Package 'abf2'

March 4, 2015

Type Package

Title Load Gap-Free Axon ABF2 Files

Version 0.7-1

Date 2015-03-04

Author Matthew Caldwell

Maintainer Matthew Caldwell <m.caldwell@ucl.ac.uk>

Description Loads ABF2 files containing gap-free data from electrophysiological recordings, as created by Axon Instruments/Molecular Devices software such as pClamp 10.

License Artistic-2.0

NeedsCompilation no

Repository CRAN

Date/Publication 2015-03-04 18:39:18

R topics documented:

`abf2-package` *Load (gap-free) Axon ABF2 files*

Description

Loads electrophysiology data from Version 2 ABF files, as created by Axon Instruments/Molecular Devices software such as pClamp 10. Only files recorded in gap-free mode are currently supported.

The ABF2 loading routines are adapted from Matlab code by Forrest Collman <forrest.collman@gmail.com> and C++ code by Jakub Nowacki <http://sourceforge.net/projects/libaxon/>.

Details

Package:	abf2
Type:	Package
Version:	0.7
Date:	2013-07-17
License:	Artistic-2.0
LazyLoad:	yes

Author(s)

Matthew Caldwell <m.caldwell@ucl.ac.uk>

Examples

```
## Not run:
# load an ABF file chosen through a standard file dialog
ab <- abfload()

# print a summary of the file contents
summary(ab)

# plot it with default options (full duration of first recorded channel)
plot(ab)

# plot the first 5 seconds of the second channel
plot(ab, adc=2, time=c(0,5))

## End(Not run)
```

`abfload` *Load an ABF2 file*

Description

Loads an Axon ABF2 file. Currently only gap-free recordings are supported.

Usage

```
abfload(filename = NULL)
```

Arguments

`filename`	Name of the ABF file to load. If this is NULL (the default), invokes `file.choose()` to allow the user to select a file using the usual OS dialog.

Value

A list object of class abf2. This includes a large number of elements corresponding to fields in the ABF file header, most of which are of little interest and are not documented here (see the source code if you really care). Fields that are actually important include:

traces	A matrix with a row for each recorded signal, containing the actual signal data.
s	The time (in seconds) corresponding to each recorded sample (ie the columns) of traces.
tags	A data frame containing any tags recorded in the file, including the time, a voltage change (if relevant) and the comment string attached to the tag. For reasons of consistency, there will always be at least one voltage tag, for time 0. Note however that ABF files do not record the initial voltage, so the value of 0 associated with this tag is typically incorrect.
ADC	A list holding information about each recorded trace in the file. It should have an entry for each row in traces. Each such entry is itself a list, which again includes a lot of fields that are typically not interesting and which may actually be incorrect depending on the recording configuration. The most useful fields here are probably name and units, which contain text strings from the recording protocol that describe the signal.

Author(s)

Matthew Caldwell <m.caldwell@ucl.ac.uk>

See Also

plot.abf2, split.abf2

Examples

```
## Not run:
# either supply a filename...
ab <- abfload("yourfile.abf")

# or omit it to invoke file selection dialog
ab <- abfload()

## End(Not run)
```

---

multiplot *Plot multiple trace segments from an* abf2 *object.*

Description

Plots multiple segments from an abf2 trace together on a single plot. This can be useful for preparing figures, since all segments share the same scale. Segments are plotted from the bottom up, ie the second is plotted above the first and so on.

Usage

```
multiplot(x, adc = 1, duration = 1, start = 0, pts = 1000,
type = "s", single.col = 1, local.col = TRUE, gutter = NULL,
gutter.prop = 0.1, labels = NULL, rotate.labels = 90,
time.scale = 0.2, time.scale.label = paste(time.scale * 1000, "ms", sep = ""),
trace.scale = 5, trace.scale.label = paste(trace.scale, "pA", sep = ""),
scale.col = "grey50", xinset = NULL, xinset.prop = 1/20, ...)
```

Arguments

x	The abf2 object containing the data, as loaded by abfload.
adc	The ADC channel from which the trace data should be taken.
duration	The length of the segments, in seconds. (All plotted segments have the same duration.)
start	A vector containing the start times (in seconds) of all the segments within the ADC trace.
pts	The maximum number of points to plot for each segment. If the segment actually contains fewer samples than this, that smaller number will be plotted. If, as is more common, the segment contains many more samples, it is downsampled to this number of points.
type	The plot type (see plot). By default, traces are drawn with the stair-step style "s".
single.col	Colour to plot all trace segments with if local.col is FALSE.
local.col	Whether to plot all trace segments in the same colour, as specified with single.col, or to use a different colour for each one. The latter can be useful if the figure will be edited subsequently in a vector graphics editing program.
gutter	The vertical space to insert between trace segments. This is specified in the units of the y axis, which is often inconvenient. By default the gap is instead calculated proportionally (see gutter.prop.)
gutter.prop	The vertical gap between traces, proportional to the largest segment (ie, with the greatest vertical range). If an explicit value is provided in the gutter argument, this is ignored.
labels	Vector of labels to be drawn alongside the trace segments. The values are coerced to character, and repeated as necessary. If NULL (the default) the function will attempt to use the prevailing voltage for each segment, if that's available from the file tags.
rotate.labels	Angle at which to draw the trace label text (if any). The default (90) draws the labels parallel to the y axis.
time.scale	The length of the time (horizontal) scale bar, in seconds.
time.scale.label	A text label to draw under the time (horizontal) scale bar. Default is the specified scale bar length expressed in milliseconds.
trace.scale	Length of the trace (vertical) scale bar, in whatever units the trace is recorded in.

`trace.scale.label`
: A text label to draw alongside the trace (vertical) scale bar. Default is the specified scale bar length with the assumption that the trace data is in picoamps.

`scale.col`
: Colour in which both the scale bars and their labels will be drawn.

`xinset`
: Amount by which the plot should be offset from the left to allow space for the scale bars, in seconds. By default this is instead specified proportionally (see `xinset.prop`).

`xinset.prop`
: Amount by which the plot should be offset from the left to allow space for the scale bars, as a fraction of the overall trace width.

`...`
: Further arguments to be passed to `plot`. Note that axes and axis labels are explicitly defined by the function (as empty/absent), so including these again will generate an error.

Value

None.

Author(s)

Matthew Caldwell <m.caldwell@ucl.ac.uk>

See Also

`abfload`

Examples

```
## Not run:
# load an abf file
ab <- abfload("yourfile.abf")

# assuming there are multiple tags in the file, plot
# the 2nd second of each tagged region of channel 2
multiplot(ab, adc=2, start=ab$tags$time + 1)

## End(Not run)
```

---

plot.abf2 *Plot a trace from an* `abf2` *object.*

Description

Plots a trace of (portions of) data loaded from an ABF2 file.

Usage

```
## S3 method for class 'abf2'
plot(x, adc = 1, time = NULL, pts = 1000, type = "s",
col = 1, vtags = TRUE, ctags = TRUE, vcol = "grey", ccol = "pink",
vlty = "dotted", clty = "dashed", xlab = "Time (s)", ylab = NULL,
vText = "bottom", vtunits = FALSE, vtcol = 4, vtpad = 0.1, ...)
```

Arguments

x	An abf2 object loaded by abfload
adc	Index of the ADC channel to plot from.
time	Optional specifier of a time range to be plotted. By default the full trace is used. If a single numeric value is provided here, it specifies the end time, with the plot starting from the beginning of the trace. Otherwise the trace is plotted from the time[1] to time[2].
pts	The maximum number of sample points to plot. If the trace actually contains fewer samples than this, that smaller number will be plotted. If, as is more common, the trace contains many more samples, it is downsampled to this number of points.
type	The plot type (see plot). By default, traces are drawn with the stair-step style "s".
col	The colour with which the trace should be plotted.
vtags	Whether to draw lines indicating any voltage changes included in the file tags.
ctags	Whether to draw lines indicating non-voltage tags.
vcol	Line colour with which voltage tag indicators should be drawn.
ccol	Line colour with which non-voltage tag indicators should be drawn.
vlty	Line type with which voltage tag indicators should be drawn.
clty	Line type with which non-voltage tag indicators should be drawn.
xlab	Label for the x-axis of the plot.
ylab	Label for the y-axis of the plot. If NULL (the default), the name and units specified for this ADC in the ABF file header will be used.
vText	String indicating where a text label for voltage change indicators should be drawn. If this is "bottom", labels are drawn at the bottom of the plot, otherwise at the top. To omit labels altogether, set this to NULL.
vtunits	Whether to include units in voltage change labels (if any).
vtcol	Colour to draw the voltage change labels (if any).
vtpad	Padding added to the plot to account for voltage change labels. Alternate label positions are also offset up and down by a fraction of this amount to mitigate against overlap when voltage changes occur close together.
...	Additional parameters passed to plot.

Value

None.

Author(s)

Matthew Caldwell <m.caldwell@ucl.ac.uk>

See Also

abfload, plot

Examples

```
## Not run:
# load an ABF file
ab <- abfload()

# plot a ten second segment of the second channel
plot(ab, adc=2, time=c(10,20))

## End(Not run)
```

---

plot.abf2split *Plot an* abf2split *segment*

Description

Plot a segment of an ABF data trace obtained by calling split on an abf2 object.

Usage

```
## S3 method for class 'abf2split'
plot(x, pts = 1000, time = NULL, type = "s", col = 1,
xlab = "Time (s)", ylab = "Current (pA)",
main = paste("Segment ", x$index, " at ", x$level, " mV  [", x$comment, "]", sep = ""),
...)
```

Arguments

x	An abf2split object returned by split.abf2.
pts	The maximum number of sample points to plot. If the segment actually contains fewer samples than this, that smaller number will be plotted. If, as is more common, the segment contains many more samples, it is downsampled to this number of points.
time	Optional specifier of a time range to be plotted. By default the full segment is used. If a single numeric value is provided here, it specifies the end time, with the plot starting from the beginning of the segment. Otherwise the segment is plotted from the time[1] to time[2].
type	The plot type (see plot). By default, traces are drawn with the stair-step style "s".

col	The colour with which the trace should be plotted.
xlab	Label for the x-axis of the plot.
ylab	Label for the y-axis of the plot.
main	Main title for the plot.
...	Additional parameters passed to plot.

Value

None.

Author(s)

Matthew Caldwell <m.caldwell@ucl.ac.uk>

See Also

split.abf2, abfload

Examples

```
## Not run:
# load an ABF file
ab <- abfload()

# split the 2nd channel
abx <- split(ab, adc=2)

# plot the first segment
plot(abx[[1]])

## End(Not run)
```

---

split.abf2 *Split an* abf2 *trace on tag boundaries.*

Description

Splits a data trace from an abf2 object (loaded by abfload into separate segments identified by the file tags.

Usage

```
## S3 method for class 'abf2'
split(x, f=NULL, drop=FALSE, adc = 1, lag = 0.3, ...)
```

Arguments

x	An abf2 object, loaded using abfload
f	Unused argument for compatibility with generic split.
drop	Unused argument for compatibility with generic split.
adc	Index of the ADC channel to split.
lag	An offset to be discarded after the start of a tag. It will typically take time for an experimental change denoted by a tag to take effect. In particular for voltage changes, there is a short delay between specifying the new voltage and it being applied by the amplifier. The default 0.3 second lag removes this delay period during which the previous value obtains. Longer values may be desirable when tags relate to slower interventions such as solution exchange.
...	Additional parameters (currently ignored).

Value

A list of objects of class abf2split, each including the following fields:

trace	A vector containing the actual sample data for split segment.
s	A vector containing the times of each of the samples in trace.
level	The prevailing voltage level, if known.
index	The index of this tag in the tags table (hence also this segment in the result list).
comment	The comment from the tag associated with this segment.

Author(s)

Matthew Caldwell <m.caldwell@ucl.ac.uk>

See Also

plot.abf2split, abfload

Examples

```
## Not run:
# load an ABF file
ab <- abfload()

# split the 2nd channel
abx <- split(ab, adc=2)

# plot the first segment
plot(abx[[1]])

## End(Not run)
```

Index