify first and last days. See details.
rescale.epoch	epoch expressed in the same unit as accelerometer's epoch to determine minutes of wear time (default is 60 and assumed to be in seconds).
keep.error	logical flag. If FALSE (default) data errors as identified by <code>errorChk</code> will be replaced by NAs.

Details

Based on total wear time (in minutes) for each day, the threshold `minval` is applied to identify the first and last days. For example, if accelerometers are sent by post to collect survey data, the first and last days in which the accelerometer was worn might not be known. Days before the first and those after the last day (truncated days) are discarded by [collapse.accfile](#).

Value

A data frame containing the following variables

fileid	file identifier
days	dates by calendar day
freq	frequency of accelerometer observations in each day
hour_day	total hours of accelerometer observations in each day

start_day	starting time of accelerometer observations
end	end time of accelerometer observations
valid_mins	wear time (minutes)
IsStartDate	dummy variable to define starting date (1 = yes)
IsEndDate	dummy variable to define end date (1 = yes)
IsTruncated	dummy variable to define truncated date (1 = yes)

Author(s)

Marco Geraci

References

Geraci M, Rich C, Sera F, Cortina-Borja M, Griffiths LJ, and Dezaux C (2012). Technical report on accelerometry data processing in the Millennium Cohort Study. London, UK: University College London. Available at <http://discovery.ucl.ac.uk/1361699>

See Also

[collapse.accfile](#)

Examples

```
data(gt1m_sample)

mw <- markwear.accfile(gt1m_sample, 20)
tsf <- tsFormat(gt1m_sample)
dateSummary(gt1m_sample, mw, tsf)
## Not run:
  fileid      days freq hour_day start_day end_day valid_mins IsStartDate
1  test 2011-12-08 3840  16.000      08     23     571.25      1
2  test 2011-12-09 5760  24.000      00     23     557.00      0
3  test 2011-12-10 5760  24.000      00     23     676.50      0
4  test 2011-12-11 5760  24.000      00     23     493.50      0
5  test 2011-12-12 5760  24.000      00     23     638.25      0
6  test 2011-12-13 5760  24.000      00     23     680.50      0
7  test 2011-12-14 5760  24.000      00     23     717.00      0
8  test 2011-12-15 5760  24.000      00     23         0.50      0
9  test 2011-12-16  750   3.125      00     03         0.00      0
  IsEndDate IsTruncated
1         0         0
2         0         0
3         0         0
4         0         0
5         0         0
6         0         0
7         0         0
8         0         0
9         1         0
```



```
## End(Not run)

# at least 600 minutes per day to determine first and last day
dateSummary(gt1m_sample, mw, tsf, minval = 600)
## Not run:
  fileid      days freq hour_day start_day end_day valid_mins IsStartDate
1  test 2011-12-08 3840  16.000      08      23      571.25      0
2  test 2011-12-09 5760  24.000      00      23      557.00      0
3  test 2011-12-10 5760  24.000      00      23      676.50      1
4  test 2011-12-11 5760  24.000      00      23      493.50      0
5  test 2011-12-12 5760  24.000      00      23      638.25      0
6  test 2011-12-13 5760  24.000      00      23      680.50      0
7  test 2011-12-14 5760  24.000      00      23      717.00      0
8  test 2011-12-15 5760  24.000      00      23         0.50      0
9  test 2011-12-16  750   3.125      00      03         0.00      0
  IsEndDate IsTruncated
1         0         1
2         0         1
3         0         0
4         0         0
5         0         0
6         0         0
7         1         0
8         0         1
9         0         1

## End(Not run)
```

errorChk

Perform error checking

Description

These functions look for errors in the data. A code is returned.

Usage

```
errorChk(x, fault = 32767)
```

Arguments

x vector of accelerometer data.

fault numerical value that indicates voltage signal saturation (temporarily used for both accelerometer counts and steps).

Details

Error coded are as follow: 0, no error; 1, all values are 5-digit values or all one value; 2, negative values; 3, NAs.

Value

a vector of the same length as `x`.

Author(s)

Marco Geraci

References

Geraci M, Rich C, Sera F, Cortina-Borja M, Griffiths LJ, and Dezaux C (2012). Technical report on accelerometry data processing in the Millennium Cohort Study. London, UK: University College London. Available at <http://discovery.ucl.ac.uk/1361699>

See Also

[gt1mAccFile](#), [gt3xAccFile](#)

fun.collapse

Summary statistics

Description

Accessory function for collapsing accelerometer files.

Usage

```
fun.collapse(x, fun = list(mean = function(x) mean(x, na.rm = TRUE),
median = function(x) median(x, na.rm = TRUE),
sd = function(x) sd(x, na.rm = TRUE)))
```

Arguments

`x` numeric vector.
`fun` named list of functions to be applied to `x`.

Value

a list of named values of the same length as `fun`.

Author(s)

Marco Geraci

References

Geraci M, Rich C, Sera F, Cortina-Borja M, Griffiths LJ, and Dezaux C (2012). Technical report on accelerometry data processing in the Millennium Cohort Study. London, UK: University College London. Available at <http://discovery.ucl.ac.uk/1361699>

See Also

[collapse.accfile](#)

gt1mAccDir	<i>Read list of accelerometer files</i>
------------	---

Description

This function reads a list of Actigraph GT1M accelerometer files.

Usage

```
gt1mAccDir(accFileList, save, compress = "gzip",  
compression_level = 6, progbar = TRUE)
```

Arguments

accFileList	an object of type list.
save	either logical or character. See readAccDir for details.
compress	logical or character string specifying whether saving to a named file is to use compression if save = TRUE. See argument compress in save .
compression_level	integer: the level of compression to be used. See argument compression_level in save .
progbar	logical flag. Should a progress bar be used? Available for Windows only.

Value

An object of class `acclist`.

Author(s)

Marco Geraci

References

Actigraph (Pensacola, Florida).
Geraci M, Rich C, Sera F, Cortina-Borja M, Griffiths LJ, and Dezateux C (2012). Technical report on accelerometry data processing in the Millennium Cohort Study. London, UK: University College London. Available at <http://discovery.ucl.ac.uk/1361699>

See Also

[readAccDir](#)

 gt1mAccFile

Read a single accelerometer file

Description

This function reads an Actigraph GT1M accelerometer file.

Usage

```
gt1mAccFile(file, path, fileid, counts.pos = 1,
            tz = "Europe/London", sparse = FALSE,
            fault = 32767)
```

Arguments

file	file name including file extension.
path	path to file.
fileid	label for file identifier.
counts.pos	when storage mode allows for accelerometer counts and steps to be recorded at the same time, this argument specifies the position of first measurement of accelerometer counts (default is counts.pos = 1).
tz	a character string specifying the timezone to be used for the conversion (see strptime).
sparse	logical flag: should data be stored in sparse format?
fault	numerical value that indicates voltage signal saturation.

Details

Raw accelerometer data are processed according to the device data format. Several data checks are performed by [errorChk](#) and [infoDate](#). An additional check is performed on the length of the sequence of measurements when both accelerometer counts and steps are recorded. If the length is odd, a warning message is produced. See file 'gt1m_sample.dat' in directory 'inst\extdata' of this package.

Value

These functions return an object of two [classes](#): `accfile` and additional device-specific class (i.e., `gt1m`).

An object of class `accfile` is a list containing the following components:

df	A data.frame object with accelerometer values in columns counts and steps (if present), and coded error for each accelerometer data column. See errorChk for error codes. If sparse = TRUE, all variables of the data frame df are returned as vectors of a matrix in sparse format (see as.matrix.csr for details).
----	--

info	A <code>data.frame</code> object with file identifier (<code>fileid</code>), device serial number (<code>serial</code>), number of recorded measurements (<code>nobs</code>), epoch (<code>epoch</code>), accelerometer mode (<code>mode</code>), start date and time (<code>ts_start</code>), time zone (<code>tz</code>), battery voltage (<code>voltage</code>), download date and time (<code>ts_dl</code>).
error_summary	A <code>list</code> object with file identifier (<code>fileid</code>), summary tables of error codes for each accelerometer data column, error code for date (<code>date</code>), and logical flag for odd number of measurements (<code>odd_number</code>) (see details).

Author(s)

Marco Geraci

References

Actigraph (Pensacola, Florida).

Geraci M, Rich C, Sera F, Cortina-Borja M, Griffiths LJ, and Dezateux C (2012). Technical report on accelerometry data processing in the Millennium Cohort Study. London, UK: University College London. Available at <http://discovery.ucl.ac.uk/1361699>

See Also

[readAccDir](#), [gt1mAccDir](#)

Examples

```
data(gt1m_sample)
class(gt1m_sample)
```

gt1m_sample	<i>GT1M accelerometer file</i>
-------------	--------------------------------

Description

This is the output of [gt1mAccFile](#).

Format

See value in [gt1mAccFile](#). The 'raw' file 'gt1m_sample.dat' can be found in the directory 'inst\extdata' of this package.

Source

Actigraph (Pensacola, Florida).

Examples

```
## Not run:
gt1m_sample <- gt1mAccFile("gt1m_sample.dat", path = "", fileid = "test")
gt1m_sample
  fileid serial  nobs epoch mode      ts_start tz voltage      ts_dl
1  test  xxxxx 44910   15    1 2011-12-08 08:00:00 GMT    3.76 2011-12-24 11:20:36

## End(Not run)
```

gt3xAccDir *Read list of accelerometer files*

Description

This function reads a list of Actigraph GT3X accelerometer files.

Usage

```
gt3xAccDir(accFileList, save, compress = "gzip",
compression_level = 6, progbar = TRUE)
```

Arguments

accFileList an object of type list.

save either logical or character. See [readAccDir](#) for details.

compress logical or character string specifying whether saving to a named file is to use compression if save = TRUE. See argument compress in [save](#).

compression_level integer: the level of compression to be used. See argument compression_level in [save](#).

progbar logical flag. Should a progress bar be used? Available for Windows only.

Value

An object of class acclist.

Author(s)

Marco Geraci

References

Actigraph (Pensacola, Florida).

See Also

[readAccDir](#)

gt3xAccFile

*Read a single accelerometer file***Description**

This function reads Actigraph GT3X and ActiSleep accelerometer files.

Usage

```
gt3xAccFile(file, path, fileid, tz = "Europe/London",
            sparse = FALSE, fault = 32767)
```

Arguments

file	file name including file extension.
path	path to file.
fileid	label for file identifier.
tz	a character string specifying the timezone to be used for the conversion (see strptime).
sparse	logical flag: should data be stored in sparse format?
fault	numerical value that indicates voltage signal saturation.

Details

Raw accelerometer data are processed according to the device data format. See file 'gt3x_sample.dat' in directory '\inst\extdata' of this package.

Value

These functions return an object of two **classes**: `accfile` and additional device-specific class (i.e., `gt3x`).

An object of class `accfile` is a list containing the following components:

df	A data.frame object with accelerometer values in columns y, x, z, and steps (if present), and coded error for each accelerometer data column. See <code>errorChk</code> for error codes. If <code>sparse = TRUE</code> , all variables of the data frame <code>df</code> are returned as vectors of a matrix in sparse format (see <code>as.matrix.csr</code> for details).
info	A data.frame object with file identifier (<code>fileid</code>), device serial number (<code>serial</code>), number of recorded measurements (<code>nobs</code>), epoch (<code>epoch</code>), accelerometer mode (<code>mode</code>), start date and time (<code>ts_start</code>), time zone (<code>tz</code>), battery voltage (<code>voltage</code>), download date and time (<code>ts_dl</code>).
error_summary	A list object with file identifier (<code>fileid</code>), summary tables of error codes for each accelerometer data column, error code for date (<code>date</code>), and logical flag for odd number of measurements (<code>odd_number</code>) (see details).

Author(s)

Marco Geraci

References

Actigraph (Pensacola, Florida).

Geraci M, Rich C, Sera F, Cortina-Borja M, Griffiths LJ, and Dezateux C (2012). Technical report on accelerometry data processing in the Millennium Cohort Study. London, UK: University College London. Available at <http://discovery.ucl.ac.uk/1361699>

See Also

[readAccDir](#)

Examples

```
data(gt3x_sample)
class(gt3x_sample)
```

gt3x_sample

GT3X accelerometer file

Description

This is the output of [gt3xAccFile](#).

Format

See value in [gt3xAccFile](#). The 'raw' file 'gt3x_sample.dat' can be found in the directory '`\inst\extdata`' of this package.

Source

Actigraph (Pensacola, Florida).

Examples

```
## Not run:
gt3x_sample <- gt3xAccFile("gt3x_sample.dat", path = "", fileid = "test")
gt3x_sample
  fileid serial nobx epoch mode      ts_start tz voltage      ts_dl
1  test  xxxxx 2676    1  13 2009-03-03 10:40:00 GMT    4.09 2009-03-03 11:24:49

## End(Not run)
```

markbouts.acclist *Classify accumulation of physical activity in bouts*

Description

This function identifies bouts of physical activity using user-defined breakpoints for accelerometer counts.

Usage

```
markbouts(object, value, which = "counts", bts = c(0, 10, 20, Inf), rescale.epoch = 60,
collapse.by = "%Y-%m-%d", value.labels = NULL, bouts.labels = NULL,
extreme = NULL, keep.error = FALSE, progbar = TRUE)
## S3 method for class 'acclist'
markbouts(object, value, which = "counts", bts = c(0, 10, 20, Inf), rescale.epoch = 60,
collapse.by = "%Y-%m-%d", value.labels = NULL, bouts.labels = NULL,
extreme = NULL, keep.error = FALSE, progbar = TRUE)
## S3 method for class 'accfile'
markbouts(object, value, which = "counts", bts = c(0, 10, 20, Inf), rescale.epoch = 60,
collapse.by = "%Y-%m-%d", value.labels = NULL, bouts.labels = NULL,
extreme = NULL, keep.error = FALSE, progbar = NULL)
```

Arguments

object	an object of class <code>acclist</code> or <code>accfile</code> .
value	vector of breaks to define physical activity modes. The lowest breakpoint must be 0.
which	either 'counts' or 'steps' for <code>gt1m</code> files or one of <code>c('x', 'y', 'z', 'steps')</code> for <code>gt3x</code> files.
bts	vector of breaks to define bouts duration (in minutes).
rescale.epoch	epoch expressed in the same unit as accelerometer's epoch to determine multiplier to rescale value (default is 60). See details.
collapse.by	dataset aggregation level. See argument format from strptime for options and details below.
value.labels	labels for physical activity modes.
bouts.labels	labels for bouts duration categories (NULL is recommended).
extreme	
keep.error	logical flag. If FALSE (default) data errors as identified by errorChk will be replaced by NAs.
progbar	logical flag. Should a progress bar be used? Available for Windows only. Argument not used for class <code>accfile</code> .

Details

Breakpoints are specified as counts per seconds using `value`. If the epoch used for `value` is different from the accelerometer's epoch, a rescaling is applied. E.g., if epoch is 15 seconds and breakpoints are expressed as counts per 60 seconds, `value` is divided by $60/15 = 4$. There can be n physical activity modes at maximum, where n is the length of `value`.

The argument `extreme` is `NULL` by default. Use either 'last' to select the last category or the category number 1 to n .

Value

The function `markbouts.acclist` returns duration, frequency and mean duration of bouts by bout category, physical activity mode and T levels of collapse.by (e.g., day) in array of dimension $c(\text{length}(\text{bts}) - 1, \text{length}(\text{value}) + 1, 3, T)$. `markbouts.acclist` is applied to objects of class `acclist`, in which case a list of arrays of the same length as the number of accelerometer files in object is returned.

Author(s)

Marco Geraci

See Also

[readAccDir](#)

markpa.acclist

Classify mode of physical activity

Description

This function identifies modes of physical activity using user-defined breakpoints for accelerometer counts.

Usage

```
markpa(object, value, which = "counts", rescale.epoch = 60, labels = NULL,
extreme = NULL, keep.error = FALSE, progbar = TRUE)
## S3 method for class 'acclist'
markpa(object, value, which = "counts", rescale.epoch = 60, labels = NULL,
extreme = NULL, keep.error = FALSE, progbar = TRUE)
## S3 method for class 'accfile'
markpa(object, value, which = "counts", rescale.epoch = 60, labels = NULL,
extreme = NULL, keep.error = FALSE, progbar = NULL)
```

Arguments

object	an object of class <code>acclist</code> or <code>accfile</code> .
value	vector of breaks to define physical activity modes. The lowest breakpoint must be 0.
which	either 'counts' or 'steps' for <code>gt1m</code> files or one of <code>c('x', 'y', 'z', 'steps')</code> for <code>gt3x</code> files.
rescale.epoch	epoch expressed in the same unit as accelerometer epoch to determine multiplier to rescale value (default is 60). See details.
labels	labels for physical activity modes.
extreme	if value includes a threshold for defining the category of extreme values, this argument identifies such category among the physical activity modes defined by value. See details.
keep.error	logical flag. If FALSE (default) data errors as identified by <code>errorChk</code> will be replaced by NAs.
progbar	logical flag. Should a progress bar be used? Available for Windows only. Argument not used for class <code>accfile</code> .

Details

Breakpoints are specified as counts per seconds using `value`. If the epoch used for `value` is different from the accelerometer epoch, a rescaling is applied. E.g., if epoch is 15 seconds and breakpoints are expressed as counts per 60 seconds, `value` is divided by $60/15 = 4$. There can be n physical activity modes at maximum, where n is the length of `value`.

The argument `extreme` is NULL by default. Use either 'last' to select the last category or the category number 1 to n .

Value

If `object` is of class `acclist`, a list of factors of the same length as the number of accelerometer files in `object`. If `object` is of class `accfile`, a single factor will be given. The number of levels is equal to `length(value) + 1`.

Author(s)

Marco Geraci

See Also

[readAccDir](#)

markwear.acclist *Classify wear and non-wear time*

Description

This functions identifies sequences of zeroes of a given length to classify wear and non-wear time in accelerometer data files.

Usage

```
markwear(object, value, which = "counts", rescale.epoch = 60,
nz = 0, keep.error = FALSE, progbar = TRUE)
## S3 method for class 'acclist'
markwear(object, value, which = "counts", rescale.epoch = 60,
nz = 0, keep.error = FALSE, progbar = TRUE)
## S3 method for class 'accfile'
markwear(object, value, which = "counts", rescale.epoch = 60,
nz = 0, keep.error = FALSE, progbar = NULL)
```

Arguments

object	an object of class <code>acclist</code> or <code>accfile</code> .
value	the length of the time window (in minutes) which contains zero values.
which	either 'counts' or 'steps' for <code>gt1m</code> files or one of <code>c('x', 'y', 'z', 'steps')</code> for <code>gt3x</code> files.
rescale.epoch	epoch expressed in the same unit as accelerometer epoch to determine multiplier to rescale value (default is 60). See details.
nz	the length of the time window (in minutes) of non-zero value sequences allowed between every two sequences of zero values.
keep.error	logical flag. If FALSE (default) data errors as identified by <code>errorChk</code> will be replaced by NAs.
progbar	logical flag. Should a progress bar be used? Available for Windows only. Argument not used for class <code>accfile</code> .

Details

The accelerometer epoch is assumed to be expressed in seconds. Therefore value is automatically rescaled to $\text{value} * 60 / \text{object}\$\text{info}\$\text{epoch}$.

Value

If object is of class `acclist`, a list of factors with two levels of the same length as the number of accelerometers files in object. If object is of class `accfile`, a single factor will be given. Levels are 'non-wear' and 'wear'.

Author(s)

Marco Geraci

References

Geraci M, Rich C, Sera F, Cortina-Borja M, Griffiths LJ, and Dezateux C (2012). Technical report on accelerometry data processing in the Millennium Cohort Study. London, UK: University College London. Available at <http://discovery.ucl.ac.uk/1361699>

See Also[readAccDir](#)**Examples**

```
## Not run:

data(gt1m_sample)

# 20-minute threshold
wear <- markwear(gt1m_sample, value = 20)
> table(wear)
wear
  Non-wear   Wear
    27572   17338

## End(Not run)

## Not run:

# lower threshold
wear <- markwear(gt1m_sample, value = 5)
> table(wear)
wear
  Non-wear   Wear
    30188   14722

## End(Not run)

## Not run:

# allow for some non-zero values within a 20-minute window
wear <- markwear.accfile(gt1m_sample, value = 20, nz = 2)
> table(wear)
wear
  Non-wear   Wear
    28198   16712

## End(Not run)
```

plot.gt1m

*Plot accelerometer file***Description**

These functions plot data from Actigraph GT1M and GT3X accelerometer files.

Usage

```
## S3 method for class 'gt1m'
plot(x, y = NULL, xlab, ylab, main,
     keep.error = TRUE, which = "counts", select = 1,...)
## S3 method for class 'gt3x'
plot(x, y = NULL, xlab, ylab, main,
     keep.error = TRUE, which = "x", select = 1,...)
```

Arguments

x	an object of class gt1m. It can be either accfile or acclist.
y	ignored.
xlab	x-axis label (optional).
ylab	y-axis label (optional).
main	main title (optional).
keep.error	logical flag. If FALSE (default) data errors as identified by <code>errorChk</code> will be replaced by NAs.
which	either 'counts' or 'steps' for gt1m files or one of c('x', 'y', 'z', 'steps') for gt3x files.
select	numeric. If class(x) is acclist, this argument specifies the corresponding position of the accelerometer file in the list (first file by default).
...	Arguments to be passed to methods, such as graphical parameters (see <code>par</code>).

Author(s)

Marco Geraci

References

Actigraph (Pensacola, Florida).

Geraci M, Rich C, Sera F, Cortina-Borja M, Griffiths LJ, and Dezateux C (2012). Technical report on accelerometry data processing in the Millennium Cohort Study. London, UK: University College London. Available at <http://discovery.ucl.ac.uk/1361699>

See Also

`plot`, `par`, `gt1mAccFile`, `gt1mAccDir`

Examples

```

data(gt1m_sample)
data(gt3x_sample)

plot(gt1m_sample, which = "counts")
plot(gt1m_sample, which = "steps")
plot(gt3x_sample, which = "x")
plot(gt3x_sample, which = "steps")

```

```
print.acclist
```

Print an accfile or acclist Object

Description

Print an object generated by [gt1mAccFile](#), [gt3xAccFile](#) or [readAccDir](#).

Usage

```

## S3 method for class 'acclist'
print(x, ...)
## S3 method for class 'accfile'
print(x, ...)

```

Arguments

x an accfile or an acclist object.
... not used.

Author(s)

Marco Geraci

```
readAccDir
```

Read content of a directory with accelerometer files

Description

This function reads raw files downloaded from accelerometers and stores them in one directory.

Usage

```

readAccDir(path, model, ext = "dat", counts.pos = 1,
tz = "Europe/London", sparse = FALSE,
fault = 32767, save = TRUE, compress = "gzip",
compression_level = 6,...)

```

Arguments

path	path to accelerometer files.
model	accelerometer model, either 'gt1m' or 'gt3x'.
ext	file extension without '.' (default is 'dat').
counts.pos	position of first measurement of accelerometer counts. See gt1mAccFile for details.
tz	a character string specifying the timezone to be used for the conversion (see strptime).
sparse	logical flag: should data be stored in sparse format?
fault	numerical value that indicates voltage signal saturation (temporarily used for both accelerometer counts and steps).
save	either logical or character. If logical, save = TRUE stores accelerometer files as .Rdata objects in a new directory ('accRfiles') in path. If the directory already exists, confirmation for overwriting will be prompted. save = FALSE stores accelerometer files in current R session. Alternatively, an existing folder can be specified.
compress	logical or character string specifying whether saving to a named file is to use compression if save = TRUE. See argument compress in save .
compression_level	integer: the level of compression to be used. See argument compression_level in save .
...	not used.

Details

This is a wrapper function. It reads raw accelerometer files stored in one directory. The argument `ext` specifies the extension of the files to look for (e.g., 'dat' or 'txt'). Files with different extension and/or sub-directories are ignored. The data format must be consistent with the specification of `model`.

Value

Either a set of .Rdata files or a [list](#) of objects of class `accfile`. In both cases, each accelerometer data file is stored as an object of type `list` and labelled using the data file name. See [gt1mAccFile](#) or [gt3xAccFile](#) for details.

Author(s)

Marco Geraci

References

Geraci M, Rich C, Sera F, Cortina-Borja M, Griffiths LJ, and Dezateux C (2012). Technical report on accelerometry data processing in the Millennium Cohort Study. London, UK: University College London. Available at <http://discovery.ucl.ac.uk/1361699>

See Also

[gt1mAccFile](#), [gt3xAccFile](#), [gt1mAccDir](#), [gt3xAccDir](#)

tsFormat

Time Stamping

Description

Time stamping.

Usage

```
tsFormat(object)
```

Arguments

object an object of class accfile.

Value

a vector of timestamps.

Author(s)

Marco Geraci

See Also

[tsFromEpoch](#)

Examples

```
data(gt1m_sample)
data(gt3x_sample)

tsFormat(gt1m_sample)
tsFormat(gt3x_sample)
```

tsFromEpoch	<i>Calculate timestamp from epoch number or epoch number from timestamp</i>
-------------	---

Description

Utility functions.

Usage

```
tsFromEpoch(object, x)
epochFromTS(object, x)
```

Arguments

object	an object of class <code>accfile</code> .
x	either an integer giving the epoch number or the timestamp in a POSIX format (e.g., <code>'%Y-%m-%d %H:%M:%S'</code>).

Value

either a timestamp corresponding to an epoch number or the epoch number corresponding to a timestamp.

Author(s)

Marco Geraci

See Also

[gt1mAccFile](#)

Examples

```
data(gt1m_sample)

tsFromEpoch(gt1m_sample, 10000)
# [1] "2011-12-10 01:39:45 GMT"

epochFromTS(gt1m_sample, as.POSIXlt(strptime('2011-12-10 01:39:45', '%Y-%m-%d %H:%M:%S')))
# [1] 10000
```

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