

Package ‘av’

October 12, 2022

Type Package

Title Working with Audio and Video in R

Version 0.8.2

Description Bindings to 'FFmpeg' <<http://www.ffmpeg.org/>> AV library for working with audio and video in R. Generates high quality video from images or R graphics with custom audio. Also offers high performance tools for reading raw audio, creating 'spectrograms', and converting between countless audio / video formats. This package interfaces directly to the C API and does not require any command line utilities.

License MIT + file LICENSE

URL <https://docs.ropensci.org/av/> (website),
<https://github.com/ropensci/av> (devel)

BugReports <https://github.com/ropensci/av/issues>

Encoding UTF-8

RoxygenNote 7.2.1

SystemRequirements FFmpeg (>= 3.2); with at least libx264 and lame (mp3) drivers. Debian/Ubuntu: libavfilter-dev, Fedora/CentOS: ffmpeg-devel (via <https://rpmfusion.org>), MacOS Homebrew: ffmpeg.

Depends R (>= 3.5)

Imports graphics

Config/pkgdown seewave, ggplot2, phonTools, signal, tuneR

Suggests testthat, ps, ggplot2, gapminder

Language en-US

NeedsCompilation yes

Author Jeroen Ooms [aut, cre] (<<https://orcid.org/0000-0002-4035-0289>>)

Maintainer Jeroen Ooms <jeroen@berkeley.edu>

Repository CRAN

Date/Publication 2022-10-06 14:50:02 UTC

R topics documented:

av_video_images	2
capturing	3
demo	4
encoding	5
formats	7
info	7
logging	8
read_audio_fft	8
window functions	10
Index	12

av_video_images	<i>Convert video to images</i>
-----------------	--------------------------------

Description

Splits a video file in a set of image files. Default image format is jpeg which has good speed and compression. Use format = "png" for losless images.

Usage

```
av_video_images(video, destdir = tempfile(), format = "jpg", fps = NULL)
```

Arguments

video	an input video
destdir	directory where to save the png files
format	image format such as png or jpeg, must be available from av_encoders()
fps	sample rate of images. Use NULL to get all images.

Details

For large input videos you can set fps to sample only a limited number of images per second. This also works with fractions, for example fps = 0.2 will output one image for every 5 sec of video.

capturing

Record Video from Graphics Device

Description

Runs the expression and captures all plots into a video. The `av_spectrogram_video` function is a wrapper that plots data from `read_audio_fft` with a moving bar and background audio.

Usage

```
av_capture_graphics(
  expr,
  output = "output.mp4",
  width = 720,
  height = 480,
  framerate = 1,
  vfilter = "null",
  audio = NULL,
  verbose = TRUE,
  ...
)

av_spectrogram_video(
  audio,
  output = "output.mp4",
  framerate = 25,
  verbose = TRUE,
  ...
)
```

Arguments

<code>expr</code>	an R expression that generates the graphics to capture
<code>output</code>	name of the output file. File extension must correspond to a known container format such as mp4, mkv, mov, or flv.
<code>width</code>	width in pixels of the graphics device
<code>height</code>	height in pixels of the graphics device
<code>framerate</code>	video framerate in frames per seconds. This is the input fps, the output fps may be different if you specify a filter that modifies speed or interpolates frames.
<code>vfilter</code>	a string defining an ffmpeg filter graph. This is the same parameter as the <code>-vf</code> argument in the ffmpeg command line utility.
<code>audio</code>	path to media file with audio stream
<code>verbose</code>	emit some output and a progress meter counting processed images. Must be TRUE or FALSE or an integer with a valid <code>av_log_level</code> .
<code>...</code>	extra graphics parameters passed to <code>png()</code>

See Also

Other av: [demo\(\)](#), [encoding](#), [formats](#), [info](#), [logging](#), [read_audio_fft\(\)](#)

Examples

```
library(gapminder)
library(ggplot2)
makeplot <- function(){
  datalist <- split(gapminder, gapminder$year)
  lapply(datalist, function(data){
    p <- ggplot(data, aes(gdpPercap, lifeExp, size = pop, color = continent)) +
      scale_size("population", limits = range(gapminder$pop)) + geom_point() + ylim(20, 90) +
      scale_x_log10(limits = range(gapminder$gdpPercap)) + ggtitle(data$year) + theme_classic()
    print(p)
  })
}

# Play 1 plot per sec, and use an interpolation filter to convert into 10 fps
video_file <- file.path(tempdir(), 'output.mp4')
av_capture_graphics(makeplot(), video_file, 1280, 720, res = 144, vfilter = 'framerate=fps=10')
av::av_media_info(video_file)
# utils::browseURL(video_file)
```

demo

Demo Video

Description

Generates random video for testing purposes.

Usage

```
av_demo(
  output = "demo.mp4",
  width = 960,
  height = 720,
  framerate = 5,
  verbose = TRUE,
  ...
)
```

Arguments

output	name of the output file. File extension must correspond to a known container format such as mp4, mkv, mov, or flv.
width	width in pixels of the graphics device
height	height in pixels of the graphics device

framerate	video framerate in frames per seconds. This is the input fps, the output fps may be different if you specify a filter that modifies speed or interpolates frames.
verbose	emit some output and a progress meter counting processed images. Must be TRUE or FALSE or an integer with a valid av_log_level .
...	other parameters passed to av_capture_graphics .

See Also

Other av: [capturing](#), [encoding](#), [formats](#), [info](#), [logging](#), [read_audio_fft\(\)](#)

encoding	<i>Encode or Convert Audio / Video</i>
----------	--

Description

Encodes a set of images into a video, using custom container format, codec, fps, [video filters](#), and audio track. If input contains video files, this effectively combines and converts them to the specified output format.

Usage

```
av_encode_video(  
    input,  
    output = "output.mp4",  
    framerate = 24,  
    vfilter = "null",  
    codec = NULL,  
    audio = NULL,  
    verbose = TRUE  
)  
  
av_video_convert(video, output = "output.mp4", verbose = TRUE)  
  
av_audio_convert(  
    audio,  
    output = "output.mp3",  
    format = NULL,  
    channels = NULL,  
    sample_rate = NULL,  
    start_time = NULL,  
    total_time = NULL,  
    verbose = TRUE  
)
```

Arguments

input	a vector with image or video files. A video input file is treated as a series of images. All input files should have the same width and height.
output	name of the output file. File extension must correspond to a known container format such as mp4, mkv, mov, or flv.
framerate	video framerate in frames per seconds. This is the input fps, the output fps may be different if you specify a filter that modifies speed or interpolates frames.
vfilter	a string defining an ffmpeg filter graph. This is the same parameter as the <code>-vf</code> argument in the <code>ffmpeg</code> command line utility.
codec	name of the video codec as listed in av_encoders . The default is <code>libx264</code> for most formats, which usually the best choice.
audio	audio or video input file with sound for the output video
verbose	emit some output and a progress meter counting processed images. Must be <code>TRUE</code> or <code>FALSE</code> or an integer with a valid av_log_level .
video	input video file with optionally also an audio track
format	a valid format name from the list of <code>av_muxers()</code> . Default <code>NULL</code> tries to guess a format from the file extension.
channels	number of output channels. Default <code>NULL</code> is to match input
sample_rate	output sampling rate. Default <code>NULL</code> is to match input
start_time	number greater than 0, seeks in the input file to position.
total_time	approximate number of seconds at which to limit the duration of the output file.

Details

The target container format is automatically determined from the file extension of the output file, for example `mp4`, `mkv`, `mov`, or `flv`. Most systems also support `gif` output, but the compression~quality for `gif` is quite bad. The [gifski](#) package is better suited for generating animated `gif` files.

It is recommended to use let `ffmpeg` choose the suitable codec for a given container format. Most video formats default to the `libx264` video codec which has excellent compression and works on all modern [browsers](#), operating systems, and digital TVs.

It is safe to interrupt the encoding process by pressing `CTRL+C`, or via [setTimeLimit](#). When the encoding is interrupted, the output stream is properly finalized and all open files and resources are properly closed.

See Also

Other av: [capturing](#), [demo\(\)](#), [formats](#), [info](#), [logging](#), [read_audio_fft\(\)](#)

formats

AV Formats

Description

List supported filters, codecs and container formats.

Usage

`av_encoders()`

`av_decoders()`

`av_filters()`

`av_muxers()`

`av_demuxers()`

Details

Encoders and decoders convert between raw video/audio frames and compressed stream data for storage or transfer. However such a compressed data stream by itself does not constitute a valid video format yet. Muxers are needed to interleave one or more audio/video/subtitle streams, along with timestamps, metadata, etc, into a proper file format, such as mp4 or mkv.

Conversely, demuxers are needed to read a file format into the separate data streams for subsequent decoding into raw audio/video frames. Most operating systems natively support demuxing and decoding common formats and codecs, needed to play those videos. However for encoding and muxing such videos, ffmpeg must have been configured with specific external libraries for a given codec or format.

See Also

Other av: [capturing](#), [demo\(\)](#), [encoding](#), [info](#), [logging](#), [read_audio_fft\(\)](#)

info

Video Info

Description

Get video info such as width, height, format, duration and framerate. This may also be used for audio input files.

Usage

`av_media_info(file)`

Arguments

file path to an existing file

See Also

Other av: [capturing](#), [demo\(\)](#), [encoding](#), [formats](#), [logging](#), [read_audio_fft\(\)](#)

logging

Logging

Description

Get or set the **log level**.

Usage

```
av_log_level(set = NULL)
```

Arguments

set new **log level** value

See Also

Other av: [capturing](#), [demo\(\)](#), [encoding](#), [formats](#), [info](#), [read_audio_fft\(\)](#)

read_audio_fft

Read audio binary and frequency data

Description

Reads raw audio data from any common audio or video format. Use [read_audio_bin](#) to get raw PCM audio samples, or [read_audio_fft](#) to stream-convert directly into frequency domain (spectrum) data using FFmpeg built-in FFT.

Usage

```
read_audio_fft(
  audio,
  window = hanning(1024),
  overlap = 0.75,
  sample_rate = NULL,
  start_time = NULL,
  end_time = NULL
)
```



```
read_audio_bin(  
  audio,  
  channels = NULL,  
  sample_rate = NULL,  
  start_time = NULL,  
  end_time = NULL  
)
```

Arguments

audio	path to the input sound or video file containing the audio stream
window	vector with weights defining the moving fft window function . The length of this vector is the size of the window and hence determines the output frequency range.
overlap	value between 0 and 1 of overlap proportion between moving fft windows
sample_rate	downsample audio to reduce FFT output size. Default keeps sample rate from the input file.
start_time, end_time	position (in seconds) to cut input stream to be processed.
channels	number of output channels, set to 1 to convert to mono sound

Details

Currently [read_audio_fft](#) automatically converts input audio to mono channel such that we get a single matrix. Use the `plot()` method on data returned by [read_audio_fft](#) to show the spectrogram. The [av_spectrogram_video](#) generates a video that plays the audio while showing an animated spectrogram with moving status bar, which is very cool.

See Also

Other av: [capturing](#), [demo\(\)](#), [encoding](#), [formats](#), [info](#), [logging](#)

Examples

```
# Use a 5 sec fragment  
wonderland <- system.file('samples/Synapsis-Wonderland.mp3', package='av')  
  
# Read initial 5 sec as as frequency spectrum  
fft_data <- read_audio_fft(wonderland, end_time = 5.0)  
dim(fft_data)  
  
# Plot the spectrogram  
plot(fft_data)  
  
# Show other parameters  
dim(read_audio_fft(wonderland, end_time = 5.0, hamming(2048)))  
dim(read_audio_fft(wonderland, end_time = 5.0, hamming(4096)))
```

window functions

Window functions

Description

Several common **windows function** generators. The functions return a vector of weights to use in [read_audio_fft](#).

Usage

hanning(n)

hamming(n)

blackman(n)

bartlett(n)

welch(n)

flattop(n)

bharris(n)

bnuttall(n)

sine(n)

nuttall(n)

bhann(n)

lanczos(n)

gauss(n)

tukey(n)

dolph(n)

cauchy(n)

parzen(n)

bohman(n)

Arguments

n size of the window (number of weights to generate)

Examples

```
# Window functions
plot(hanning(1024), type = 'l', xlab = 'window', ylab = 'weight')
lines(hamming(1024), type = 'l', col = 'red')
lines(bartlett(1024), type = 'l', col = 'blue')
lines(welch(1024), type = 'l', col = 'purple')
lines(flattop(1024), type = 'l', col = 'darkgreen')
```

Index

* av

- capturing, 3
 - demo, 4
 - encoding, 5
 - formats, 7
 - info, 7
 - logging, 8
 - read_audio_fft, 8
- av (encoding), 5
- av_audio_convert (encoding), 5
- av_capture_graphics, 5
- av_capture_graphics (capturing), 3
- av_decoders (formats), 7
- av_demo (demo), 4
- av_demuxers (formats), 7
- av_encode_video (encoding), 5
- av_encoders, 6
- av_encoders (formats), 7
- av_filters (formats), 7
- av_log_level, 3, 5, 6
- av_log_level (logging), 8
- av_media_info (info), 7
- av_muxers (formats), 7
- av_spectrogram_video, 3, 9
- av_spectrogram_video (capturing), 3
- av_video_convert (encoding), 5
- av_video_images, 2
- av_video_info (info), 7
-
- bartlett (window functions), 10
- bhann (window functions), 10
- bharris (window functions), 10
- blackman (window functions), 10
- bnuttall (window functions), 10
- bohman (window functions), 10
-
- capturing, 3, 5–9
- cauchy (window functions), 10
-
- demo, 4, 4, 6–9
-
- dolph (window functions), 10
-
- encoding, 4, 5, 5, 7–9
-
- fft window function, 9
- flattop (window functions), 10
- formats, 4–6, 7, 8, 9
-
- gauss (window functions), 10
-
- hamming (window functions), 10
- hanning (window functions), 10
-
- info, 4–7, 7, 8, 9
-
- lanczos (window functions), 10
- logging, 4–8, 8, 9
-
- nutall (window functions), 10
-
- parzen (window functions), 10
- png(), 3
-
- read_audio_bin, 8
- read_audio_bin (read_audio_fft), 8
- read_audio_fft, 3–8, 8, 9, 10
-
- setTimeLimit, 6
- sine (window functions), 10
-
- tukey (window functions), 10
-
- welch (window functions), 10
- window functions, 10