

FFmpeg Filters Documentation

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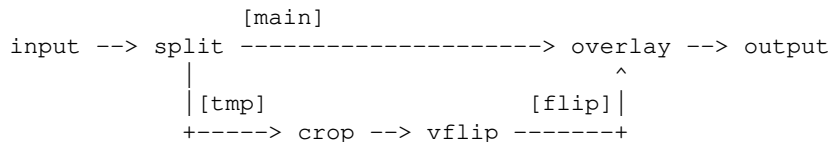
1 Description# TOC

This document describes filters, sources, and sinks provided by the libavfilter library.

2 Filtering Introduction# TOC

Filtering in FFmpeg is enabled through the libavfilter library.

In libavfilter, a filter can have multiple inputs and multiple outputs. To illustrate the sorts of things that are possible, we consider the following filtergraph.



This filtergraph splits the input stream in two streams, then sends one stream through the crop filter and the vflip filter, before merging it back with the other stream by overlaying it on top. You can use the following command to achieve this:

```
ffmpeg -i INPUT -vf "split [main][tmp]; [tmp] crop=iw:ih/2:0:0, vflip [flip]; [main][flip] overlay=0:H/2" OUTPUT
```

The result will be that the top half of the video is mirrored onto the bottom half of the output video.

Filters in the same linear chain are separated by commas, and distinct linear chains of filters are separated by semicolons. In our example, *crop*, *vflip* are in one linear chain, *split* and *overlay* are separately in another. The points where the linear chains join are labelled by names enclosed in square brackets. In the example, the split filter generates two outputs that are associated to the labels *[main]* and *[tmp]*.

The stream sent to the second output of *split*, labelled as *[tmp]*, is processed through the *crop* filter, which crops away the lower half part of the video, and then vertically flipped. The *overlay* filter takes in input the first unchanged output of the split filter (which was labelled as *[main]*), and overlay on its lower half the output generated by the *crop,vflip* filterchain.

Some filters take in input a list of parameters: they are specified after the filter name and an equal sign, and are separated from each other by a colon.

There exist so-called *source filters* that do not have an audio/video input, and *sink filters* that will not have audio/video output.

3 graph2dot# TOC

The *graph2dot* program included in the FFmpeg `tools` directory can be used to parse a filtergraph description and issue a corresponding textual representation in the dot language.

Invoke the command:

```
graph2dot -h
```

to see how to use *graph2dot*.

You can then pass the dot description to the *dot* program (from the graphviz suite of programs) and obtain a graphical representation of the filtergraph.

For example the sequence of commands:

```
echo GRAPH_DESCRIPTION | \
tools/graph2dot -o graph.tmp && \
dot -Tpng graph.tmp -o graph.png && \
display graph.png
```

can be used to create and display an image representing the graph described by the *GRAPH_DESCRIPTION* string. Note that this string must be a complete self-contained graph, with its inputs and outputs explicitly defined. For example if your command line is of the form:

```
ffmpeg -i infile -vf scale=640:360 outfile
```

your *GRAPH_DESCRIPTION* string will need to be of the form:

```
nullsrc,scale=640:360,nullsink
```

you may also need to set the *nullsrc* parameters and add a *format* filter in order to simulate a specific input file.

4 Filtergraph description# TOC

A filtergraph is a directed graph of connected filters. It can contain cycles, and there can be multiple links between a pair of filters. Each link has one input pad on one side connecting it to one filter from which it takes its input, and one output pad on the other side connecting it to one filter accepting its output.

Each filter in a filtergraph is an instance of a filter class registered in the application, which defines the features and the number of input and output pads of the filter.

A filter with no input pads is called a "source", and a filter with no output pads is called a "sink".

4.1 Filtergraph syntax# TOC

A filtergraph has a textual representation, which is recognized by the `-filter/-vf/-af` and `-filter_complex` options in `ffmpeg` and `-vf/-af` in `ffplay`, and by the `avfilter_graph_parse_ptr()` function defined in `libavfilter/avfilter.h`.

A filterchain consists of a sequence of connected filters, each one connected to the previous one in the sequence. A filterchain is represented by a list of `"`,"-separated filter descriptions.

A filtergraph consists of a sequence of filterchains. A sequence of filterchains is represented by a list of `"`;"-separated filterchain descriptions.

A filter is represented by a string of the form:

`[in_link_1]...[in_link_N]filter_name@id=arguments[out_link_1]...[out_link_M]`

filter_name is the name of the filter class of which the described filter is an instance of, and has to be the name of one of the filter classes registered in the program optionally followed by `"@id"`. The name of the filter class is optionally followed by a string `"=arguments"`.

arguments is a string which contains the parameters used to initialize the filter instance. It may have one of two forms:

- A `':'`-separated list of *key=value* pairs.
- A `':'`-separated list of *value*. In this case, the keys are assumed to be the option names in the order they are declared. E.g. the `fade` filter declares three options in this order – `type`, `start_frame` and `nb_frames`. Then the parameter list `in:0:30` means that the value *in* is assigned to the option `type`, `0` to `start_frame` and `30` to `nb_frames`.
- A `':'`-separated list of mixed direct *value* and long *key=value* pairs. The direct *value* must precede the *key=value* pairs, and follow the same constraints order of the previous point. The following *key=value* pairs can be set in any preferred order.

If the option value itself is a list of items (e.g. the `format` filter takes a list of pixel formats), the items in the list are usually separated by `'|'`.

The list of arguments can be quoted using the character ‘`’`’ as initial and ending mark, and the character ‘`\`’ for escaping the characters within the quoted text; otherwise the argument string is considered terminated when the next special character (belonging to the set ‘`[] = ; , ’`’) is encountered.

The name and arguments of the filter are optionally preceded and followed by a list of link labels. A link label allows one to name a link and associate it to a filter output or input pad. The preceding labels *in_link_1* ... *in_link_N*, are associated to the filter input pads, the following labels *out_link_1* ... *out_link_M*, are associated to the output pads.

When two link labels with the same name are found in the filtergraph, a link between the corresponding input and output pad is created.

If an output pad is not labelled, it is linked by default to the first unlabelled input pad of the next filter in the filterchain. For example in the filterchain

```
nullsrc, split[L1], [L2]overlay, nullsink
```

the split filter instance has two output pads, and the overlay filter instance two input pads. The first output pad of split is labelled "L1", the first input pad of overlay is labelled "L2", and the second output pad of split is linked to the second input pad of overlay, which are both unlabelled.

In a filter description, if the input label of the first filter is not specified, "in" is assumed; if the output label of the last filter is not specified, "out" is assumed.

In a complete filterchain all the unlabelled filter input and output pads must be connected. A filtergraph is considered valid if all the filter input and output pads of all the filterchains are connected.

Libavfilter will automatically insert scale filters where format conversion is required. It is possible to specify swscale flags for those automatically inserted scalers by prepending `sws_flags=flags;` to the filtergraph description.

Here is a BNF description of the filtergraph syntax:

```
NAME                ::= sequence of alphanumeric characters and ‘_’
FILTER_NAME         ::= NAME["@NAME]
LINKLABEL           ::= "[" NAME "]"
LINKLABELS          ::= LINKLABEL [LINKLABELS]
FILTER_ARGUMENTS    ::= sequence of chars (possibly quoted)
FILTER              ::= [LINKLABELS] FILTER_NAME ["=" FILTER_ARGUMENTS] [LINKLABELS]
FILTERCHAIN         ::= FILTER [,FILTERCHAIN]
FILTERGRAPH         ::= [sws_flags=flags;] FILTERCHAIN [;FILTERGRAPH]
```

4.2 Notes on filtergraph escaping# TOC

Filtergraph description composition entails several levels of escaping. See (ffmpeg-utils)the "Quoting and escaping" section in the ffmpeg-utils(1) manual for more information about the employed escaping procedure.

A first level escaping affects the content of each filter option value, which may contain the special character `:` used to separate values, or one of the escaping characters `\'`.

A second level escaping affects the whole filter description, which may contain the escaping characters `\'` or the special characters `[] , ;` used by the filtergraph description.

Finally, when you specify a filtergraph on a shell commandline, you need to perform a third level escaping for the shell special characters contained within it.

For example, consider the following string to be embedded in the `drawtext` filter description `text` value:

```
this is a 'string': may contain one, or more, special characters
```

This string contains the `'` special escaping character, and the `:` special character, so it needs to be escaped in this way:

```
text=this is a \'string\': may contain one, or more, special characters
```

A second level of escaping is required when embedding the filter description in a filtergraph description, in order to escape all the filtergraph special characters. Thus the example above becomes:

```
drawtext=text=this is a \\\'string\\\'\: may contain one\, or more\, special characters
```

(note that in addition to the `\'` escaping special characters, also `,` needs to be escaped).

Finally an additional level of escaping is needed when writing the filtergraph description in a shell command, which depends on the escaping rules of the adopted shell. For example, assuming that `\` is special and needs to be escaped with another `\`, the previous string will finally result in:

```
-vf "drawtext=text=this is a \\\\'string\\\\\'\\\: may contain one\\, or more\\, special characters"
```

5 Timeline editing# TOC

Some filters support a generic `enable` option. For the filters supporting timeline editing, this option can be set to an expression which is evaluated before sending a frame to the filter. If the evaluation is non-zero, the filter will be enabled, otherwise the frame will be sent unchanged to the next filter in the filtergraph.

The expression accepts the following values:

`'t'`

timestamp expressed in seconds, NAN if the input timestamp is unknown

`'n'`

sequential number of the input frame, starting from 0

`'pos'`

the position in the file of the input frame, NAN if unknown

`'w'`

`'h'`

width and height of the input frame if video

Additionally, these filters support an `enable` command that can be used to re-define the expression.

Like any other filtering option, the `enable` option follows the same rules.

For example, to enable a blur filter (`smartblur`) from 10 seconds to 3 minutes, and a curves filter starting at 3 seconds:

```
smartblur = enable='between(t,10,3*60)',  
curves    = enable='gte(t,3)' : preset=cross_process
```

See `ffmpeg -filters` to view which filters have timeline support.

6 Options for filters with several inputs (framesync)# TOC

Some filters with several inputs support a common set of options. These options can only be set by name, not with the short notation.

`eof_action`

The action to take when EOF is encountered on the secondary input; it accepts one of the following values:

`repeat`

Repeat the last frame (the default).

`endall`

End both streams.

`pass`

Pass the main input through.

`shortest`

If set to 1, force the output to terminate when the shortest input terminates. Default value is 0.

`repeatlast`

If set to 1, force the filter to extend the last frame of secondary streams until the end of the primary stream. A value of 0 disables this behavior. Default value is 1.

7 Audio Filters# TOC

When you configure your FFmpeg build, you can disable any of the existing filters using `--disable-filters`. The configure output will show the audio filters included in your build.

Below is a description of the currently available audio filters.

7.1 acompressor# TOC

A compressor is mainly used to reduce the dynamic range of a signal. Especially modern music is mostly compressed at a high ratio to improve the overall loudness. It's done to get the highest attention of a listener, "fatten" the sound and bring more "power" to the track. If a signal is compressed too much it may sound dull or "dead" afterwards or it may start to "pump" (which could be a powerful effect but can also destroy a track completely). The right compression is the key to reach a professional sound and is the high art of mixing and mastering. Because of its complex settings it may take a long time to get the right feeling for this kind of effect.

Compression is done by detecting the volume above a chosen level `threshold` and dividing it by the factor set with `ratio`. So if you set the threshold to -12dB and your signal reaches -6dB a ratio of 2:1 will result in a signal at -9dB. Because an exact manipulation of the signal would cause distortion of the waveform the reduction can be levelled over the time. This is done by setting "Attack" and "Release". `attack` determines how long the signal has to rise above the threshold before any reduction will occur and `release` sets the time the signal has to fall below the threshold to reduce the reduction again. Shorter signals than the chosen attack time will be left untouched. The overall reduction of the signal can be made up afterwards with the `makeup` setting. So compressing the peaks of a signal about 6dB and raising the makeup to this level results in a signal twice as loud than the source. To gain a softer entry in the compression the `knee` flattens the hard edge at the threshold in the range of the chosen decibels.

The filter accepts the following options:

`level_in`

Set input gain. Default is 1. Range is between 0.015625 and 64.

`threshold`

If a signal of stream rises above this level it will affect the gain reduction. By default it is 0.125. Range is between 0.00097563 and 1.

`ratio`

Set a ratio by which the signal is reduced. 1:2 means that if the level rose 4dB above the threshold, it will be only 2dB above after the reduction. Default is 2. Range is between 1 and 20.

attack

Amount of milliseconds the signal has to rise above the threshold before gain reduction starts.
Default is 20. Range is between 0.01 and 2000.

release

Amount of milliseconds the signal has to fall below the threshold before reduction is decreased again.
Default is 250. Range is between 0.01 and 9000.

makeup

Set the amount by how much signal will be amplified after processing. Default is 1. Range is from 1 to 64.

knee

Curve the sharp knee around the threshold to enter gain reduction more softly. Default is 2.82843.
Range is between 1 and 8.

link

Choose if the average level between all channels of input stream or the louder(maximum) channel of input stream affects the reduction. Default is average.

detection

Should the exact signal be taken in case of peak or an RMS one in case of rms. Default is rms which is mostly smoother.

mix

How much to use compressed signal in output. Default is 1. Range is between 0 and 1.

7.2 acontrast# TOC

Simple audio dynamic range commpression/expansion filter.

The filter accepts the following options:

contrast

Set contrast. Default is 33. Allowed range is between 0 and 100.

7.3 acopy# TOC

Copy the input audio source unchanged to the output. This is mainly useful for testing purposes.

7.4 acrossfade# TOC

Apply cross fade from one input audio stream to another input audio stream. The cross fade is applied for specified duration near the end of first stream.

The filter accepts the following options:

`nb_samples, ns`

Specify the number of samples for which the cross fade effect has to last. At the end of the cross fade effect the first input audio will be completely silent. Default is 44100.

`duration, d`

Specify the duration of the cross fade effect. See (ffmpeg-utils)the Time duration section in the ffmpeg-utils(1) manual for the accepted syntax. By default the duration is determined by *nb_samples*. If set this option is used instead of *nb_samples*.

`overlap, o`

Should first stream end overlap with second stream start. Default is enabled.

`curve1`

Set curve for cross fade transition for first stream.

`curve2`

Set curve for cross fade transition for second stream.

For description of available curve types see *afade* filter description.

7.4.1 Examples# TOC

- Cross fade from one input to another:

```
ffmpeg -i first.flac -i second.flac -filter_complex acrossfade=d=10:c1=exp:c2=exp output.flac
```

- Cross fade from one input to another but without overlapping:

```
ffmpeg -i first.flac -i second.flac -filter_complex acrossfade=d=10:o=0:c1=exp:c2=exp output.flac
```

7.5 acrusher# TOC

Reduce audio bit resolution.

This filter is bit crusher with enhanced functionality. A bit crusher is used to audibly reduce number of bits an audio signal is sampled with. This doesn't change the bit depth at all, it just produces the effect. Material reduced in bit depth sounds more harsh and "digital". This filter is able to even round to continuous values instead of discrete bit depths. Additionally it has a D/C offset which results in different crushing of the lower and the upper half of the signal. An Anti-Aliasing setting is able to produce "softer" crushing sounds.

Another feature of this filter is the logarithmic mode. This setting switches from linear distances between bits to logarithmic ones. The result is a much more "natural" sounding crusher which doesn't gate low signals for example. The human ear has a logarithmic perception, so this kind of crushing is much more pleasant. Logarithmic crushing is also able to get anti-aliased.

The filter accepts the following options:

`level_in`

Set level in.

`level_out`

Set level out.

`bits`

Set bit reduction.

`mix`

Set mixing amount.

`mode`

Can be linear: `lin` or logarithmic: `log`.

`dc`

Set DC.

`aa`

Set anti-aliasing.

`samples`

Set sample reduction.

lfo

Enable LFO. By default disabled.

lforange

Set LFO range.

lforate

Set LFO rate.

7.6 adeclick# TOC

Remove impulsive noise from input audio.

Samples detected as impulsive noise are replaced by interpolated samples using autoregressive modelling.

w

Set window size, in milliseconds. Allowed range is from 10 to 100. Default value is 55 milliseconds. This sets size of window which will be processed at once.

o

Set window overlap, in percentage of window size. Allowed range is from 50 to 95. Default value is 75 percent. Setting this to a very high value increases impulsive noise removal but makes whole process much slower.

a

Set autoregression order, in percentage of window size. Allowed range is from 0 to 25. Default value is 2 percent. This option also controls quality of interpolated samples using neighbour good samples.

t

Set threshold value. Allowed range is from 1 to 100. Default value is 2. This controls the strength of impulsive noise which is going to be removed. The lower value, the more samples will be detected as impulsive noise.

b

Set burst fusion, in percentage of window size. Allowed range is 0 to 10. Default value is 2. If any two samples detected as noise are spaced less than this value then any sample inbetween those two samples will be also detected as noise.

m

Set overlap method.

It accepts the following values:

a

Select overlap-add method. Even not interpolated samples are slightly changed with this method.

s

Select overlap-save method. Not interpolated samples remain unchanged.

Default value is a.

7.7 adeclip# TOC

Remove clipped samples from input audio.

Samples detected as clipped are replaced by interpolated samples using autoregressive modelling.

w

Set window size, in milliseconds. Allowed range is from 10 to 100. Default value is 55 milliseconds. This sets size of window which will be processed at once.

o

Set window overlap, in percentage of window size. Allowed range is from 50 to 95. Default value is 75 percent.

a

Set autoregression order, in percentage of window size. Allowed range is from 0 to 25. Default value is 8 percent. This option also controls quality of interpolated samples using neighbour good samples.

t

Set threshold value. Allowed range is from 1 to 100. Default value is 10. Higher values make clip detection less aggressive.

n

Set size of histogram used to detect clips. Allowed range is from 100 to 9999. Default value is 1000. Higher values make clip detection less aggressive.

m

Set overlap method.

It accepts the following values:

a

Select overlap-add method. Even not interpolated samples are slightly changed with this method.

s

Select overlap-save method. Not interpolated samples remain unchanged.

Default value is a.

7.8 `adelay#` TOC

Delay one or more audio channels.

Samples in delayed channel are filled with silence.

The filter accepts the following option:

`delays`

Set list of delays in milliseconds for each channel separated by '|'. Unused delays will be silently ignored. If number of given delays is smaller than number of channels all remaining channels will not be delayed. If you want to delay exact number of samples, append 'S' to number.

7.8.1 `Examples#` TOC

- Delay first channel by 1.5 seconds, the third channel by 0.5 seconds and leave the second channel (and any other channels that may be present) unchanged.

```
adelay=1500|0|500
```

- Delay second channel by 500 samples, the third channel by 700 samples and leave the first channel (and any other channels that may be present) unchanged.

```
adelay=0|500S|700S
```

7.9 `aderivative, aintegral#` TOC

Compute derivative/integral of audio stream.

Applying both filters one after another produces original audio.

7.10 aecho# TOC

Apply echoing to the input audio.

Echoes are reflected sound and can occur naturally amongst mountains (and sometimes large buildings) when talking or shouting; digital echo effects emulate this behaviour and are often used to help fill out the sound of a single instrument or vocal. The time difference between the original signal and the reflection is the `delay`, and the loudness of the reflected signal is the `decay`. Multiple echoes can have different delays and decays.

A description of the accepted parameters follows.

`in_gain`

Set input gain of reflected signal. Default is 0.6.

`out_gain`

Set output gain of reflected signal. Default is 0.3.

`delays`

Set list of time intervals in milliseconds between original signal and reflections separated by '|'. Allowed range for each `delay` is (0 - 90000.0]. Default is 1000.

`decays`

Set list of loudness of reflected signals separated by '|'. Allowed range for each `decay` is (0 - 1.0]. Default is 0.5.

7.10.1 Examples# TOC

- Make it sound as if there are twice as many instruments as are actually playing:

```
aecho=0.8:0.88:60:0.4
```

- If delay is very short, then it sound like a (metallic) robot playing music:

```
aecho=0.8:0.88:6:0.4
```

- A longer delay will sound like an open air concert in the mountains:

```
aecho=0.8:0.9:1000:0.3
```

- Same as above but with one more mountain:

```
aecho=0.8:0.9:1000|1800:0.3|0.25
```

7.11 aemphasis# TOC

Audio emphasis filter creates or restores material directly taken from LPs or emphasized CDs with different filter curves. E.g. to store music on vinyl the signal has to be altered by a filter first to even out the disadvantages of this recording medium. Once the material is played back the inverse filter has to be applied to restore the distortion of the frequency response.

The filter accepts the following options:

`level_in`

Set input gain.

`level_out`

Set output gain.

`mode`

Set filter mode. For restoring material use `reproduction mode`, otherwise use `production mode`. Default is `reproduction mode`.

`type`

Set filter type. Selects medium. Can be one of the following:

`col`

select Columbia.

`emi`

select EMI.

`bsi`

select BSI (78RPM).

`riaa`

select RIAA.

`cd`

select Compact Disc (CD).

50 fm

select 50 $\hat{\text{A}}\mu\text{s}$ (FM).

75 fm

select 75 $\hat{\text{A}}\mu\text{s}$ (FM).

50 kf

select 50 $\hat{\text{A}}\mu\text{s}$ (FM-KF).

75 kf

select 75 $\hat{\text{A}}\mu\text{s}$ (FM-KF).

7.12 aeval# TOC

Modify an audio signal according to the specified expressions.

This filter accepts one or more expressions (one for each channel), which are evaluated and used to modify a corresponding audio signal.

It accepts the following parameters:

exprs

Set the `'|'`-separated expressions list for each separate channel. If the number of input channels is greater than the number of expressions, the last specified expression is used for the remaining output channels.

channel_layout, *c*

Set output channel layout. If not specified, the channel layout is specified by the number of expressions. If set to `'same'`, it will use by default the same input channel layout.

Each expression in *exprs* can contain the following constants and functions:

ch

channel number of the current expression

n

number of the evaluated sample, starting from 0

s

sample rate

`t`

time of the evaluated sample expressed in seconds

`nb_in_channels`

`nb_out_channels`

input and output number of channels

`val(CH)`

the value of input channel with number *CH*

Note: this filter is slow. For faster processing you should use a dedicated filter.

7.12.1 Examples# TOC

- Half volume:

```
aeval=val(ch)/2:c=same
```

- Invert phase of the second channel:

```
aeval=val(0)|-val(1)
```

7.13 afade# TOC

Apply fade-in/out effect to input audio.

A description of the accepted parameters follows.

`type, t`

Specify the effect type, can be either `in` for fade-in, or `out` for a fade-out effect. Default is `in`.

`start_sample, ss`

Specify the number of the start sample for starting to apply the fade effect. Default is 0.

`nb_samples, ns`

Specify the number of samples for which the fade effect has to last. At the end of the fade-in effect the output audio will have the same volume as the input audio, at the end of the fade-out transition the output audio will be silence. Default is 44100.

`start_time, st`

Specify the start time of the fade effect. Default is 0. The value must be specified as a time duration; see (ffmpeg-utils)the Time duration section in the ffmpeg-utils(1) manual for the accepted syntax. If set this option is used instead of *start_sample*.

duration, d

Specify the duration of the fade effect. See (ffmpeg-utils)the Time duration section in the ffmpeg-utils(1) manual for the accepted syntax. At the end of the fade-in effect the output audio will have the same volume as the input audio, at the end of the fade-out transition the output audio will be silence. By default the duration is determined by *nb_samples*. If set this option is used instead of *nb_samples*.

curve

Set curve for fade transition.

It accepts the following values:

tri

select triangular, linear slope (default)

qsin

select quarter of sine wave

hsin

select half of sine wave

esin

select exponential sine wave

log

select logarithmic

ipar

select inverted parabola

qua

select quadratic

cub

select cubic

squ

select square root

cbr

select cubic root

par

select parabola

exp

select exponential

iqsin

select inverted quarter of sine wave

ihsin

select inverted half of sine wave

dese

select double-exponential seat

desi

select double-exponential sigmoid

7.13.1 Examples# TOC

- Fade in first 15 seconds of audio:

```
afade=t=in:ss=0:d=15
```

- Fade out last 25 seconds of a 900 seconds audio:

```
afade=t=out:st=875:d=25
```

7.14 afftfilt# TOC

Apply arbitrary expressions to samples in frequency domain.

`real`

Set frequency domain real expression for each separate channel separated by '|'. Default is "1". If the number of input channels is greater than the number of expressions, the last specified expression is used for the remaining output channels.

`imag`

Set frequency domain imaginary expression for each separate channel separated by '|'. If not set, *real* option is used.

Each expression in *real* and *imag* can contain the following constants:

`sr`

sample rate

`b`

current frequency bin number

`nb`

number of available bins

`ch`

channel number of the current expression

`chs`

number of channels

`pts`

current frame pts

`win_size`

Set window size.

It accepts the following values:

'w16'

'w32'

'w64'

'w128'

'w256'

'w512'
'w1024'
'w2048'
'w4096'
'w8192'
'w16384'
'w32768'
'w65536'

Default is w4096

win_func

Set window function. Default is hann.

overlap

Set window overlap. If set to 1, the recommended overlap for selected window function will be picked. Default is 0.75.

7.14.1 Examples# TOC

- Leave almost only low frequencies in audio:

```
afftfilt="1-clip((b/nb)*b,0,1)"
```

7.15 afir# TOC

Apply an arbitrary Frequency Impulse Response filter.

This filter is designed for applying long FIR filters, up to 30 seconds long.

It can be used as component for digital crossover filters, room equalization, cross talk cancellation, wavefield synthesis, auralization, ambiophonics and ambisonics.

This filter uses second stream as FIR coefficients. If second stream holds single channel, it will be used for all input channels in first stream, otherwise number of channels in second stream must be same as number of channels in first stream.

It accepts the following parameters:

dry

Set dry gain. This sets input gain.

wet

Set wet gain. This sets final output gain.

`length`

Set Impulse Response filter length. Default is 1, which means whole IR is processed.

`again`

Enable applying gain measured from power of IR.

`maxir`

Set max allowed Impulse Response filter duration in seconds. Default is 30 seconds. Allowed range is 0.1 to 60 seconds.

`response`

Show IR frequency response, magnitude and phase in additional video stream. By default it is disabled.

`channel`

Set for which IR channel to display frequency response. By default is first channel displayed. This option is used only when *response* is enabled.

`size`

Set video stream size. This option is used only when *response* is enabled.

7.15.1 Examples# TOC

- Apply reverb to stream using mono IR file as second input, complete command using ffmpeg:

```
ffmpeg -i input.wav -i middle_tunnel_1way_mono.wav -lavfi afir output.wav
```

7.16 aformat# TOC

Set output format constraints for the input audio. The framework will negotiate the most appropriate format to minimize conversions.

It accepts the following parameters:

`sample_fmts`

A '|' -separated list of requested sample formats.

`sample_rates`

A '|'-separated list of requested sample rates.

channel_layouts

A '|'-separated list of requested channel layouts.

See (ffmpeg-utils)the Channel Layout section in the ffmpeg-utils(1) manual for the required syntax.

If a parameter is omitted, all values are allowed.

Force the output to either unsigned 8-bit or signed 16-bit stereo

aformat=sample_fmts=u8|s16:channel_layouts=stereo

7.17 agate# TOC

A gate is mainly used to reduce lower parts of a signal. This kind of signal processing reduces disturbing noise between useful signals.

Gating is done by detecting the volume below a chosen level *threshold* and dividing it by the factor set with *ratio*. The bottom of the noise floor is set via *range*. Because an exact manipulation of the signal would cause distortion of the waveform the reduction can be levelled over time. This is done by setting *attack* and *release*.

attack determines how long the signal has to fall below the threshold before any reduction will occur and *release* sets the time the signal has to rise above the threshold to reduce the reduction again. Shorter signals than the chosen attack time will be left untouched.

level_in

Set input level before filtering. Default is 1. Allowed range is from 0.015625 to 64.

range

Set the level of gain reduction when the signal is below the threshold. Default is 0.06125. Allowed range is from 0 to 1.

threshold

If a signal rises above this level the gain reduction is released. Default is 0.125. Allowed range is from 0 to 1.

ratio

Set a ratio by which the signal is reduced. Default is 2. Allowed range is from 1 to 9000.

attack

Amount of milliseconds the signal has to rise above the threshold before gain reduction stops. Default is 20 milliseconds. Allowed range is from 0.01 to 9000.

release

Amount of milliseconds the signal has to fall below the threshold before the reduction is increased again. Default is 250 milliseconds. Allowed range is from 0.01 to 9000.

makeup

Set amount of amplification of signal after processing. Default is 1. Allowed range is from 1 to 64.

knee

Curve the sharp knee around the threshold to enter gain reduction more softly. Default is 2.828427125. Allowed range is from 1 to 8.

detection

Choose if exact signal should be taken for detection or an RMS like one. Default is rms. Can be peak or rms.

link

Choose if the average level between all channels or the louder channel affects the reduction. Default is average. Can be average or maximum.

7.18 aiir# TOC

Apply an arbitrary Infinite Impulse Response filter.

It accepts the following parameters:

z

Set numerator/zeros coefficients.

p

Set denominator/poles coefficients.

k

Set channels gains.

dry_gain

Set input gain.

wet_gain

Set output gain.

f

Set coefficients format.

‘tf’

transfer function

‘zp’

Z-plane zeros/poles, cartesian (default)

‘pr’

Z-plane zeros/poles, polar radians

‘pd’

Z-plane zeros/poles, polar degrees

r

Set kind of processing. Can be d - direct or s - serial cascading. Defaults is s.

e

Set filtering precision.

‘dbl’

double-precision floating-point (default)

‘flt’

single-precision floating-point

‘i32’

32-bit integers

‘i16’

16-bit integers

response

Show IR frequency response, magnitude and phase in additional video stream. By default it is disabled.

channel

Set for which IR channel to display frequency response. By default is first channel displayed. This option is used only when *response* is enabled.

size

Set video stream size. This option is used only when *response* is enabled.

Coefficients in *tf* format are separated by spaces and are in ascending order.

Coefficients in *zp* format are separated by spaces and order of coefficients doesn't matter. Coefficients in *zp* format are complex numbers with *i* imaginary unit.

Different coefficients and gains can be provided for every channel, in such case use '|' to separate coefficients or gains. Last provided coefficients will be used for all remaining channels.

7.18.1 Examples# TOC

- Apply 2 pole elliptic notch at around 5000Hz for 48000 Hz sample rate:

```
allr=k:l:z=7.957584807809675810E-1 -2.575128568908332300 3.674839853930788710 -2.57512875289799137 7.957586296317130880E-1:p=1 -2.86950072432325953 3.63022088054647218 -2.28075678147272232 6.361362326477423500E-1:f=wf:rnd
```

- Same as above but in *zp* format:

```
allr=k:0.795758480780967561:z=0.80918701+0.58773007i 0.80918701-0.58773007i 0.80884700+0.58784055i 0.80884700-0.58784055i:p=0.63892345+0.59951235i 0.63892345-0.59951235i 0.79582691+0.44198673i 0.79582691-0.44198673i:f=exp:rnd
```

7.19 alimiter# TOC

The limiter prevents an input signal from rising over a desired threshold. This limiter uses lookahead technology to prevent your signal from distorting. It means that there is a small delay after the signal is processed. Keep in mind that the delay it produces is the attack time you set.

The filter accepts the following options:

level_in

Set input gain. Default is 1.

level_out

Set output gain. Default is 1.

`limit`

Don't let signals above this level pass the limiter. Default is 1.

`attack`

The limiter will reach its attenuation level in this amount of time in milliseconds. Default is 5 milliseconds.

`release`

Come back from limiting to attenuation 1.0 in this amount of milliseconds. Default is 50 milliseconds.

`asc`

When gain reduction is always needed ASC takes care of releasing to an average reduction level rather than reaching a reduction of 0 in the release time.

`asc_level`

Select how much the release time is affected by ASC, 0 means nearly no changes in release time while 1 produces higher release times.

`level`

Auto level output signal. Default is enabled. This normalizes audio back to 0dB if enabled.

Depending on picked setting it is recommended to upsample input 2x or 4x times with `aresample` before applying this filter.

7.20 allpass# TOC

Apply a two-pole all-pass filter with central frequency (in Hz) *frequency*, and filter-width *width*. An all-pass filter changes the audio's frequency to phase relationship without changing its frequency to amplitude relationship.

The filter accepts the following options:

`frequency, f`

Set frequency in Hz.

`width_type, t`

Set method to specify band-width of filter.

`h`

Hz

q

Q-Factor

o

octave

s

slope

k

kHz

width, w

Specify the band-width of a filter in width_type units.

channels, c

Specify which channels to filter, by default all available are filtered.

7.20.1 Commands# TOC

This filter supports the following commands:

frequency, f

Change allpass frequency. Syntax for the command is : "*frequency*"

width_type, t

Change allpass width_type. Syntax for the command is : "*width_type*"

width, w

Change allpass width. Syntax for the command is : "*width*"

7.21 aloop# TOC

Loop audio samples.

The filter accepts the following options:

loop

Set the number of loops. Setting this value to -1 will result in infinite loops. Default is 0.

size

Set maximal number of samples. Default is 0.

start

Set first sample of loop. Default is 0.

7.22 amerge# TOC

Merge two or more audio streams into a single multi-channel stream.

The filter accepts the following options:

inputs

Set the number of inputs. Default is 2.

If the channel layouts of the inputs are disjoint, and therefore compatible, the channel layout of the output will be set accordingly and the channels will be reordered as necessary. If the channel layouts of the inputs are not disjoint, the output will have all the channels of the first input then all the channels of the second input, in that order, and the channel layout of the output will be the default value corresponding to the total number of channels.

For example, if the first input is in 2.1 (FL+FR+LF) and the second input is FC+BL+BR, then the output will be in 5.1, with the channels in the following order: a1, a2, b1, a3, b2, b3 (a1 is the first channel of the first input, b1 is the first channel of the second input).

On the other hand, if both input are in stereo, the output channels will be in the default order: a1, a2, b1, b2, and the channel layout will be arbitrarily set to 4.0, which may or may not be the expected value.

All inputs must have the same sample rate, and format.

If inputs do not have the same duration, the output will stop with the shortest.

7.22.1 Examples# TOC

- Merge two mono files into a stereo stream:

```
amovie=left.wav [l] ; amovie=right.mp3 [r] ; [l] [r] amerge
```

- Multiple merges assuming 1 video stream and 6 audio streams in input.mkv:

```
ffmpeg -i input.mkv -filter_complex "[0:1][0:2][0:3][0:4][0:5][0:6] amerge=inputs=6" -c:a pcm_s16le output.mkv
```

7.23 amix# TOC

Mixes multiple audio inputs into a single output.

Note that this filter only supports float samples (the *amerge* and *pan* audio filters support many formats). If the *amix* input has integer samples then *aresample* will be automatically inserted to perform the conversion to float samples.

For example

```
ffmpeg -i INPUT1 -i INPUT2 -i INPUT3 -filter_complex amix=inputs=3:duration=first:dropout_transition=3 OUTPUT
```

will mix 3 input audio streams to a single output with the same duration as the first input and a dropout transition time of 3 seconds.

It accepts the following parameters:

`inputs`

The number of inputs. If unspecified, it defaults to 2.

`duration`

How to determine the end-of-stream.

`longest`

The duration of the longest input. (default)

`shortest`

The duration of the shortest input.

`first`

The duration of the first input.

`dropout_transition`

The transition time, in seconds, for volume renormalization when an input stream ends. The default value is 2 seconds.

`weights`

Specify weight of each input audio stream as sequence. Each weight is separated by space. By default all inputs have same weight.

7.24 anequalizer# TOC

High-order parametric multiband equalizer for each channel.

It accepts the following parameters:

params

This option string is in format: "cchn f=cf w=w g=g t=f| ..." Each equalizer band is separated by '|'.
The first four options are required.

chn

Set channel number to which equalization will be applied. If input doesn't have that channel the entry is ignored.

f

Set central frequency for band. If input doesn't have that frequency the entry is ignored.

W

Set band width in hertz.

g

Set band gain in dB.

 t

Set filter type for band, optional, can be:

‘0’

Butterworth, this is default.

‘1’

Chebyshev type 1.

‘2’

Chebyshev type 2.

curves

With this option activated frequency response of anequalizer is displayed in video stream.

size

Set video stream size. Only useful if curves option is activated.

mgain

Set max gain that will be displayed. Only useful if curves option is activated. Setting this to a reasonable value makes it possible to display gain which is derived from neighbour bands which are too close to each other and thus produce higher gain when both are activated.

fscale

Set frequency scale used to draw frequency response in video output. Can be linear or logarithmic. Default is logarithmic.

colors

Set color for each channel curve which is going to be displayed in video stream. This is list of color names separated by space or by '|'. Unrecognised or missing colors will be replaced by white color.

7.24.1 Examples# TOC

- Lower gain by 10 of central frequency 200Hz and width 100 Hz for first 2 channels using Chebyshev type 1 filter:

```
anequalizer=c0 f=200 w=100 g=-10 t=1|c1 f=200 w=100 g=-10 t=1
```

7.24.2 Commands# TOC

This filter supports the following commands:

change

Alter existing filter parameters. Syntax for the commands is : "*fN*|*f=freq*|*w=width*|*g=gain*"

fN is existing filter number, starting from 0, if no such filter is available error is returned. *freq* set new frequency parameter. *width* set new width parameter in herz. *gain* set new gain parameter in dB.

Full filter invocation with asendcmd may look like this: asendcmd=c='4.0 anequalizer change 0|f=200|w=50|g=1',anequalizer=...

7.25 anull# TOC

Pass the audio source unchanged to the output.

7.26 apad# TOC

Pad the end of an audio stream with silence.

This can be used together with `ffmpeg -shortest` to extend audio streams to the same length as the video stream.

A description of the accepted options follows.

`packet_size`

Set silence packet size. Default value is 4096.

`pad_len`

Set the number of samples of silence to add to the end. After the value is reached, the stream is terminated. This option is mutually exclusive with `whole_len`.

`whole_len`

Set the minimum total number of samples in the output audio stream. If the value is longer than the input audio length, silence is added to the end, until the value is reached. This option is mutually exclusive with `pad_len`.

If neither the `pad_len` nor the `whole_len` option is set, the filter will add silence to the end of the input stream indefinitely.

7.26.1 Examples# TOC

- Add 1024 samples of silence to the end of the input:

```
apad=pad_len=1024
```

- Make sure the audio output will contain at least 10000 samples, pad the input with silence if required:

```
apad=whole_len=10000
```

- Use `ffmpeg` to pad the audio input with silence, so that the video stream will always result the shortest and will be converted until the end in the output file when using the `shortest` option:

```
ffmpeg -i VIDEO -i AUDIO -filter_complex "[1:0]apad" -shortest OUTPUT
```

7.27 aphaser# TOC

Add a phasing effect to the input audio.

A phaser filter creates series of peaks and troughs in the frequency spectrum. The position of the peaks and troughs are modulated so that they vary over time, creating a sweeping effect.

A description of the accepted parameters follows.

`in_gain`

Set input gain. Default is 0.4.

out_gain

Set output gain. Default is 0.74

delay

Set delay in milliseconds. Default is 3.0.

decay

Set decay. Default is 0.4.

speed

Set modulation speed in Hz. Default is 0.5.

type

Set modulation type. Default is triangular.

It accepts the following values:

`'triangular, t'`
`'sinusoidal, s'`

7.28 apulsator# TOC

Audio pulsator is something between an autopanner and a tremolo. But it can produce funny stereo effects as well. Pulsator changes the volume of the left and right channel based on a LFO (low frequency oscillator) with different waveforms and shifted phases. This filter have the ability to define an offset between left and right channel. An offset of 0 means that both LFO shapes match each other. The left and right channel are altered equally - a conventional tremolo. An offset of 50% means that the shape of the right channel is exactly shifted in phase (or moved backwards about half of the frequency) - pulsator acts as an autopanner. At 1 both curves match again. Every setting in between moves the phase shift gapless between all stages and produces some "bypassing" sounds with sine and triangle waveforms. The more you set the offset near 1 (starting from the 0.5) the faster the signal passes from the left to the right speaker.

The filter accepts the following options:

level_in

Set input gain. By default it is 1. Range is [0.015625 - 64].

level_out

Set output gain. By default it is 1. Range is [0.015625 - 64].

mode

Set waveform shape the LFO will use. Can be one of: sine, triangle, square, sawup or sawdown. Default is sine.

amount

Set modulation. Define how much of original signal is affected by the LFO.

offset_l

Set left channel offset. Default is 0. Allowed range is [0 - 1].

offset_r

Set right channel offset. Default is 0.5. Allowed range is [0 - 1].

width

Set pulse width. Default is 1. Allowed range is [0 - 2].

timing

Set possible timing mode. Can be one of: bpm, ms or hz. Default is hz.

bpm

Set bpm. Default is 120. Allowed range is [30 - 300]. Only used if timing is set to bpm.

ms

Set ms. Default is 500. Allowed range is [10 - 2000]. Only used if timing is set to ms.

hz

Set frequency in Hz. Default is 2. Allowed range is [0.01 - 100]. Only used if timing is set to hz.

7.29 aresample# TOC

Resample the input audio to the specified parameters, using the libswresample library. If none are specified then the filter will automatically convert between its input and output.

This filter is also able to stretch/squeeze the audio data to make it match the timestamps or to inject silence / cut out audio to make it match the timestamps, do a combination of both or do neither.

The filter accepts the syntax `[sample_rate:]resampler_options`, where *sample_rate* expresses a sample rate and *resampler_options* is a list of *key=value* pairs, separated by ":". See the (ffmpeg-resampler)"Resampler Options" section in the ffmpeg-resampler(1) manual for the complete list of supported options.

7.29.1 Examples# TOC

- Resample the input audio to 44100Hz:

```
aresample=44100
```

- Stretch/squeeze samples to the given timestamps, with a maximum of 1000 samples per second compensation:

```
aresample=async=1000
```

7.30 areverse# TOC

Reverse an audio clip.

Warning: This filter requires memory to buffer the entire clip, so trimming is suggested.

7.30.1 Examples# TOC

- Take the first 5 seconds of a clip, and reverse it.

```
atrim=end=5,areverse
```

7.31 asetnsamples# TOC

Set the number of samples per each output audio frame.

The last output packet may contain a different number of samples, as the filter will flush all the remaining samples when the input audio signals its end.

The filter accepts the following options:

`nb_out_samples, n`

Set the number of frames per each output audio frame. The number is intended as the number of samples *per each channel*. Default value is 1024.

`pad, p`

If set to 1, the filter will pad the last audio frame with zeroes, so that the last frame will contain the same number of samples as the previous ones. Default value is 1.

For example, to set the number of per-frame samples to 1234 and disable padding for the last frame, use:

```
asetnsamples=n=1234:p=0
```

7.32 asetrate# TOC

Set the sample rate without altering the PCM data. This will result in a change of speed and pitch.

The filter accepts the following options:

```
sample_rate, r
```

Set the output sample rate. Default is 44100 Hz.

7.33 ashowinfo# TOC

Show a line containing various information for each input audio frame. The input audio is not modified.

The shown line contains a sequence of key/value pairs of the form *key:value*.

The following values are shown in the output:

```
n
```

The (sequential) number of the input frame, starting from 0.

```
pts
```

The presentation timestamp of the input frame, in time base units; the time base depends on the filter input pad, and is usually $1/\text{sample_rate}$.

```
pts_time
```

The presentation timestamp of the input frame in seconds.

```
pos
```

position of the frame in the input stream, -1 if this information is unavailable and/or meaningless (for example in case of synthetic audio)

```
fmt
```

The sample format.

```
chlayout
```

The channel layout.

rate

The sample rate for the audio frame.

nb_samples

The number of samples (per channel) in the frame.

checksum

The Adler-32 checksum (printed in hexadecimal) of the audio data. For planar audio, the data is treated as if all the planes were concatenated.

plane_checksums

A list of Adler-32 checksums for each data plane.

7.34 astats# TOC

Display time domain statistical information about the audio channels. Statistics are calculated and displayed for each audio channel and, where applicable, an overall figure is also given.

It accepts the following option:

length

Short window length in seconds, used for peak and trough RMS measurement. Default is 0.05 (50 milliseconds). Allowed range is [0.01 - 10].

metadata

Set metadata injection. All the metadata keys are prefixed with `lavfi.astats.X`, where X is channel number starting from 1 or string `Overall`. Default is disabled.

Available keys for each channel are: `DC_offset` `Min_level` `Max_level` `Min_difference` `Max_difference` `Mean_difference` `RMS_difference` `Peak_level` `RMS_peak` `RMS_trough` `Crest_factor` `Flat_factor` `Peak_count` `Bit_depth` `Dynamic_range`

and for Overall: `DC_offset` `Min_level` `Max_level` `Min_difference` `Max_difference` `Mean_difference` `RMS_difference` `Peak_level` `RMS_level` `RMS_peak` `RMS_trough` `Flat_factor` `Peak_count` `Bit_depth` `Number_of_samples`

For example full key look like this `lavfi.astats.1.DC_offset` or this `lavfi.astats.Overall.Peak_count`.

For description what each key means read below.

reset

Set number of frame after which stats are going to be recalculated. Default is disabled.

A description of each shown parameter follows:

DC offset

Mean amplitude displacement from zero.

Min level

Minimal sample level.

Max level

Maximal sample level.

Min difference

Minimal difference between two consecutive samples.

Max difference

Maximal difference between two consecutive samples.

Mean difference

Mean difference between two consecutive samples. The average of each difference between two consecutive samples.

RMS difference

Root Mean Square difference between two consecutive samples.

Peak level dB

RMS level dB

Standard peak and RMS level measured in dBFS.

RMS peak dB

RMS trough dB

Peak and trough values for RMS level measured over a short window.

Crest factor

Standard ratio of peak to RMS level (note: not in dB).

Flat factor

Flatness (i.e. consecutive samples with the same value) of the signal at its peak levels (i.e. either *Min level* or *Max level*).

Peak count

Number of occasions (not the number of samples) that the signal attained either *Min level* or *Max level*.

Bit depth

Overall bit depth of audio. Number of bits used for each sample.

Dynamic range

Measured dynamic range of audio in dB.

7.35 atempo# TOC

Adjust audio tempo.

The filter accepts exactly one parameter, the audio tempo. If not specified then the filter will assume nominal 1.0 tempo. Tempo must be in the [0.5, 2.0] range.

7.35.1 Examples# TOC

- Slow down audio to 80% tempo:

```
atempo=0.8
```

- To speed up audio to 125% tempo:

```
atempo=1.25
```

7.36 atrim# TOC

Trim the input so that the output contains one continuous subpart of the input.

It accepts the following parameters:

start

Timestamp (in seconds) of the start of the section to keep. I.e. the audio sample with the timestamp *start* will be the first sample in the output.

end

Specify time of the first audio sample that will be dropped, i.e. the audio sample immediately preceding the one with the timestamp *end* will be the last sample in the output.

`start_pts`

Same as *start*, except this option sets the start timestamp in samples instead of seconds.

`end_pts`

Same as *end*, except this option sets the end timestamp in samples instead of seconds.

`duration`

The maximum duration of the output in seconds.

`start_sample`

The number of the first sample that should be output.

`end_sample`

The number of the first sample that should be dropped.

`start`, `end`, and `duration` are expressed as time duration specifications; see (ffmpeg-utils)the Time duration section in the ffmpeg-utils(1) manual.

Note that the first two sets of the `start/end` options and the `duration` option look at the frame timestamp, while the `_sample` options simply count the samples that pass through the filter. So `start/end_pts` and `start/end_sample` will give different results when the timestamps are wrong, inexact or do not start at zero. Also note that this filter does not modify the timestamps. If you wish to have the output timestamps start at zero, insert the `asetpts` filter after the `atrim` filter.

If multiple `start` or `end` options are set, this filter tries to be greedy and keep all samples that match at least one of the specified constraints. To keep only the part that matches all the constraints at once, chain multiple `atrim` filters.

The defaults are such that all the input is kept. So it is possible to set e.g. just the end values to keep everything before the specified time.

Examples:

- Drop everything except the second minute of input:

```
ffmpeg -i INPUT -af atrim=60:120
```

- Keep only the first 1000 samples:

```
ffmpeg -i INPUT -af atrim=end_sample=1000
```

7.37 bandpass# TOC

Apply a two-pole Butterworth band-pass filter with central frequency *frequency*, and (3dB-point) band-width width. The *csg* option selects a constant skirt gain (peak gain = Q) instead of the default: constant 0dB peak gain. The filter roll off at 6dB per octave (20dB per decade).

The filter accepts the following options:

`frequency, f`

Set the filter's central frequency. Default is 3000.

`csg`

Constant skirt gain if set to 1. Defaults to 0.

`width_type, t`

Set method to specify band-width of filter.

`h`

Hz

`q`

Q-Factor

`o`

octave

`s`

slope

`k`

kHz

`width, w`

Specify the band-width of a filter in width_type units.

`channels, c`

Specify which channels to filter, by default all available are filtered.

7.37.1 Commands# TOC

This filter supports the following commands:

`frequency, f`

Change bandpass frequency. Syntax for the command is : "*frequency*"

`width_type, t`

Change bandpass width_type. Syntax for the command is : "*width_type*"

`width, w`

Change bandpass width. Syntax for the command is : "*width*"

7.38 bandreject# TOC

Apply a two-pole Butterworth band-reject filter with central frequency *frequency*, and (3dB-point) band-width *width*. The filter roll off at 6dB per octave (20dB per decade).

The filter accepts the following options:

`frequency, f`

Set the filter's central frequency. Default is 3000.

`width_type, t`

Set method to specify band-width of filter.

`h`

Hz

`q`

Q-Factor

`o`

octave

`s`

slope

`k`

kHz

width, w

Specify the band-width of a filter in width_type units.

channels, c

Specify which channels to filter, by default all available are filtered.

7.38.1 Commands# TOC

This filter supports the following commands:

frequency, f

Change bandreject frequency. Syntax for the command is : "*frequency*"

width_type, t

Change bandreject width_type. Syntax for the command is : "*width_type*"

width, w

Change bandreject width. Syntax for the command is : "*width*"

7.39 bass, lowshelf# TOC

Boost or cut the bass (lower) frequencies of the audio using a two-pole shelving filter with a response similar to that of a standard hi-fi's tone-controls. This is also known as shelving equalisation (EQ).

The filter accepts the following options:

gain, g

Give the gain at 0 Hz. Its useful range is about -20 (for a large cut) to +20 (for a large boost). Beware of clipping when using a positive gain.

frequency, f

Set the filter's central frequency and so can be used to extend or reduce the frequency range to be boosted or cut. The default value is 100 Hz.

width_type, t

Set method to specify band-width of filter.

h

Hz

q

Q-Factor

o

octave

s

slope

k

kHz

width, w

Determine how steep is the filter's shelf transition.

channels, c

Specify which channels to filter, by default all available are filtered.

7.39.1 Commands# TOC

This filter supports the following commands:

frequency, f

Change bass frequency. Syntax for the command is : "*frequency*"

width_type, t

Change bass width_type. Syntax for the command is : "*width_type*"

width, w

Change bass width. Syntax for the command is : "*width*"

gain, g

Change bass gain. Syntax for the command is : "*gain*"

7.40 biquad# TOC

Apply a biquad IIR filter with the given coefficients. Where $b0$, $b1$, $b2$ and $a0$, $a1$, $a2$ are the numerator and denominator coefficients respectively. and *channels*, c specify which channels to filter, by default all available are filtered.

7.40.1 Commands# TOC

This filter supports the following commands:

a0
a1
a2
b0
b1
b2

Change biquad parameter. Syntax for the command is : "*value*"

7.41 bs2b# TOC

Bauer stereo to binaural transformation, which improves headphone listening of stereo audio records.

To enable compilation of this filter you need to configure FFmpeg with `--enable-libbs2b`.

It accepts the following parameters:

profile

Pre-defined crossfeed level.

default

Default level (fcut=700, feed=50).

cmoy

Chu Moy circuit (fcut=700, feed=60).

jmeier

Jan Meier circuit (fcut=650, feed=95).

fcut

Cut frequency (in Hz).

feed

Feed level (in Hz).

7.42 channelmap# TOC

Remap input channels to new locations.

It accepts the following parameters:

map

Map channels from input to output. The argument is a '|'-separated list of mappings, each in the *in_channel-out_channel* or *in_channel* form. *in_channel* can be either the name of the input channel (e.g. FL for front left) or its index in the input channel layout. *out_channel* is the name of the output channel or its index in the output channel layout. If *out_channel* is not given then it is implicitly an index, starting with zero and increasing by one for each mapping.

channel_layout

The channel layout of the output stream.

If no mapping is present, the filter will implicitly map input channels to output channels, preserving indices.

7.42.1 Examples# TOC

- For example, assuming a 5.1+downmix input MOV file,

```
ffmpeg -i in.mov -filter 'channelmap=map=DL-FL|DR-FR' out.wav
```

will create an output WAV file tagged as stereo from the downmix channels of the input.

- To fix a 5.1 WAV improperly encoded in AAC's native channel order

```
ffmpeg -i in.wav -filter 'channelmap=1|2|0|5|3|4:5.1' out.wav
```

7.43 channelsplit# TOC

Split each channel from an input audio stream into a separate output stream.

It accepts the following parameters:

channel_layout

The channel layout of the input stream. The default is "stereo".

channels

A channel layout describing the channels to be extracted as separate output streams or "all" to extract each input channel as a separate stream. The default is "all".

Choosing channels not present in channel layout in the input will result in an error.

7.43.1 Examples# TOC

- For example, assuming a stereo input MP3 file,

```
ffmpeg -i in.mp3 -filter_complex channelsplit out.mkv
```

will create an output Matroska file with two audio streams, one containing only the left channel and the other the right channel.

- Split a 5.1 WAV file into per-channel files:

```
ffmpeg -i in.wav -filter_complex  
'channelsplit=channel_layout=5.1[FL][FR][FC][LFE][SL][SR]'  
-map '[FL]' front_left.wav -map '[FR]' front_right.wav -map '[FC]'  
front_center.wav -map '[LFE]' lfe.wav -map '[SL]' side_left.wav -map '[SR]'  
side_right.wav
```

- Extract only LFE from a 5.1 WAV file:

```
ffmpeg -i in.wav -filter_complex 'channelsplit=channel_layout=5.1:channels=LFE[LFE]'  
-map '[LFE]' lfe.wav
```

7.44 chorus# TOC

Add a chorus effect to the audio.

Can make a single vocal sound like a chorus, but can also be applied to instrumentation.

Chorus resembles an echo effect with a short delay, but whereas with echo the delay is constant, with chorus, it is varied using sinusoidal or triangular modulation. The modulation depth defines the range the modulated delay is played before or after the delay. Hence the delayed sound will sound slower or faster, that is the delayed sound tuned around the original one, like in a chorus where some vocals are slightly off key.

It accepts the following parameters:

in_gain

Set input gain. Default is 0.4.

out_gain

Set output gain. Default is 0.4.

delays

Set delays. A typical delay is around 40ms to 60ms.

decays

Set decays.

speeds

Set speeds.

depths

Set depths.

7.44.1 Examples# TOC

- A single delay:

```
chorus=0.7:0.9:55:0.4:0.25:2
```

- Two delays:

```
chorus=0.6:0.9:50|60:0.4|0.32:0.25|0.4:2|1.3
```

- Fuller sounding chorus with three delays:

```
chorus=0.5:0.9:50|60|40:0.4|0.32|0.3:0.25|0.4|0.3:2|2.3|1.3
```

7.45 compand# TOC

Compress or expand the audio's dynamic range.

It accepts the following parameters:

attacks

decays

A list of times in seconds for each channel over which the instantaneous level of the input signal is averaged to determine its volume. *attacks* refers to increase of volume and *decays* refers to decrease of volume. For most situations, the attack time (response to the audio getting louder) should be shorter than the decay time, because the human ear is more sensitive to sudden loud audio than sudden soft audio. A typical value for attack is 0.3 seconds and a typical value for decay is 0.8 seconds. If specified number of attacks & decays is lower than number of channels, the last set attack/decay will be used for all remaining channels.

points

A list of points for the transfer function, specified in dB relative to the maximum possible signal amplitude. Each key points list must be defined using the following syntax:

$x_0/y_0 \mid x_1/y_1 \mid x_2/y_2 \mid \dots$ or $x_0/y_0 \ x_1/y_1 \ x_2/y_2 \ \dots$

The input values must be in strictly increasing order but the transfer function does not have to be monotonically rising. The point 0/0 is assumed but may be overridden (by 0/out-dBn). Typical values for the transfer function are $-70/-70 \mid -60/-20 \mid 1/0$.

soft-knee

Set the curve radius in dB for all joints. It defaults to 0.01.

gain

Set the additional gain in dB to be applied at all points on the transfer function. This allows for easy adjustment of the overall gain. It defaults to 0.

volume

Set an initial volume, in dB, to be assumed for each channel when filtering starts. This permits the user to supply a nominal level initially, so that, for example, a very large gain is not applied to initial signal levels before the companding has begun to operate. A typical value for audio which is initially quiet is -90 dB. It defaults to 0.

delay

Set a delay, in seconds. The input audio is analyzed immediately, but audio is delayed before being fed to the volume adjuster. Specifying a delay approximately equal to the attack/decay times allows the filter to effectively operate in predictive rather than reactive mode. It defaults to 0.

7.45.1 Examples# TOC

- Make music with both quiet and loud passages suitable for listening to in a noisy environment:

```
compand=.3|.3:1|1:-90/-60|-60/-40|-40/-30|-20/-20:6:0:-90:0.2
```

Another example for audio with whisper and explosion parts:

```
compand=0|0:1|1:-90/-900|-70/-70|-30/-9|0/-3:6:0:0:0
```

- A noise gate for when the noise is at a lower level than the signal:

```
compand=.1|.1:.2|.2:-900/-900|-50.1/-900|-50/-50:.01:0:-90:.1
```

- Here is another noise gate, this time for when the noise is at a higher level than the signal (making it, in some ways, similar to squelch):

compand=.1|.1:.1|.1:-45.1/-45.1|-45/-900|0/-900:.01:45:-90:.1

- 2:1 compression starting at -6dB:

compand=points=-80/-80|-6/-6|0/-3.8|20/3.5

- 2:1 compression starting at -9dB:

compand=points=-80/-80|-9/-9|0/-5.3|20/2.9

- 2:1 compression starting at -12dB:

compand=points=-80/-80|-12/-12|0/-6.8|20/1.9

- 2:1 compression starting at -18dB:

compand=points=-80/-80|-18/-18|0/-9.8|20/0.7

- 3:1 compression starting at -15dB:

compand=points=-80/-80|-15/-15|0/-10.8|20/-5.2

- Compressor/Gate:

compand=points=-80/-105|-62/-80|-15.4/-15.4|0/-12|20/-7.6

- Expander:

compand=attacks=0:points=-80/-169|-54/-80|-49.5/-64.6|-41.1/-41.1|-25.8/-15|-10.8/-4.5|0/0|20/8.3

- Hard limiter at -6dB:

compand=attacks=0:points=-80/-80|-6/-6|20/-6

- Hard limiter at -12dB:

compand=attacks=0:points=-80/-80|-12/-12|20/-12

- Hard noise gate at -35 dB:

compand=attacks=0:points=-80/-115|-35.1/-80|-35/-35|20/20

- Soft limiter:

compand=attacks=0:points=-80/-80|-12.4/-12.4|-6/-8|0/-6.8|20/-2.8

7.46 compensationdelay# TOC

Compensation Delay Line is a metric based delay to compensate differing positions of microphones or speakers.

For example, you have recorded guitar with two microphones placed in different location. Because the front of sound wave has fixed speed in normal conditions, the phasing of microphones can vary and depends on their location and interposition. The best sound mix can be achieved when these microphones

are in phase (synchronized). Note that distance of ~30 cm between microphones makes one microphone to capture signal in antiphase to another microphone. That makes the final mix sounding moody. This filter helps to solve phasing problems by adding different delays to each microphone track and make them synchronized.

The best result can be reached when you take one track as base and synchronize other tracks one by one with it. Remember that synchronization/delay tolerance depends on sample rate, too. Higher sample rates will give more tolerance.

It accepts the following parameters:

mm

Set millimeters distance. This is compensation distance for fine tuning. Default is 0.

cm

Set cm distance. This is compensation distance for tightening distance setup. Default is 0.

m

Set meters distance. This is compensation distance for hard distance setup. Default is 0.

dry

Set dry amount. Amount of unprocessed (dry) signal. Default is 0.

wet

Set wet amount. Amount of processed (wet) signal. Default is 1.

temp

Set temperature degree in Celsius. This is the temperature of the environment. Default is 20.

7.47 crossfeed# TOC

Apply headphone crossfeed filter.

Crossfeed is the process of blending the left and right channels of stereo audio recording. It is mainly used to reduce extreme stereo separation of low frequencies.

The intent is to produce more speaker like sound to the listener.

The filter accepts the following options:

strength

Set strength of crossfeed. Default is 0.2. Allowed range is from 0 to 1. This sets gain of low shelf filter for side part of stereo image. Default is -6dB. Max allowed is -30db when strength is set to 1.

range

Set soundstage wideness. Default is 0.5. Allowed range is from 0 to 1. This sets cut off frequency of low shelf filter. Default is cut off near 1550 Hz. With range set to 1 cut off frequency is set to 2100 Hz.

level_in

Set input gain. Default is 0.9.

level_out

Set output gain. Default is 1.

7.48 crystalizer# TOC

Simple algorithm to expand audio dynamic range.

The filter accepts the following options:

i

Sets the intensity of effect (default: 2.0). Must be in range between 0.0 (unchanged sound) to 10.0 (maximum effect).

c

Enable clipping. By default is enabled.

7.49 dcshift# TOC

Apply a DC shift to the audio.

This can be useful to remove a DC offset (caused perhaps by a hardware problem in the recording chain) from the audio. The effect of a DC offset is reduced headroom and hence volume. The astats filter can be used to determine if a signal has a DC offset.

shift

Set the DC shift, allowed range is [-1, 1]. It indicates the amount to shift the audio.

limitergain

Optional. It should have a value much less than 1 (e.g. 0.05 or 0.02) and is used to prevent clipping.

7.50 drmeter# TOC

Measure audio dynamic range.

DR values of 14 and higher is found in very dynamic material. DR of 8 to 13 is found in transition material. And anything less than 8 have very poor dynamics and is very compressed.

The filter accepts the following options:

`length`

Set window length in seconds used to split audio into segments of equal length. Default is 3 seconds.

7.51 dynaudnorm# TOC

Dynamic Audio Normalizer.

This filter applies a certain amount of gain to the input audio in order to bring its peak magnitude to a target level (e.g. 0 dBFS). However, in contrast to more "simple" normalization algorithms, the Dynamic Audio Normalizer *dynamically* re-adjusts the gain factor to the input audio. This allows for applying extra gain to the "quiet" sections of the audio while avoiding distortions or clipping the "loud" sections. In other words: The Dynamic Audio Normalizer will "even out" the volume of quiet and loud sections, in the sense that the volume of each section is brought to the same target level. Note, however, that the Dynamic Audio Normalizer achieves this goal *without* applying "dynamic range compressing". It will retain 100% of the dynamic range *within* each section of the audio file.

`f`

Set the frame length in milliseconds. In range from 10 to 8000 milliseconds. Default is 500 milliseconds. The Dynamic Audio Normalizer processes the input audio in small chunks, referred to as frames. This is required, because a peak magnitude has no meaning for just a single sample value. Instead, we need to determine the peak magnitude for a contiguous sequence of sample values. While a "standard" normalizer would simply use the peak magnitude of the complete file, the Dynamic Audio Normalizer determines the peak magnitude individually for each frame. The length of a frame is specified in milliseconds. By default, the Dynamic Audio Normalizer uses a frame length of 500 milliseconds, which has been found to give good results with most files. Note that the exact frame length, in number of samples, will be determined automatically, based on the sampling rate of the individual input audio file.

`g`

Set the Gaussian filter window size. In range from 3 to 301, must be odd number. Default is 31. Probably the most important parameter of the Dynamic Audio Normalizer is the `window_size` of the Gaussian smoothing filter. The filter's window size is specified in frames, centered around the current frame. For the sake of simplicity, this must be an odd number. Consequently, the default value of 31 takes into account the current frame, as well as the 15 preceding frames and the 15 subsequent frames. Using a larger window results in a stronger smoothing effect and thus in less gain variation, i.e. slower gain adaptation. Conversely, using a smaller window results in a weaker

smoothing effect and thus in more gain variation, i.e. faster gain adaptation. In other words, the more you increase this value, the more the Dynamic Audio Normalizer will behave like a "traditional" normalization filter. On the contrary, the more you decrease this value, the more the Dynamic Audio Normalizer will behave like a dynamic range compressor.

p

Set the target peak value. This specifies the highest permissible magnitude level for the normalized audio input. This filter will try to approach the target peak magnitude as closely as possible, but at the same time it also makes sure that the normalized signal will never exceed the peak magnitude. A frame's maximum local gain factor is imposed directly by the target peak magnitude. The default value is 0.95 and thus leaves a headroom of 5%*. It is not recommended to go above this value.

m

Set the maximum gain factor. In range from 1.0 to 100.0. Default is 10.0. The Dynamic Audio Normalizer determines the maximum possible (local) gain factor for each input frame, i.e. the maximum gain factor that does not result in clipping or distortion. The maximum gain factor is determined by the frame's highest magnitude sample. However, the Dynamic Audio Normalizer additionally bounds the frame's maximum gain factor by a predetermined (global) maximum gain factor. This is done in order to avoid excessive gain factors in "silent" or almost silent frames. By default, the maximum gain factor is 10.0, For most inputs the default value should be sufficient and it usually is not recommended to increase this value. Though, for input with an extremely low overall volume level, it may be necessary to allow even higher gain factors. Note, however, that the Dynamic Audio Normalizer does not simply apply a "hard" threshold (i.e. cut off values above the threshold). Instead, a "sigmoid" threshold function will be applied. This way, the gain factors will smoothly approach the threshold value, but never exceed that value.

r

Set the target RMS. In range from 0.0 to 1.0. Default is 0.0 - disabled. By default, the Dynamic Audio Normalizer performs "peak" normalization. This means that the maximum local gain factor for each frame is defined (only) by the frame's highest magnitude sample. This way, the samples can be amplified as much as possible without exceeding the maximum signal level, i.e. without clipping. Optionally, however, the Dynamic Audio Normalizer can also take into account the frame's root mean square, abbreviated RMS. In electrical engineering, the RMS is commonly used to determine the power of a time-varying signal. It is therefore considered that the RMS is a better approximation of the "perceived loudness" than just looking at the signal's peak magnitude. Consequently, by adjusting all frames to a constant RMS value, a uniform "perceived loudness" can be established. If a target RMS value has been specified, a frame's local gain factor is defined as the factor that would result in exactly that RMS value. Note, however, that the maximum local gain factor is still restricted by the frame's highest magnitude sample, in order to prevent clipping.

n

Enable channels coupling. By default is enabled. By default, the Dynamic Audio Normalizer will amplify all channels by the same amount. This means the same gain factor will be applied to all channels, i.e. the maximum possible gain factor is determined by the "loudest" channel. However, in

some recordings, it may happen that the volume of the different channels is uneven, e.g. one channel may be "quieter" than the other one(s). In this case, this option can be used to disable the channel coupling. This way, the gain factor will be determined independently for each channel, depending only on the individual channel's highest magnitude sample. This allows for harmonizing the volume of the different channels.

c

Enable DC bias correction. By default is disabled. An audio signal (in the time domain) is a sequence of sample values. In the Dynamic Audio Normalizer these sample values are represented in the -1.0 to 1.0 range, regardless of the original input format. Normally, the audio signal, or "waveform", should be centered around the zero point. That means if we calculate the mean value of all samples in a file, or in a single frame, then the result should be 0.0 or at least very close to that value. If, however, there is a significant deviation of the mean value from 0.0, in either positive or negative direction, this is referred to as a DC bias or DC offset. Since a DC bias is clearly undesirable, the Dynamic Audio Normalizer provides optional DC bias correction. With DC bias correction enabled, the Dynamic Audio Normalizer will determine the mean value, or "DC correction" offset, of each input frame and subtract that value from all of the frame's sample values which ensures those samples are centered around 0.0 again. Also, in order to avoid "gaps" at the frame boundaries, the DC correction offset values will be interpolated smoothly between neighbouring frames.

b

Enable alternative boundary mode. By default is disabled. The Dynamic Audio Normalizer takes into account a certain neighbourhood around each frame. This includes the preceding frames as well as the subsequent frames. However, for the "boundary" frames, located at the very beginning and at the very end of the audio file, not all neighbouring frames are available. In particular, for the first few frames in the audio file, the preceding frames are not known. And, similarly, for the last few frames in the audio file, the subsequent frames are not known. Thus, the question arises which gain factors should be assumed for the missing frames in the "boundary" region. The Dynamic Audio Normalizer implements two modes to deal with this situation. The default boundary mode assumes a gain factor of exactly 1.0 for the missing frames, resulting in a smooth "fade in" and "fade out" at the beginning and at the end of the input, respectively.

s

Set the compress factor. In range from 0.0 to 30.0. Default is 0.0. By default, the Dynamic Audio Normalizer does not apply "traditional" compression. This means that signal peaks will not be pruned and thus the full dynamic range will be retained within each local neighbourhood. However, in some cases it may be desirable to combine the Dynamic Audio Normalizer's normalization algorithm with a more "traditional" compression. For this purpose, the Dynamic Audio Normalizer provides an optional compression (thresholding) function. If (and only if) the compression feature is enabled, all input frames will be processed by a soft knee thresholding function prior to the actual normalization process. Put simply, the thresholding function is going to prune all samples whose magnitude exceeds a certain threshold value. However, the Dynamic Audio Normalizer does not simply apply a fixed threshold value. Instead, the threshold value will be adjusted for each individual frame. In general, smaller parameters result in stronger compression, and vice versa. Values below 3.0 are not recommended, because audible distortion may appear.

7.52 earwax# TOC

Make audio easier to listen to on headphones.

This filter adds ‘cues’ to 44.1kHz stereo (i.e. audio CD format) audio so that when listened to on headphones the stereo image is moved from inside your head (standard for headphones) to outside and in front of the listener (standard for speakers).

Ported from SoX.

7.53 equalizer# TOC

Apply a two-pole peaking equalisation (EQ) filter. With this filter, the signal-level at and around a selected frequency can be increased or decreased, whilst (unlike bandpass and bandreject filters) that at all other frequencies is unchanged.

In order to produce complex equalisation curves, this filter can be given several times, each with a different central frequency.

The filter accepts the following options:

`frequency, f`

Set the filter’s central frequency in Hz.

`width_type, t`

Set method to specify band-width of filter.

`h`

Hz

`q`

Q-Factor

`o`

octave

`s`

slope

`k`

kHz

width, w

Specify the band-width of a filter in width_type units.

gain, g

Set the required gain or attenuation in dB. Beware of clipping when using a positive gain.

channels, c

Specify which channels to filter, by default all available are filtered.

7.53.1 Examples# TOC

- Attenuate 10 dB at 1000 Hz, with a bandwidth of 200 Hz:

```
equalizer=f=1000:t=h:width=200:g=-10
```

- Apply 2 dB gain at 1000 Hz with Q 1 and attenuate 5 dB at 100 Hz with Q 2:

```
equalizer=f=1000:t=q:w=1:g=2,equalizer=f=100:t=q:w=2:g=-5
```

7.53.2 Commands# TOC

This filter supports the following commands:

frequency, f

Change equalizer frequency. Syntax for the command is : "*frequency*"

width_type, t

Change equalizer width_type. Syntax for the command is : "*width_type*"

width, w

Change equalizer width. Syntax for the command is : "*width*"

gain, g

Change equalizer gain. Syntax for the command is : "*gain*"

7.54 extrastereo# TOC

Linearly increases the difference between left and right channels which adds some sort of "live" effect to playback.

The filter accepts the following options:

`m`

Sets the difference coefficient (default: 2.5). 0.0 means mono sound (average of both channels), with 1.0 sound will be unchanged, with -1.0 left and right channels will be swapped.

`c`

Enable clipping. By default is enabled.

7.55 firequalizer# TOC

Apply FIR Equalization using arbitrary frequency response.

The filter accepts the following option:

`gain`

Set gain curve equation (in dB). The expression can contain variables:

`f`

the evaluated frequency

`sr`

sample rate

`ch`

channel number, set to 0 when multichannels evaluation is disabled

`chid`

channel id, see libavutil/channel_layout.h, set to the first channel id when multichannels evaluation is disabled

`chs`

number of channels

`chlayout`

channel_layout, see libavutil/channel_layout.h

and functions:

`gain_interpolate(f)`

interpolate gain on frequency `f` based on `gain_entry`

`cubic_interpolate(f)`

same as `gain_interpolate`, but smoother

This option is also available as command. Default is `gain_interpolate(f)`.

`gain_entry`

Set gain entry for `gain_interpolate` function. The expression can contain functions:

`entry(f, g)`

store gain entry at frequency `f` with value `g`

This option is also available as command.

`delay`

Set filter delay in seconds. Higher value means more accurate. Default is `0.01`.

`accuracy`

Set filter accuracy in Hz. Lower value means more accurate. Default is `5`.

`wfunc`

Set window function. Acceptable values are:

`rectangular`

rectangular window, useful when gain curve is already smooth

`hann`

hann window (default)

`hamming`

hamming window

`blackman`

blackman window

`nuttall3`

3-terms continuous 1st derivative nuttall window

`mnuttall13`

minimum 3-terms discontinuous nuttall window

`nuttall`

4-terms continuous 1st derivative nuttall window

`bnuttall`

minimum 4-terms discontinuous nuttall (blackman-nuttall) window

`bharris`

blackman-harris window

`tukey`

tukey window

`fixed`

If enabled, use fixed number of audio samples. This improves speed when filtering with large delay. Default is disabled.

`multi`

Enable multichannels evaluation on gain. Default is disabled.

`zero_phase`

Enable zero phase mode by subtracting timestamp to compensate delay. Default is disabled.

`scale`

Set scale used by gain. Acceptable values are:

`linlin`

linear frequency, linear gain

`linlog`

linear frequency, logarithmic (in dB) gain (default)

`loglin`

logarithmic (in octave scale where 20 Hz is 0) frequency, linear gain

loglog

logarithmic frequency, logarithmic gain

dumpfile

Set file for dumping, suitable for gnuplot.

dumpscale

Set scale for dumpfile. Acceptable values are same with scale option. Default is linlog.

fft2

Enable 2-channel convolution using complex FFT. This improves speed significantly. Default is disabled.

min_phase

Enable minimum phase impulse response. Default is disabled.

7.55.1 Examples# TOC

- lowpass at 1000 Hz:

```
firequalizer=gain='if(lt(f,1000), 0, -INF)'
```

- lowpass at 1000 Hz with gain_entry:

```
firequalizer=gain_entry='entry(1000,0); entry(1001, -INF)'
```

- custom equalization:

```
firequalizer=gain_entry='entry(100,0); entry(400, -4); entry(1000, -6); entry(2000, 0)'
```

- higher delay with zero phase to compensate delay:

```
firequalizer=delay=0.1:fixed=on:zero_phase=on
```

- lowpass on left channel, highpass on right channel:

```
firequalizer=gain='if(eq(chid,1), gain_interpolate(f), if(eq(chid,2), gain_interpolate(1e6+f), 0))':  
gain_entry='entry(1000, 0); entry(1001,-INF); entry(1e6+1000,0)':multi=on
```

7.56 flanger# TOC

Apply a flanging effect to the audio.

The filter accepts the following options:

`delay`

Set base delay in milliseconds. Range from 0 to 30. Default value is 0.

`depth`

Set added sweep delay in milliseconds. Range from 0 to 10. Default value is 2.

`regen`

Set percentage regeneration (delayed signal feedback). Range from -95 to 95. Default value is 0.

`width`

Set percentage of delayed signal mixed with original. Range from 0 to 100. Default value is 71.

`speed`

Set sweeps per second (Hz). Range from 0.1 to 10. Default value is 0.5.

`shape`

Set swept wave shape, can be *triangular* or *sinusoidal*. Default value is *sinusoidal*.

`phase`

Set swept wave percentage-shift for multi channel. Range from 0 to 100. Default value is 25.

`interp`

Set delay-line interpolation, *linear* or *quadratic*. Default is *linear*.

7.57 haas# TOC

Apply Haas effect to audio.

Note that this makes most sense to apply on mono signals. With this filter applied to mono signals it give some directionality and stretches its stereo image.

The filter accepts the following options:

`level_in`

Set input level. By default is *1*, or 0dB

`level_out`

Set output level. By default is 1 , or 0dB.

side_gain

Set gain applied to side part of signal. By default is 1 .

middle_source

Set kind of middle source. Can be one of the following:

‘left’

Pick left channel.

‘right’

Pick right channel.

‘mid’

Pick middle part signal of stereo image.

‘side’

Pick side part signal of stereo image.

middle_phase

Change middle phase. By default is disabled.

left_delay

Set left channel delay. By default is 2.05 milliseconds.

left_balance

Set left channel balance. By default is -1 .

left_gain

Set left channel gain. By default is 1 .

left_phase

Change left phase. By default is disabled.

right_delay

Set right channel delay. By default is 2.12 milliseconds.

right_balance

Set right channel balance. By default is 1.

right_gain

Set right channel gain. By default is 1.

right_phase

Change right phase. By default is enabled.

7.58 hdc# TOC

Decodes High Definition Compatible Digital (HDCD) data. A 16-bit PCM stream with embedded HDCD codes is expanded into a 20-bit PCM stream.

The filter supports the Peak Extend and Low-level Gain Adjustment features of HDCD, and detects the Transient Filter flag.

```
ffmpeg -i HDCD16.flac -af hcd OUT24.flac
```

When using the filter with wav, note the default encoding for wav is 16-bit, so the resulting 20-bit stream will be truncated back to 16-bit. Use something like `-acodec pcm_s24le` after the filter to get 24-bit PCM output.

```
ffmpeg -i HDCD16.wav -af hcd OUT16.wav  
ffmpeg -i HDCD16.wav -af hcd -c:a pcm_s24le OUT24.wav
```

The filter accepts the following options:

disable_autoconvert

Disable any automatic format conversion or resampling in the filter graph.

process_stereo

Process the stereo channels together. If `target_gain` does not match between channels, consider it invalid and use the last valid `target_gain`.

cdt_ms

Set the code detect timer period in ms.

force_pe

Always extend peaks above -3dBFS even if PE isn't signaled.

`analyze_mode`

Replace audio with a solid tone and adjust the amplitude to signal some specific aspect of the decoding process. The output file can be loaded in an audio editor alongside the original to aid analysis.

`analyze_mode=pe:force_pe=true` can be used to see all samples above the PE level.

Modes are:

`'0, off'`

Disabled

`'1, lle'`

Gain adjustment level at each sample

`'2, pe'`

Samples where peak extend occurs

`'3, cdt'`

Samples where the code detect timer is active

`'4, tgm'`

Samples where the target gain does not match between channels

7.59 headphone# TOC

Apply head-related transfer functions (HRTFs) to create virtual loudspeakers around the user for binaural listening via headphones. The HRIRs are provided via additional streams, for each channel one stereo input stream is needed.

The filter accepts the following options:

`map`

Set mapping of input streams for convolution. The argument is a '|'-separated list of channel names in order as they are given as additional stream inputs for filter. This also specify number of input streams. Number of input streams must be not less than number of channels in first stream plus one.

`gain`

Set gain applied to audio. Value is in dB. Default is 0.

type

Set processing type. Can be *time* or *freq*. *time* is processing audio in time domain which is slow. *freq* is processing audio in frequency domain which is fast. Default is *freq*.

lfe

Set custom gain for LFE channels. Value is in dB. Default is 0.

size

Set size of frame in number of samples which will be processed at once. Default value is *1024*. Allowed range is from 1024 to 96000.

hrir

Set format of hrir stream. Default value is *stereo*. Alternative value is *multich*. If value is set to *stereo*, number of additional streams should be greater or equal to number of input channels in first input stream. Also each additional stream should have stereo number of channels. If value is set to *multich*, number of additional streams should be exactly one. Also number of input channels of additional stream should be equal or greater than twice number of channels of first input stream.

7.59.1 Examples# TOC

- Full example using wav files as coefficients with amovie filters for 7.1 downmix, each amovie filter use stereo file with IR coefficients as input. The files give coefficients for each position of virtual loudspeaker:

```
ffmpeg -i input.wav -lavfi-complex "amovie=mi_270_ah_0_300.wav[a0],amovie=mi_30_ah_0_300.wav[a1],amovie=mi_225_ah_0_300.wav[a2],amovie=mi_135_ah_0_300.wav[a3],amovie=mi_0_ah_0_300.wav[a4],amovie=mi_315_ah_0_300.wav[a5],amovie=mi_225_ah_0_300.wav[a6],amovie=mi_135_ah_0_300.wav[a7],amovie=mi_30_ah_0_300.wav[a8],amovie=mi_270_ah_0_300.wav[a9],a0|a1|a2|a3|a4|a5|a6|a7|a8|a9|mi|sl|sr" output.wav
```

- Full example using wav files as coefficients with amovie filters for 7.1 downmix, but now in *multich* *hrir* format.

```
ffmpeg -i input.wav -lavfi-complex "amovie=mi_270_ah_0_300.wav[a0],amovie=mi_30_ah_0_300.wav[a1],amovie=mi_225_ah_0_300.wav[a2],amovie=mi_135_ah_0_300.wav[a3],amovie=mi_0_ah_0_300.wav[a4],amovie=mi_315_ah_0_300.wav[a5],amovie=mi_225_ah_0_300.wav[a6],amovie=mi_135_ah_0_300.wav[a7],amovie=mi_30_ah_0_300.wav[a8],amovie=mi_270_ah_0_300.wav[a9],a0|a1|a2|a3|a4|a5|a6|a7|a8|a9|mi|sl|sr:hrir=multich" output.wav
```

7.60 highpass# TOC

Apply a high-pass filter with 3dB point frequency. The filter can be either single-pole, or double-pole (the default). The filter roll off at 6dB per pole per octave (20dB per pole per decade).

The filter accepts the following options:

frequency, f

Set frequency in Hz. Default is 3000.

`poles, p`

Set number of poles. Default is 2.

`width_type, t`

Set method to specify band-width of filter.

`h`

Hz

`q`

Q-Factor

`o`

octave

`s`

slope

`k`

kHz

`width, w`

Specify the band-width of a filter in `width_type` units. Applies only to double-pole filter. The default is 0.707q and gives a Butterworth response.

`channels, c`

Specify which channels to filter, by default all available are filtered.

7.60.1 Commands# TOC

This filter supports the following commands:

`frequency, f`

Change highpass frequency. Syntax for the command is : "*frequency*"

`width_type, t`

Change highpass `width_type`. Syntax for the command is : "*width_type*"

width, w

Change highpass width. Syntax for the command is : "*width*"

7.61 join# TOC

Join multiple input streams into one multi-channel stream.

It accepts the following parameters:

inputs

The number of input streams. It defaults to 2.

channel_layout

The desired output channel layout. It defaults to stereo.

map

Map channels from inputs to output. The argument is a '|'-separated list of mappings, each in the *input_idx.in_channel-out_channel* form. *input_idx* is the 0-based index of the input stream. *in_channel* can be either the name of the input channel (e.g. FL for front left) or its index in the specified input stream. *out_channel* is the name of the output channel.

The filter will attempt to guess the mappings when they are not specified explicitly. It does so by first trying to find an unused matching input channel and if that fails it picks the first unused input channel.

Join 3 inputs (with properly set channel layouts):

```
ffmpeg -i INPUT1 -i INPUT2 -i INPUT3 -filter_complex join=inputs=3 OUTPUT
```

Build a 5.1 output from 6 single-channel streams:

```
ffmpeg -i fl -i fr -i fc -i sl -i sr -i lfe -filter_complex  
'join=inputs=6:channel_layout=5.1:map=0.0-FL|1.0-FR|2.0-FC|3.0-SL|4.0-SR|5.0-LFE'  
out
```

7.62 ladspa# TOC

Load a LADSPA (Linux Audio Developer's Simple Plugin API) plugin.

To enable compilation of this filter you need to configure FFmpeg with `--enable-ladspa`.

file, f

Specifies the name of LADSPA plugin library to load. If the environment variable `LADSPA_PATH` is defined, the LADSPA plugin is searched in each one of the directories specified by the colon separated list in `LADSPA_PATH`, otherwise in the standard LADSPA paths, which are in this order: `HOME/.ladspa/lib/`, `/usr/local/lib/ladspa/`, `/usr/lib/ladspa/`.

`plugin, p`

Specifies the plugin within the library. Some libraries contain only one plugin, but others contain many of them. If this is not set filter will list all available plugins within the specified library.

`controls, c`

Set the '|' separated list of controls which are zero or more floating point values that determine the behavior of the loaded plugin (for example delay, threshold or gain). Controls need to be defined using the following syntax: `c0=value0|c1=value1|c2=value2|...`, where *valuei* is the value set on the *i*-th control. Alternatively they can be also defined using the following syntax: `value0|value1|value2|...`, where *valuei* is the value set on the *i*-th control. If `controls` is set to `help`, all available controls and their valid ranges are printed.

`sample_rate, s`

Specify the sample rate, default to 44100. Only used if plugin have zero inputs.

`nb_samples, n`

Set the number of samples per channel per each output frame, default is 1024. Only used if plugin have zero inputs.

`duration, d`

Set the minimum duration of the sourced audio. See (ffmpeg-utils)the Time duration section in the ffmpeg-utils(1) manual for the accepted syntax. Note that the resulting duration may be greater than the specified duration, as the generated audio is always cut at the end of a complete frame. If not specified, or the expressed duration is negative, the audio is supposed to be generated forever. Only used if plugin have zero inputs.

7.62.1 Examples# TOC

- List all available plugins within amp (LADSPA example plugin) library:

```
ladspa=file=amp
```

- List all available controls and their valid ranges for `vcf_notch` plugin from VCF library:

```
ladspa=f=vcf:p=vcf_notch:c=help
```

- Simulate low quality audio equipment using Computer Music Toolkit (CMT) plugin library:

```
ladspa=file=cmt:plugin=lofi:controls=c0=22|c1=12|c2=12
```

- Add reverberation to the audio using TAP-plugins (Tom's Audio Processing plugins):

```
ladspa=file=tap_reverb:tap_reverb
```

- Generate white noise, with 0.2 amplitude:

```
ladspa=file=cmt:noise_source_white:c=c0=.2
```

- Generate 20 bpm clicks using plugin C* Click – Metronome from the C* Audio Plugin Suite (CAPS) library:

```
ladspa=file=caps:Click:c=c1=20'
```

- Apply C* Eq10X2 - Stereo 10-band equaliser effect:

$$\text{ladspa=caps:Eq10X2:c=c0=-48|c9=-24|c3=12|c4=2}$$

- Increase volume by 20dB using fast lookahead limiter from Steve Harris SWH Plugins collection:

```
ladspa=fast_lookahead_limiter_1913:fastLookaheadLimiter:20|0|2
```

- Attenuate low frequencies using Multiband EQ from Steve Harris SWH Plugins collection:

ladspa=mbeq_1197:mbeq:-24|-24|-24|0|0|0|0|0|0|0|0|0|0|0|0|0|0

- Reduce stereo image using `Narrower` from the `C* Audio Plugin Suite (CAPS)` library:

```
ladspa=caps:Narrower
```

- Another white noise, now using C* Audio Plugin Suite (CAPS) library:

ladspa=caps:White:.2

- Some fractal noise, using C* Audio Plugin Suite (CAPS) library:

$$\text{ladspa}=\text{caps}:\text{Fractal}:c=c1=1$$

- Dynamic volume normalization using VLevel plugin:

```
ladspa=vlevel-ladspa:vlevel_mono
```

7.62.2 Commands# TOC

This filter supports the following commands:

CN

Modify the N -th control value.

If the specified value is not valid, it is ignored and prior one is kept.

7.63 loudnorm# TOC

EBU R128 loudness normalization. Includes both dynamic and linear normalization modes. Support for both single pass (livestreams, files) and double pass (files) modes. This algorithm can target IL, LRA, and maximum true peak. To accurately detect true peaks, the audio stream will be upsampled to 192 kHz unless the normalization mode is linear. Use the `-ar` option or `aresample` filter to explicitly set an output sample rate.

The filter accepts the following options:

`I, i`

Set integrated loudness target. Range is -70.0 - -5.0. Default value is -24.0.

`LRA, lra`

Set loudness range target. Range is 1.0 - 20.0. Default value is 7.0.

`TP, tp`

Set maximum true peak. Range is -9.0 - +0.0. Default value is -2.0.

`measured_I, measured_i`

Measured IL of input file. Range is -99.0 - +0.0.

`measured_LRA, measured_lra`

Measured LRA of input file. Range is 0.0 - 99.0.

`measured_TP, measured_tp`

Measured true peak of input file. Range is -99.0 - +99.0.

`measured_thresh`

Measured threshold of input file. Range is -99.0 - +0.0.

`offset`

Set offset gain. Gain is applied before the true-peak limiter. Range is -99.0 - +99.0. Default is +0.0.

`linear`

Normalize linearly if possible. `measured_I`, `measured_LRA`, `measured_TP`, and `measured_thresh` must also to be specified in order to use this mode. Options are true or false. Default is true.

`dual_mono`

Treat mono input files as "dual-mono". If a mono file is intended for playback on a stereo system, its EBU R128 measurement will be perceptually incorrect. If set to `true`, this option will compensate for this effect. Multi-channel input files are not affected by this option. Options are true or false. Default is false.

`print_format`

Set print format for stats. Options are summary, json, or none. Default value is none.

7.64 lowpass# TOC

Apply a low-pass filter with 3dB point frequency. The filter can be either single-pole or double-pole (the default). The filter roll off at 6dB per pole per octave (20dB per pole per decade).

The filter accepts the following options:

frequency, f

Set frequency in Hz. Default is 500.

poles, p

Set number of poles. Default is 2.

width_type, t

Set method to specify band-width of filter.

h

Hz

q

Q-Factor

o

octave

s

slope

k

kHz

width, w

Specify the band-width of a filter in width_type units. Applies only to double-pole filter. The default is 0.707q and gives a Butterworth response.

channels, c

Specify which channels to filter, by default all available are filtered.

7.64.1 Examples# TOC

- Lowpass only LFE channel, if LFE is not present it does nothing:

```
lowpass=c=LFE
```

7.64.2 Commands# TOC

This filter supports the following commands:

`frequency, f`

Change lowpass frequency. Syntax for the command is : "*frequency*"

`width_type, t`

Change lowpass width_type. Syntax for the command is : "*width_type*"

`width, w`

Change lowpass width. Syntax for the command is : "*width*"

7.65 lv2# TOC

Load a LV2 (LADSPA Version 2) plugin.

To enable compilation of this filter you need to configure FFmpeg with `--enable-lv2`.

`plugin, p`

Specifies the plugin URI. You may need to escape ':'.

`controls, c`

Set the '|' separated list of controls which are zero or more floating point values that determine the behavior of the loaded plugin (for example delay, threshold or gain). If `controls` is set to `help`, all available controls and their valid ranges are printed.

`sample_rate, s`

Specify the sample rate, default to 44100. Only used if plugin have zero inputs.

`nb_samples, n`

Set the number of samples per channel per each output frame, default is 1024. Only used if plugin have zero inputs.

duration, d

Set the minimum duration of the sourced audio. See (ffmpeg-utils)the Time duration section in the ffmpeg-utils(1) manual for the accepted syntax. Note that the resulting duration may be greater than the specified duration, as the generated audio is always cut at the end of a complete frame. If not specified, or the expressed duration is negative, the audio is supposed to be generated forever. Only used if plugin have zero inputs.

7.65.1 Examples# TOC

- Apply bass enhancer plugin from Calf:

```
lv2=p=http\\\\://calf.sourceforge.net/plugins/BassEnhancer:c=amount=2
```

- Apply vinyl plugin from Calf:

```
lv2=p=http\\\\://calf.sourceforge.net/plugins/Vinyl:c=drone=0.2|aging=0.5
```

- Apply bit crusher plugin from ArtyFX:

```
lv2=p=http\\\\://www.openavproductions.com/artyfx#bitta:c=crush=0.3
```

7.66 mcompand# TOC

Multiband Compress or expand the audio's dynamic range.

The input audio is divided into bands using 4th order Linkwitz-Riley IIRs. This is akin to the crossover of a loudspeaker, and results in flat frequency response when absent compander action.

It accepts the following parameters:

args

This option syntax is: attack,decay,[attack,decay..] soft-knee points crossover_frequency [delay [initial_volume [gain]]] | attack,decay ... For explanation of each item refer to compand filter documentation.

7.67 pan# TOC

Mix channels with specific gain levels. The filter accepts the output channel layout followed by a set of channels definitions.

This filter is also designed to efficiently remap the channels of an audio stream.

The filter accepts parameters of the form: "*l|outdef|outdef|...*"

output channel layout or number of channels

outdef

output channel specification, of the form: "*out_name*=[*gain*]**in_name*[(+)[*gain*]**in_name*...]"

out_name

output channel to define, either a channel name (FL, FR, etc.) or a channel number (c0, c1, etc.)

gain

multiplicative coefficient for the channel, 1 leaving the volume unchanged

in_name

input channel to use, see out_name for details; it is not possible to mix named and numbered input channels

If the '=' in a channel specification is replaced by '<', then the gains for that specification will be renormalized so that the total is 1, thus avoiding clipping noise.

7.67.1 Mixing examples# TOC

For example, if you want to down-mix from stereo to mono, but with a bigger factor for the left channel:

```
pan=1c|c0=0.9*c0+0.1*c1
```

A customized down-mix to stereo that works automatically for 3-, 4-, 5- and 7-channels surround:

```
pan=stereo| FL < FL + 0.5*FC + 0.6*BL + 0.6*SL | FR < FR + 0.5*FC + 0.6*BR + 0.6*SR
```

Note that `ffmpeg` integrates a default down-mix (and up-mix) system that should be preferred (see "-ac" option) unless you have very specific needs.

7.67.2 Remapping examples# TOC

The channel remapping will be effective if, and only if:

- gain coefficients are zeroes or ones,
- only one input per channel output,

If all these conditions are satisfied, the filter will notify the user ("Pure channel mapping detected"), and use an optimized and lossless method to do the remapping.

For example, if you have a 5.1 source and want a stereo audio stream by dropping the extra channels:

```
pan="stereo| c0=FL | c1=FR"
```


Given the same source, you can also switch front left and front right channels and keep the input channel layout:

```
pan="5.1 | c0=c1 | c1=c0 | c2=c2 | c3=c3 | c4=c4 | c5=c5"
```

If the input is a stereo audio stream, you can mute the front left channel (and still keep the stereo channel layout) with:

```
pan="stereo | c1=c1"
```

Still with a stereo audio stream input, you can copy the right channel in both front left and right:

```
pan="stereo | c0=FR | c1=FR"
```

7.68 replaygain# TOC

ReplayGain scanner filter. This filter takes an audio stream as an input and outputs it unchanged. At end of filtering it displays `track_gain` and `track_peak`.

7.69 resample# TOC

Convert the audio sample format, sample rate and channel layout. It is not meant to be used directly.

7.70 rubberband# TOC

Apply time-stretching and pitch-shifting with `librubberband`.

To enable compilation of this filter, you need to configure FFmpeg with `--enable-librubberband`.

The filter accepts the following options:

`tempo`

Set tempo scale factor.

`pitch`

Set pitch scale factor.

`transients`

Set transients detector. Possible values are:

crisp

mixed

smooth

detector

Set detector. Possible values are:

compound
percussive
soft

phase

Set phase. Possible values are:

laminar
independent

window

Set processing window size. Possible values are:

standard
short
long

smoothing

Set smoothing. Possible values are:

off
on

formant

Enable formant preservation when shift pitching. Possible values are:

shifted
preserved

pitchq

Set pitch quality. Possible values are:

quality
speed
consistency

channels

Set channels. Possible values are:

apart
together

7.71 sidechaincompress# TOC

This filter acts like normal compressor but has the ability to compress detected signal using second input signal. It needs two input streams and returns one output stream. First input stream will be processed depending on second stream signal. The filtered signal then can be filtered with other filters in later stages of processing. See pan and amerge filter.

The filter accepts the following options:

`level_in`

Set input gain. Default is 1. Range is between 0.015625 and 64.

`threshold`

If a signal of second stream raises above this level it will affect the gain reduction of first stream. By default is 0.125. Range is between 0.00097563 and 1.

`ratio`

Set a ratio about which the signal is reduced. 1:2 means that if the level raised 4dB above the threshold, it will be only 2dB above after the reduction. Default is 2. Range is between 1 and 20.

`attack`

Amount of milliseconds the signal has to rise above the threshold before gain reduction starts. Default is 20. Range is between 0.01 and 2000.

`release`

Amount of milliseconds the signal has to fall below the threshold before reduction is decreased again. Default is 250. Range is between 0.01 and 9000.

`makeup`

Set the amount by how much signal will be amplified after processing. Default is 1. Range is from 1 to 64.

`knee`

Curve the sharp knee around the threshold to enter gain reduction more softly. Default is 2.82843. Range is between 1 and 8.

`link`

Choose if the average level between all channels of side-chain stream or the louder(maximum) channel of side-chain stream affects the reduction. Default is average.

detection

Should the exact signal be taken in case of peak or an RMS one in case of rms. Default is rms which is mainly smoother.

level_sc

Set sidechain gain. Default is 1. Range is between 0.015625 and 64.

mix

How much to use compressed signal in output. Default is 1. Range is between 0 and 1.

7.71.1 Examples# TOC

- Full ffmpeg example taking 2 audio inputs, 1st input to be compressed depending on the signal of 2nd input and later compressed signal to be merged with 2nd input:

```
ffmpeg -i main.flac -i sidechain.flac -filter_complex "[1:a]asplit=2[sc][mix];[0:a][sc]sidechaincompress[compr];[compr][mix]amerge"
```

7.72 sidechaingate# TOC

A sidechain gate acts like a normal (wideband) gate but has the ability to filter the detected signal before sending it to the gain reduction stage. Normally a gate uses the full range signal to detect a level above the threshold. For example: If you cut all lower frequencies from your sidechain signal the gate will decrease the volume of your track only if not enough highs appear. With this technique you are able to reduce the resonance of a natural drum or remove "rumbling" of muted strokes from a heavily distorted guitar. It needs two input streams and returns one output stream. First input stream will be processed depending on second stream signal.

The filter accepts the following options:

level_in

Set input level before filtering. Default is 1. Allowed range is from 0.015625 to 64.

range

Set the level of gain reduction when the signal is below the threshold. Default is 0.06125. Allowed range is from 0 to 1.

threshold

If a signal rises above this level the gain reduction is released. Default is 0.125. Allowed range is from 0 to 1.

ratio

Set a ratio about which the signal is reduced. Default is 2. Allowed range is from 1 to 9000.

`attack`

Amount of milliseconds the signal has to rise above the threshold before gain reduction stops. Default is 20 milliseconds. Allowed range is from 0.01 to 9000.

`release`

Amount of milliseconds the signal has to fall below the threshold before the reduction is increased again. Default is 250 milliseconds. Allowed range is from 0.01 to 9000.

`makeup`

Set amount of amplification of signal after processing. Default is 1. Allowed range is from 1 to 64.

`knee`

Curve the sharp knee around the threshold to enter gain reduction more softly. Default is 2.828427125. Allowed range is from 1 to 8.

`detection`

Choose if exact signal should be taken for detection or an RMS like one. Default is rms. Can be peak or rms.

`link`

Choose if the average level between all channels or the louder channel affects the reduction. Default is average. Can be average or maximum.

`level_sc`

Set sidechain gain. Default is 1. Range is from 0.015625 to 64.

7.73 silencedetect# TOC

Detect silence in an audio stream.

This filter logs a message when it detects that the input audio volume is less or equal to a noise tolerance value for a duration greater or equal to the minimum detected noise duration.

The printed times and duration are expressed in seconds.

The filter accepts the following options:

`duration, d`

Set silence duration until notification (default is 2 seconds).

`noise, n`

Set noise tolerance. Can be specified in dB (in case "dB" is appended to the specified value) or amplitude ratio. Default is -60dB, or 0.001.

7.73.1 Examples# TOC

- Detect 5 seconds of silence with -50dB noise tolerance:

```
silencedetect=n=-50dB:d=5
```

- Complete example with `ffmpeg` to detect silence with 0.0001 noise tolerance in `silence.mp3`:

```
ffmpeg -i silence.mp3 -af silencedetect=noise=0.0001 -f null -
```

7.74 silenceremove# TOC

Remove silence from the beginning, middle or end of the audio.

The filter accepts the following options:

`start_periods`

This value is used to indicate if audio should be trimmed at beginning of the audio. A value of zero indicates no silence should be trimmed from the beginning. When specifying a non-zero value, it trims audio up until it finds non-silence. Normally, when trimming silence from beginning of audio the *start_periods* will be 1 but it can be increased to higher values to trim all audio up to specific count of non-silence periods. Default value is 0.

`start_duration`

Specify the amount of time that non-silence must be detected before it stops trimming audio. By increasing the duration, bursts of noises can be treated as silence and trimmed off. Default value is 0.

`start_threshold`

This indicates what sample value should be treated as silence. For digital audio, a value of 0 may be fine but for audio recorded from analog, you may wish to increase the value to account for background noise. Can be specified in dB (in case "dB" is appended to the specified value) or amplitude ratio. Default value is 0.

`stop_periods`

Set the count for trimming silence from the end of audio. To remove silence from the middle of a file, specify a *stop_periods* that is negative. This value is then treated as a positive value and is used to indicate the effect should restart processing as specified by *start_periods*, making it suitable for removing periods of silence in the middle of the audio. Default value is 0.

`stop_duration`

Specify a duration of silence that must exist before audio is not copied any more. By specifying a higher duration, silence that is wanted can be left in the audio. Default value is 0.

`stop_threshold`

This is the same as `start_threshold` but for trimming silence from the end of audio. Can be specified in dB (in case "dB" is appended to the specified value) or amplitude ratio. Default value is 0.

`leave_silence`

This indicates that *stop_duration* length of audio should be left intact at the beginning of each period of silence. For example, if you want to remove long pauses between words but do not want to remove the pauses completely. Default value is 0.

`detection`

Set how is silence detected. Can be `rms` or `peak`. Second is faster and works better with digital silence which is exactly 0. Default value is `rms`.

`window`

Set ratio used to calculate size of window for detecting silence. Default value is 0.02. Allowed range is from 0 to 10.

7.74.1 Examples# TOC

- The following example shows how this filter can be used to start a recording that does not contain the delay at the start which usually occurs between pressing the record button and the start of the performance:

```
silenceremove=1:5:0.02
```

- Trim all silence encountered from beginning to end where there is more than 1 second of silence in audio:

```
silenceremove=0:0:0:-1:1:-90dB
```

7.75 sofalizer# TOC

SOFAIzer uses head-related transfer functions (HRTFs) to create virtual loudspeakers around the user for binaural listening via headphones (audio formats up to 9 channels supported). The HRTFs are stored in SOFA files (see <http://www.sofacoustics.org/> for a database). SOFAIzer is developed at the Acoustics Research Institute (ARI) of the Austrian Academy of Sciences.

To enable compilation of this filter you need to configure FFmpeg with `--enable-libmysofa`.

The filter accepts the following options:

`sofa`

Set the SOFA file used for rendering.

`gain`

Set gain applied to audio. Value is in dB. Default is 0.

`rotation`

Set rotation of virtual loudspeakers in deg. Default is 0.

`elevation`

Set elevation of virtual speakers in deg. Default is 0.

`radius`

Set distance in meters between loudspeakers and the listener with near-field HRTFs. Default is 1.

`type`

Set processing type. Can be *time* or *freq*. *time* is processing audio in time domain which is slow. *freq* is processing audio in frequency domain which is fast. Default is *freq*.

`speakers`

Set custom positions of virtual loudspeakers. Syntax for this option is: `<CH> <AZIM> <ELEV>[|<CH> <AZIM> <ELEV>[...]]`. Each virtual loudspeaker is described with short channel name following with azimuth and elevation in degrees. Each virtual loudspeaker description is separated by '|'. For example to override front left and front right channel positions use: `'speakers=FL 45 15|FR 345 15'`. Descriptions with unrecognised channel names are ignored.

`lfegain`

Set custom gain for LFE channels. Value is in dB. Default is 0.

7.75.1 Examples# TOC

- Using ClubFritz6 sofa file:

```
sofalizer=sofa=/path/to/ClubFritz6.sofa:type=freq:radius=1
```

- Using ClubFritz12 sofa file and bigger radius with small rotation:


```
sofalizer=sofa=/path/to/ClubFritz12.sofa:type=freq:radius=2:rotation=5
```

- Similar as above but with custom speaker positions for front left, front right, back left and back right and also with custom gain:

```
"sofalizer=sofa=/path/to/ClubFritz6.sofa:type=freq:radius=2:speakers=FL 45|FR 315|BL 135|BR 225:gain=28"
```

7.76 stereotools# TOC

This filter has some handy utilities to manage stereo signals, for converting M/S stereo recordings to L/R signal while having control over the parameters or spreading the stereo image of master track.

The filter accepts the following options:

level_in

Set input level before filtering for both channels. Defaults is 1. Allowed range is from 0.015625 to 64.

level_out

Set output level after filtering for both channels. Defaults is 1. Allowed range is from 0.015625 to 64.

balance_in

Set input balance between both channels. Default is 0. Allowed range is from -1 to 1.

balance_out

Set output balance between both channels. Default is 0. Allowed range is from -1 to 1.

softclip

Enable softclipping. Results in analog distortion instead of harsh digital 0dB clipping. Disabled by default.

mutel

Mute the left channel. Disabled by default.

muter

Mute the right channel. Disabled by default.

phasel

Change the phase of the left channel. Disabled by default.

phaser

Change the phase of the right channel. Disabled by default.

mode

Set stereo mode. Available values are:

`'lr>lr'`

Left/Right to Left/Right, this is default.

`'lr>ms'`

Left/Right to Mid/Side.

`'ms>lr'`

Mid/Side to Left/Right.

`'lr>ll'`

Left/Right to Left/Left.

`'lr>rr'`

Left/Right to Right/Right.

`'lr>l+r'`

Left/Right to Left + Right.

`'lr>rl'`

Left/Right to Right/Left.

`'ms>ll'`

Mid/Side to Left/Left.

`'ms>rr'`

Mid/Side to Right/Right.

slev

Set level of side signal. Default is 1. Allowed range is from 0.015625 to 64.

sbal

Set balance of side signal. Default is 0. Allowed range is from -1 to 1.

mlev

Set level of the middle signal. Default is 1. Allowed range is from 0.015625 to 64.

mpan

Set middle signal pan. Default is 0. Allowed range is from -1 to 1.

base

Set stereo base between mono and inversed channels. Default is 0. Allowed range is from -1 to 1.

delay

Set delay in milliseconds how much to delay left from right channel and vice versa. Default is 0. Allowed range is from -20 to 20.

sclevel

Set S/C level. Default is 1. Allowed range is from 1 to 100.

phase

Set the stereo phase in degrees. Default is 0. Allowed range is from 0 to 360.

bmode_in, bmode_out

Set balance mode for balance_in/balance_out option.

Can be one of the following:

‘balance’

Classic balance mode. Attenuate one channel at time. Gain is raised up to 1.

‘amplitude’

Similar as classic mode above but gain is raised up to 2.

‘power’

Equal power distribution, from -6dB to +6dB range.

7.76.1 Examples# TOC

- Apply karaoke like effect:

```
stereotools=mlev=0.015625
```

- Convert M/S signal to L/R:

```
"stereotools=mode=ms>lr"
```

7.77 stereowiden# TOC

This filter enhance the stereo effect by suppressing signal common to both channels and by delaying the signal of left into right and vice versa, thereby widening the stereo effect.

The filter accepts the following options:

delay

Time in milliseconds of the delay of left signal into right and vice versa. Default is 20 milliseconds.

feedback

Amount of gain in delayed signal into right and vice versa. Gives a delay effect of left signal in right output and vice versa which gives widening effect. Default is 0.3.

crossfeed

Cross feed of left into right with inverted phase. This helps in suppressing the mono. If the value is 1 it will cancel all the signal common to both channels. Default is 0.3.

drymix

Set level of input signal of original channel. Default is 0.8.

7.78 superequalizer# TOC

Apply 18 band equalizer.

The filter accepts the following options:

1b

Set 65Hz band gain.

2b

Set 92Hz band gain.

3b

Set 131Hz band gain.

4b

Set 185Hz band gain.

5b

Set 262Hz band gain.

6b

Set 370Hz band gain.

7b

Set 523Hz band gain.

8b

Set 740Hz band gain.

9b

Set 1047Hz band gain.

10b

Set 1480Hz band gain.

11b

Set 2093Hz band gain.

12b

Set 2960Hz band gain.

13b

Set 4186Hz band gain.

14b

Set 5920Hz band gain.

15b

Set 8372Hz band gain.

16b

Set 11840Hz band gain.

17b

Set 16744Hz band gain.

18b

Set 20000Hz band gain.

7.79 surround# TOC

Apply audio surround upmix filter.

This filter allows to produce multichannel output from audio stream.

The filter accepts the following options:

chl_out

Set output channel layout. By default, this is *5.1*.

See (ffmpeg-utils)the Channel Layout section in the ffmpeg-utils(1) manual for the required syntax.

chl_in

Set input channel layout. By default, this is *stereo*.

See (ffmpeg-utils)the Channel Layout section in the ffmpeg-utils(1) manual for the required syntax.

level_in

Set input volume level. By default, this is *1*.

level_out

Set output volume level. By default, this is *1*.

lfe

Enable LFE channel output if output channel layout has it. By default, this is enabled.

`lfe_low`

Set LFE low cut off frequency. By default, this is 128 Hz.

`lfe_high`

Set LFE high cut off frequency. By default, this is 256 Hz.

`fc_in`

Set front center input volume. By default, this is 1.

`fc_out`

Set front center output volume. By default, this is 1.

`lfe_in`

Set LFE input volume. By default, this is 1.

`lfe_out`

Set LFE output volume. By default, this is 1.

7.80 treble, highshelf# TOC

Boost or cut treble (upper) frequencies of the audio using a two-pole shelving filter with a response similar to that of a standard hi-fi's tone-controls. This is also known as shelving equalisation (EQ).

The filter accepts the following options:

`gain, g`

Give the gain at whichever is the lower of ~22 kHz and the Nyquist frequency. Its useful range is about -20 (for a large cut) to +20 (for a large boost). Beware of clipping when using a positive gain.

`frequency, f`

Set the filter's central frequency and so can be used to extend or reduce the frequency range to be boosted or cut. The default value is 3000 Hz.

`width_type, t`

Set method to specify band-width of filter.

`h`

Hz

q

Q-Factor

o

octave

s

slope

k

kHz

width, w

Determine how steep is the filter's shelf transition.

channels, c

Specify which channels to filter, by default all available are filtered.

7.80.1 Commands# TOC

This filter supports the following commands:

frequency, f

Change treble frequency. Syntax for the command is : "*frequency*"

width_type, t

Change treble width_type. Syntax for the command is : "*width_type*"

width, w

Change treble width. Syntax for the command is : "*width*"

gain, g

Change treble gain. Syntax for the command is : "*gain*"

7.81 tremolo# TOC

Sinusoidal amplitude modulation.

The filter accepts the following options:

f

Modulation frequency in Hertz. Modulation frequencies in the subharmonic range (20 Hz or lower) will result in a tremolo effect. This filter may also be used as a ring modulator by specifying a modulation frequency higher than 20 Hz. Range is 0.1 - 20000.0. Default value is 5.0 Hz.

d

Depth of modulation as a percentage. Range is 0.0 - 1.0. Default value is 0.5.

7.82 vibrato# TOC

Sinusoidal phase modulation.

The filter accepts the following options:

f

Modulation frequency in Hertz. Range is 0.1 - 20000.0. Default value is 5.0 Hz.

d

Depth of modulation as a percentage. Range is 0.0 - 1.0. Default value is 0.5.

7.83 volume# TOC

Adjust the input audio volume.

It accepts the following parameters:

volume

Set audio volume expression.

Output values are clipped to the maximum value.

The output audio volume is given by the relation:

$$output_volume = volume * input_volume$$

The default value for *volume* is "1.0".

precision

This parameter represents the mathematical precision.

It determines which input sample formats will be allowed, which affects the precision of the volume scaling.

fixed

8-bit fixed-point; this limits input sample format to U8, S16, and S32.

float

32-bit floating-point; this limits input sample format to FLT. (default)

double

64-bit floating-point; this limits input sample format to DBL.

replaygain

Choose the behaviour on encountering ReplayGain side data in input frames.

drop

Remove ReplayGain side data, ignoring its contents (the default).

ignore

Ignore ReplayGain side data, but leave it in the frame.

track

Prefer the track gain, if present.

album

Prefer the album gain, if present.

replaygain_preamp

Pre-amplification gain in dB to apply to the selected replaygain gain.

Default value for *replaygain_preamp* is 0.0.

eval

Set when the volume expression is evaluated.

It accepts the following values:

`'once'`

only evaluate expression once during the filter initialization, or when the `'volume'` command is sent

`'frame'`

evaluate expression for each incoming frame

Default value is `'once'`.

The volume expression can contain the following parameters.

`n`

frame number (starting at zero)

`nb_channels`

number of channels

`nb_consumed_samples`

number of samples consumed by the filter

`nb_samples`

number of samples in the current frame

`pos`

original frame position in the file

`pts`

frame PTS

`sample_rate`

sample rate

`startpts`

PTS at start of stream

`starttt`

time at start of stream

t

frame time

tb

timestamp timebase

volume

last set volume value

Note that when `eval` is set to ‘once’ only the *sample_rate* and *tb* variables are available, all other variables will evaluate to NAN.

7.83.1 Commands# TOC

This filter supports the following commands:

volume

Modify the volume expression. The command accepts the same syntax of the corresponding option.

If the specified expression is not valid, it is kept at its current value.

replaygain_noclip

Prevent clipping by limiting the gain applied.

Default value for *replaygain_noclip* is 1.

7.83.2 Examples# TOC

- Halve the input audio volume:

```
volume=volume=0.5  
volume=volume=1/2  
volume=volume=-6.0206dB
```

In all the above example the named key for `volume` can be omitted, for example like in:

```
volume=0.5
```

- Increase input audio power by 6 decibels using fixed-point precision:

```
volume=volume=6dB:precision=fixed
```

- Fade volume after time 10 with an annihilation period of 5 seconds:

```
volume='if (lt (t,10),1,max (1-(t-10)/5,0))':eval=frame
```

7.84 volumedetect# TOC

Detect the volume of the input video.

The filter has no parameters. The input is not modified. Statistics about the volume will be printed in the log when the input stream end is reached.

In particular it will show the mean volume (root mean square), maximum volume (on a per-sample basis), and the beginning of a histogram of the registered volume values (from the maximum value to a cumulated 1/1000 of the samples).

All volumes are in decibels relative to the maximum PCM value.

7.84.1 Examples# TOC

Here is an excerpt of the output:

```
[Parsed_volumedetect_0 0xa23120] mean_volume: -27 dB
[Parsed_volumedetect_0 0xa23120] max_volume: -4 dB
[Parsed_volumedetect_0 0xa23120] histogram_4db: 6
[Parsed_volumedetect_0 0xa23120] histogram_5db: 62
[Parsed_volumedetect_0 0xa23120] histogram_6db: 286
[Parsed_volumedetect_0 0xa23120] histogram_7db: 1042
[Parsed_volumedetect_0 0xa23120] histogram_8db: 2551
[Parsed_volumedetect_0 0xa23120] histogram_9db: 4609
[Parsed_volumedetect_0 0xa23120] histogram_10db: 8409
```

It means that:

- The mean square energy is approximately -27 dB, or $10^{-2.7}$.
- The largest sample is at -4 dB, or more precisely between -4 dB and -5 dB.
- There are 6 samples at -4 dB, 62 at -5 dB, 286 at -6 dB, etc.

In other words, raising the volume by +4 dB does not cause any clipping, raising it by +5 dB causes clipping for 6 samples, etc.

8 Audio Sources# TOC

Below is a description of the currently available audio sources.

8.1 abuffer# TOC

Buffer audio frames, and make them available to the filter chain.

This source is mainly intended for a programmatic use, in particular through the interface defined in `libavfilter/asrc_abuffer.h`.

It accepts the following parameters:

`time_base`

The timebase which will be used for timestamps of submitted frames. It must be either a floating-point number or in *numerator/denominator* form.

`sample_rate`

The sample rate of the incoming audio buffers.

`sample_fmt`

The sample format of the incoming audio buffers. Either a sample format name or its corresponding integer representation from the enum `AVSampleFormat` in `libavutil/samplefmt.h`

`channel_layout`

The channel layout of the incoming audio buffers. Either a channel layout name from `channel_layout_map` in `libavutil/channel_layout.c` or its corresponding integer representation from the `AV_CH_LAYOUT_*` macros in `libavutil/channel_layout.h`

`channels`

The number of channels of the incoming audio buffers. If both *channels* and *channel_layout* are specified, then they must be consistent.

8.1.1 Examples# TOC

```
abuffer=sample_rate=44100:sample_fmt=s16p:channel_layout=stereo
```

will instruct the source to accept planar 16bit signed stereo at 44100Hz. Since the sample format with name "s16p" corresponds to the number 6 and the "stereo" channel layout corresponds to the value 0x3, this is equivalent to:

```
abuffer=sample_rate=44100:sample_fmt=6:channel_layout=0x3
```

8.2 aevalsrc# TOC

Generate an audio signal specified by an expression.

This source accepts in input one or more expressions (one for each channel), which are evaluated and used to generate a corresponding audio signal.

This source accepts the following options:

`exprs`

Set the '|'-separated expressions list for each separate channel. In case the `channel_layout` option is not specified, the selected channel layout depends on the number of provided expressions. Otherwise the last specified expression is applied to the remaining output channels.

`channel_layout, c`

Set the channel layout. The number of channels in the specified layout must be equal to the number of specified expressions.

`duration, d`

Set the minimum duration of the sourced audio. See (ffmpeg-utils)the Time duration section in the ffmpeg-utils(1) manual for the accepted syntax. Note that the resulting duration may be greater than the specified duration, as the generated audio is always cut at the end of a complete frame.

If not specified, or the expressed duration is negative, the audio is supposed to be generated forever.

`nb_samples, n`

Set the number of samples per channel per each output frame, default to 1024.

`sample_rate, s`

Specify the sample rate, default to 44100.

Each expression in *exprs* can contain the following constants:

`n`

number of the evaluated sample, starting from 0

`t`

time of the evaluated sample expressed in seconds, starting from 0

`s`

sample rate

8.2.1 Examples# TOC

- Generate silence:

```
aevalsrc=0
```

- Generate a sin signal with frequency of 440 Hz, set sample rate to 8000 Hz:

```
aevalsrc="sin(440*2*PI*t):s=8000"
```

- Generate a two channels signal, specify the channel layout (Front Center + Back Center) explicitly:

```
aevalsrc="sin(420*2*PI*t) | cos(430*2*PI*t) :c=FC|BC"
```

- Generate white noise:

```
aevalsrc="-2+random(0) "
```

- Generate an amplitude modulated signal:

```
aevalsrc="sin(10*2*PI*t)*sin(880*2*PI*t) "
```

- Generate 2.5 Hz binaural beats on a 360 Hz carrier:

```
aevalsrc="0.1*sin(2*PI*(360-2.5/2)*t) | 0.1*sin(2*PI*(360+2.5/2)*t) "
```

8.3 anullsrc# TOC

The null audio source, return unprocessed audio frames. It is mainly useful as a template and to be employed in analysis / debugging tools, or as the source for filters which ignore the input data (for example the sox synth filter).

This source accepts the following options:

`channel_layout, cl`

Specifies the channel layout, and can be either an integer or a string representing a channel layout. The default value of *channel_layout* is "stereo".

Check the `channel_layout_map` definition in `libavutil/channel_layout.c` for the mapping between strings and channel layout values.

`sample_rate, r`

Specifies the sample rate, and defaults to 44100.

`nb_samples, n`

Set the number of samples per requested frames.

8.3.1 Examples# TOC

- Set the sample rate to 48000 Hz and the channel layout to AV_CH_LAYOUT_MONO.

```
anullsrc=r=48000:cl=4
```

- Do the same operation with a more obvious syntax:

```
anullsrc=r=48000:cl=mono
```

All the parameters need to be explicitly defined.

8.4 flite# TOC

Synthesize a voice utterance using the libflite library.

To enable compilation of this filter you need to configure FFmpeg with `--enable-libflite`.

Note that versions of the flite library prior to 2.0 are not thread-safe.

The filter accepts the following options:

`list_voices`

If set to 1, list the names of the available voices and exit immediately. Default value is 0.

`nb_samples, n`

Set the maximum number of samples per frame. Default value is 512.

`textfile`

Set the filename containing the text to speak.

`text`

Set the text to speak.

`voice, v`

Set the voice to use for the speech synthesis. Default value is `kal`. See also the `list_voices` option.

8.4.1 Examples# TOC

- Read from file `speech.txt`, and synthesize the text using the standard flite voice:

```
flite=textfile=speech.txt
```

- Read the specified text selecting the `slt` voice:

```
flite=text='So fare thee well, poor devil of a Sub-Sub, whose commentator I am':voice=slt
```

- Input text to `ffmpeg`:

```
ffmpeg -f lavfi -i flite=text='So fare thee well, poor devil of a Sub-Sub, whose commentator I am':voice=slt
```

- Make `ffplay` speak the specified text, using `flite` and the `lavfi` device:

```
ffplay -f lavfi flite=text='No more be grieved for which that thou hast done.'
```

For more information about libflite, check: <http://www.festvox.org/flite/>

8.5 `anoisesrc`# TOC

Generate a noise audio signal.

The filter accepts the following options:

`sample_rate, r`

Specify the sample rate. Default value is 48000 Hz.

`amplitude, a`

Specify the amplitude (0.0 - 1.0) of the generated audio stream. Default value is 1.0.

`duration, d`

Specify the duration of the generated audio stream. Not specifying this option results in noise with an infinite length.

`color, colour, c`

Specify the color of noise. Available noise colors are white, pink, brown, blue and violet. Default color is white.

`seed, s`

Specify a value used to seed the PRNG.

`nb_samples, n`

Set the number of samples per each output frame, default is 1024.

8.5.1 Examples# TOC

- Generate 60 seconds of pink noise, with a 44.1 kHz sampling rate and an amplitude of 0.5:

```
anoisesrc=d=60:c=pink:r=44100:a=0.5
```

8.6 `hilbert`# TOC

Generate odd-tap Hilbert transform FIR coefficients.

The resulting stream can be used with `afir` filter for phase-shifting the signal by 90 degrees.

This is used in many matrix coding schemes and for analytic signal generation. The process is often written as a multiplication by i (or j), the imaginary unit.

The filter accepts the following options:

`sample_rate, s`

Set sample rate, default is 44100.

`taps, t`

Set length of FIR filter, default is 22051.

`nb_samples, n`

Set number of samples per each frame.

`win_func, w`

Set window function to be used when generating FIR coefficients.

8.7 sine# TOC

Generate an audio signal made of a sine wave with amplitude 1/8.

The audio signal is bit-exact.

The filter accepts the following options:

`frequency, f`

Set the carrier frequency. Default is 440 Hz.

`beep_factor, b`

Enable a periodic beep every second with frequency *beep_factor* times the carrier frequency. Default is 0, meaning the beep is disabled.

`sample_rate, r`

Specify the sample rate, default is 44100.

`duration, d`

Specify the duration of the generated audio stream.

`samples_per_frame`

Set the number of samples per output frame.

The expression can contain the following constants:

`n`

The (sequential) number of the output audio frame, starting from 0.

`pts`

The PTS (Presentation TimeStamp) of the output audio frame, expressed in *TB* units.

`t`

The PTS of the output audio frame, expressed in seconds.

`TB`

The timebase of the output audio frames.

Default is 1024.

8.7.1 Examples# TOC

- Generate a simple 440 Hz sine wave:

```
sine
```

- Generate a 220 Hz sine wave with a 880 Hz beep each second, for 5 seconds:

```
sine=220:4:d=5  
sine=f=220:b=4:d=5  
sine=frequency=220:beep_factor=4:duration=5
```

- Generate a 1 kHz sine wave following 1602, 1601, 1602, 1601, 1602 NTSC pattern:

```
sine=1000:samples_per_frame='st(0,mod(n,5)); 1602-not(not(eq(ld(0),1)+eq(ld(0),3)))'
```

9 Audio Sinks# TOC

Below is a description of the currently available audio sinks.

9.1 abuffersink# TOC

Buffer audio frames, and make them available to the end of filter chain.

This sink is mainly intended for programmatic use, in particular through the interface defined in `libavfilter/buffersink.h` or the options system.

It accepts a pointer to an `AVABufferSinkContext` structure, which defines the incoming buffers' formats, to be passed as the opaque parameter to `avfilter_init_filter` for initialization.

9.2 anullsink# TOC

Null audio sink; do absolutely nothing with the input audio. It is mainly useful as a template and for use in analysis / debugging tools.

10 Video Filters# TOC

When you configure your FFmpeg build, you can disable any of the existing filters using `--disable-filters`. The configure output will show the video filters included in your build.

Below is a description of the currently available video filters.

10.1 alphaextract# TOC

Extract the alpha component from the input as a grayscale video. This is especially useful with the *alphamerge* filter.

10.2 alphamerge# TOC

Add or replace the alpha component of the primary input with the grayscale value of a second input. This is intended for use with *alphaextract* to allow the transmission or storage of frame sequences that have alpha in a format that doesn't support an alpha channel.

For example, to reconstruct full frames from a normal YUV-encoded video and a separate video created with *alphaextract*, you might use:

```
movie=in_alpha.mkv [alpha]; [in][alpha] alphamerge [out]
```

Since this filter is designed for reconstruction, it operates on frame sequences without considering timestamps, and terminates when either input reaches end of stream. This will cause problems if your encoding pipeline drops frames. If you're trying to apply an image as an overlay to a video stream, consider the *overlay* filter instead.

10.3 amplify# TOC

Amplify differences between current pixel and pixels of adjacent frames in same pixel location.

This filter accepts the following options:

`radius`

Set frame radius. Default is 2. Allowed range is from 1 to 63. For example radius of 3 will instruct filter to calculate average of 7 frames.

`factor`

Set factor to amplify difference. Default is 2. Allowed range is from 0 to 65535.

threshold

Set threshold for difference amplification. Any difference greater or equal to this value will not alter source pixel. Default is 10. Allowed range is from 0 to 65535.

low

Set lower limit for changing source pixel. Default is 65535. Allowed range is from 0 to 65535. This option controls maximum possible value that will decrease source pixel value.

high

Set high limit for changing source pixel. Default is 65535. Allowed range is from 0 to 65535. This option controls maximum possible value that will increase source pixel value.

planes

Set which planes to filter. Default is all. Allowed range is from 0 to 15.

10.4 ass# TOC

Same as the subtitles filter, except that it doesn't require libavcodec and libavformat to work. On the other hand, it is limited to ASS (Advanced Substation Alpha) subtitles files.

This filter accepts the following option in addition to the common options from the subtitles filter:

shaping

Set the shaping engine

Available values are:

'auto'

The default libass shaping engine, which is the best available.

'simple'

Fast, font-agnostic shaper that can do only substitutions

'complex'

Slower shaper using OpenType for substitutions and positioning

The default is auto.

10.5 atadenoise# TOC

Apply an Adaptive Temporal Averaging Denoiser to the video input.

The filter accepts the following options:

0a

Set threshold A for 1st plane. Default is 0.02. Valid range is 0 to 0.3.

0b

Set threshold B for 1st plane. Default is 0.04. Valid range is 0 to 5.

1a

Set threshold A for 2nd plane. Default is 0.02. Valid range is 0 to 0.3.

1b

Set threshold B for 2nd plane. Default is 0.04. Valid range is 0 to 5.

2a

Set threshold A for 3rd plane. Default is 0.02. Valid range is 0 to 0.3.

2b

Set threshold B for 3rd plane. Default is 0.04. Valid range is 0 to 5.

Threshold A is designed to react on abrupt changes in the input signal and threshold B is designed to react on continuous changes in the input signal.

s

Set number of frames filter will use for averaging. Default is 9. Must be odd number in range [5, 129].

p

Set what planes of frame filter will use for averaging. Default is all.

10.6 avgblur# TOC

Apply average blur filter.

The filter accepts the following options:

`sizeX`

Set horizontal kernel size.

`planes`

Set which planes to filter. By default all planes are filtered.

`sizeY`

Set vertical kernel size, if zero it will be same as `sizeX`. Default is 0.

10.7 bbox# TOC

Compute the bounding box for the non-black pixels in the input frame luminance plane.

This filter computes the bounding box containing all the pixels with a luminance value greater than the minimum allowed value. The parameters describing the bounding box are printed on the filter log.

The filter accepts the following option:

`min_val`

Set the minimal luminance value. Default is 16.

10.8 bitplanenoise# TOC

Show and measure bit plane noise.

The filter accepts the following options:

`bitplane`

Set which plane to analyze. Default is 1.

`filter`

Filter out noisy pixels from `bitplane` set above. Default is disabled.

10.9 blackdetect# TOC

Detect video intervals that are (almost) completely black. Can be useful to detect chapter transitions, commercials, or invalid recordings. Output lines contains the time for the start, end and duration of the detected black interval expressed in seconds.

In order to display the output lines, you need to set the `loglevel` at least to the `AV_LOG_INFO` value.

The filter accepts the following options:

`black_min_duration, d`

Set the minimum detected black duration expressed in seconds. It must be a non-negative floating point number.

Default value is 2.0.

`picture_black_ratio_th, pic_th`

Set the threshold for considering a picture "black". Express the minimum value for the ratio:

$$nb_black_pixels / nb_pixels$$

for which a picture is considered black. Default value is 0.98.

`pixel_black_th, pix_th`

Set the threshold for considering a pixel "black".

The threshold expresses the maximum pixel luminance value for which a pixel is considered "black". The provided value is scaled according to the following equation:

$$absolute_threshold = luminance_minimum_value + pixel_black_th * luminance_range_size$$

luminance_range_size and *luminance_minimum_value* depend on the input video format, the range is [0-255] for YUV full-range formats and [16-235] for YUV non full-range formats.

Default value is 0.10.

The following example sets the maximum pixel threshold to the minimum value, and detects only black intervals of 2 or more seconds:

```
blackdetect=d=2:pix_th=0.00
```

10.10 blackframe# TOC

Detect frames that are (almost) completely black. Can be useful to detect chapter transitions or commercials. Output lines consist of the frame number of the detected frame, the percentage of blackness, the position in the file if known or -1 and the timestamp in seconds.

In order to display the output lines, you need to set the loglevel at least to the AV_LOG_INFO value.

This filter exports frame metadata `lavfi.blackframe.pblack`. The value represents the percentage of pixels in the picture that are below the threshold value.

It accepts the following parameters:

amount

The percentage of the pixels that have to be below the threshold; it defaults to 98.

threshold, thresh

The threshold below which a pixel value is considered black; it defaults to 32.

10.11 blend, tblend# TOC

Blend two video frames into each other.

The `blend` filter takes two input streams and outputs one stream, the first input is the "top" layer and second input is "bottom" layer. By default, the output terminates when the longest input terminates.

The `tblend` (time blend) filter takes two consecutive frames from one single stream, and outputs the result obtained by blending the new frame on top of the old frame.

A description of the accepted options follows.

`c0_mode`
`c1_mode`
`c2_mode`
`c3_mode`
`all_mode`

Set blend mode for specific pixel component or all pixel components in case of *all_mode*. Default value is `normal`.

Available values for component modes are:

`'addition'`
`'grainmerge'`
`'and'`
`'average'`
`'burn'`
`'darken'`
`'difference'`
`'grainextract'`
`'divide'`
`'dodge'`
`'freeze'`
`'exclusion'`
`'extremity'`
`'glow'`
`'hardlight'`

'hardmix'
'heat'
'lighten'
'linearlight'
'multiply'
'multiply128'
'negation'
'normal'
'or'
'overlay'
'phoenix'
'pinlight'
'reflect'
'screen'
'softlight'
'subtract'
'vividlight'
'xor'
c0_opacity
c1_opacity
c2_opacity
c3_opacity
all_opacity

Set blend opacity for specific pixel component or all pixel components in case of *all_opacity*. Only used in combination with pixel component blend modes.

c0_expr
c1_expr
c2_expr
c3_expr
all_expr

Set blend expression for specific pixel component or all pixel components in case of *all_expr*. Note that related mode options will be ignored if those are set.

The expressions can use the following variables:

N

The sequential number of the filtered frame, starting from 0.

X

Y

the coordinates of the current sample

W
H

the width and height of currently filtered plane

SW
SH

Width and height scale depending on the currently filtered plane. It is the ratio between the corresponding luma plane number of pixels and the current plane ones. E.g. for YUV4:2:0 the values are 1, 1 for the luma plane, and 0.5, 0.5 for chroma planes.

T

Time of the current frame, expressed in seconds.

TOP, A

Value of pixel component at current location for first video frame (top layer).

BOTTOM, B

Value of pixel component at current location for second video frame (bottom layer).

The blend filter also supports the framesync options.

10.11.1 Examples# TOC

- Apply transition from bottom layer to top layer in first 10 seconds:

```
blend=all_expr='A*(if(gte(T,10),1,T/10))+B*(1-(if(gte(T,10),1,T/10)))'
```

- Apply linear horizontal transition from top layer to bottom layer:

```
blend=all_expr='A*(X/W)+B*(1-X/W)'
```

- Apply 1x1 checkerboard effect:

```
blend=all_expr='if(eq(mod(X,2),mod(Y,2)),A,B)'
```

- Apply uncover left effect:

```
blend=all_expr='if(gte(N*SW+X,W),A,B)'
```

- Apply uncover down effect:

```
blend=all_expr='if(gte(Y-N*SH,0),A,B)'
```

- Apply uncover up-left effect:

```
blend=all_expr=' if (gte (T*SH*40+Y,H) *gte ((T*40*SW+X) *W/H,W) , A,B) '
```

- Split diagonally video and shows top and bottom layer on each side:

```
blend=all_expr=' if (gt (X,Y*(W/H)) , A,B) '
```

- Display differences between the current and the previous frame:

```
tblend=all_mode=grainextract
```

10.12 boxblur# TOC

Apply a boxblur algorithm to the input video.

It accepts the following parameters:

```
luma_radius, lr  
luma_power, lp  
chroma_radius, cr  
chroma_power, cp  
alpha_radius, ar  
alpha_power, ap
```

A description of the accepted options follows.

```
luma_radius, lr  
chroma_radius, cr  
alpha_radius, ar
```

Set an expression for the box radius in pixels used for blurring the corresponding input plane.

The radius value must be a non-negative number, and must not be greater than the value of the expression $\min(w, h) / 2$ for the luma and alpha planes, and of $\min(cw, ch) / 2$ for the chroma planes.

Default value for `luma_radius` is "2". If not specified, `chroma_radius` and `alpha_radius` default to the corresponding value set for `luma_radius`.

The expressions can contain the following constants:

```
w  
h
```

The input width and height in pixels.

```
cw  
ch
```

The input chroma image width and height in pixels.

`hsub`
`vsub`

The horizontal and vertical chroma subsample values. For example, for the pixel format "yuv422p", *hsub* is 2 and *vsub* is 1.

`luma_power, lp`
`chroma_power, cp`
`alpha_power, ap`

Specify how many times the boxblur filter is applied to the corresponding plane.

Default value for `luma_power` is 2. If not specified, `chroma_power` and `alpha_power` default to the corresponding value set for `luma_power`.

A value of 0 will disable the effect.

10.12.1 Examples# TOC

- Apply a boxblur filter with the luma, chroma, and alpha radii set to 2:

```
boxblur=luma_radius=2:luma_power=1  
boxblur=2:1
```

- Set the luma radius to 2, and alpha and chroma radius to 0:

```
boxblur=2:1:cr=0:ar=0
```

- Set the luma and chroma radii to a fraction of the video dimension:

```
boxblur=luma_radius=min(h\,w)/10:luma_power=1:chroma_radius=min(cw\,ch)/10:chroma_power=1
```

10.13 bwdif# TOC

Deinterlace the input video ("bwdif" stands for "Bob Weaver Deinterlacing Filter").

Motion adaptive deinterlacing based on yadif with the use of w3fdif and cubic interpolation algorithms. It accepts the following parameters:

`mode`

The interlacing mode to adopt. It accepts one of the following values:

`0, send_frame`

Output one frame for each frame.

`1, send_field`

Output one frame for each field.

The default value is `send_field`.

`parity`

The picture field parity assumed for the input interlaced video. It accepts one of the following values:

`0, tff`

Assume the top field is first.

`1, bff`

Assume the bottom field is first.

`-1, auto`

Enable automatic detection of field parity.

The default value is `auto`. If the interlacing is unknown or the decoder does not export this information, top field first will be assumed.

`deint`

Specify which frames to deinterlace. Accept one of the following values:

`0, all`

Deinterlace all frames.

`1, interlaced`

Only deinterlace frames marked as interlaced.

The default value is `all`.

10.14 chromakey# TOC

YUV colorspace color/chroma keying.

The filter accepts the following options:

`color`

The color which will be replaced with transparency.

similarity

Similarity percentage with the key color.

0.01 matches only the exact key color, while 1.0 matches everything.

blend

Blend percentage.

0.0 makes pixels either fully transparent, or not transparent at all.

Higher values result in semi-transparent pixels, with a higher transparency the more similar the pixels color is to the key color.

yuv

Signals that the color passed is already in YUV instead of RGB.

Literal colors like "green" or "red" don't make sense with this enabled anymore. This can be used to pass exact YUV values as hexadecimal numbers.

10.14.1 Examples# TOC

- Make every green pixel in the input image transparent:

```
ffmpeg -i input.png -vf chromakey=green out.png
```

- Overlay a greenscreen-video on top of a static black background.

```
ffmpeg -f lavfi -i color=c=black:s=1280x720 -i video.mp4 -shortest -filter_complex "[1:v]chromakey=0x70de77:0.1:0.2[ckout];[0:v][ckout]overlay[out]" -map "[out]" output.mkv
```

10.15 cscope# TOC

Display CIE color diagram with pixels overlaid onto it.

The filter accepts the following options:

system

Set color system.

```
'ntsc, 470m'  
'ebu, 470bg'  
'smpte'  
'240m'  
'apple'  
'widergb'
```



```
'cie1931'  
'rec709, hdtv'  
'uhdtv, rec2020'  
cie
```

Set CIE system.

```
'xyy'  
'ucs'  
'luv'  
gamuts
```

Set what gamuts to draw.

See system option for available values.

```
size, s
```

Set ciescope size, by default set to 512.

```
intensity, i
```

Set intensity used to map input pixel values to CIE diagram.

```
contrast
```

Set contrast used to draw tongue colors that are out of active color system gamut.

```
corrgamma
```

Correct gamma displayed on scope, by default enabled.

```
showwhite
```

Show white point on CIE diagram, by default disabled.

```
gamma
```

Set input gamma. Used only with XYZ input color space.

10.16 codecview# TOC

Visualize information exported by some codecs.

Some codecs can export information through frames using side-data or other means. For example, some MPEG based codecs export motion vectors through the *export_mvs* flag in the codec *flags2* option.

The filter accepts the following option:

`mv`

Set motion vectors to visualize.

Available flags for *mv* are:

‘p f’

forward predicted MVs of P-frames

‘b f’

forward predicted MVs of B-frames

‘b b’

backward predicted MVs of B-frames

`qp`

Display quantization parameters using the chroma planes.

`mv_type, mvt`

Set motion vectors type to visualize. Includes MVs from all frames unless specified by *frame_type* option.

Available flags for *mv_type* are:

‘f p’

forward predicted MVs

‘b p’

backward predicted MVs

`frame_type, ft`

Set frame type to visualize motion vectors of.

Available flags for *frame_type* are:

‘i f’

intra-coded frames (I-frames)

`'pf'`

predicted frames (P-frames)

`'bf'`

bi-directionally predicted frames (B-frames)

10.16.1 Examples# TOC

- Visualize forward predicted MVs of all frames using `ffplay`:

```
ffplay -flags2 +export_mvs input.mp4 -vf codecview=mv_type=fp
```

- Visualize multi-directional MVs of P and B-Frames using `ffplay`:

```
ffplay -flags2 +export_mvs input.mp4 -vf codecview=mv=pf+bf+bb
```

10.17 colorbalance# TOC

Modify intensity of primary colors (red, green and blue) of input frames.

The filter allows an input frame to be adjusted in the shadows, midtones or highlights regions for the red-cyan, green-magenta or blue-yellow balance.

A positive adjustment value shifts the balance towards the primary color, a negative value towards the complementary color.

The filter accepts the following options:

`rs`
`gs`
`bs`

Adjust red, green and blue shadows (darkest pixels).

`rm`
`gm`
`bm`

Adjust red, green and blue midtones (medium pixels).

`rh`
`gh`
`bh`

Adjust red, green and blue highlights (brightest pixels).

Allowed ranges for options are $[-1.0, 1.0]$. Defaults are 0.

10.17.1 Examples# TOC

- Add red color cast to shadows:

```
colorbalance=rs=.3
```

10.18 colorkey# TOC

RGB colorspace color keying.

The filter accepts the following options:

color

The color which will be replaced with transparency.

similarity

Similarity percentage with the key color.

0.01 matches only the exact key color, while 1.0 matches everything.

blend

Blend percentage.

0.0 makes pixels either fully transparent, or not transparent at all.

Higher values result in semi-transparent pixels, with a higher transparency the more similar the pixels color is to the key color.

10.18.1 Examples# TOC

- Make every green pixel in the input image transparent:

```
ffmpeg -i input.png -vf colorkey=green out.png
```

- Overlay a greenscreen-video on top of a static background image.

```
ffmpeg -i background.png -i video.mp4 -filter_complex "[1:v]colorkey=0x3BBD1E:0.3:0.2[ckout];[0:v][ckout]overlay[out]" -map "[out]" output.flv
```

10.19 colorlevels# TOC

Adjust video input frames using levels.

The filter accepts the following options:

rimin
gimin
bimin
aimin

Adjust red, green, blue and alpha input black point. Allowed ranges for options are $[-1.0, 1.0]$. Defaults are 0.

rimax
gimax
bimax
aimax

Adjust red, green, blue and alpha input white point. Allowed ranges for options are $[-1.0, 1.0]$. Defaults are 1.

Input levels are used to lighten highlights (bright tones), darken shadows (dark tones), change the balance of bright and dark tones.

romin
gomin
bomin
aomin

Adjust red, green, blue and alpha output black point. Allowed ranges for options are $[0, 1.0]$. Defaults are 0.

romax
gomax
bomax
aomax

Adjust red, green, blue and alpha output white point. Allowed ranges for options are $[0, 1.0]$. Defaults are 1.

Output levels allows manual selection of a constrained output level range.

10.19.1 Examples# TOC

- Make video output darker:

```
colorlevels=rimin=0.058:gimin=0.058:bimin=0.058
```

- Increase contrast:

```
colorlevels=rimin=0.039:gimin=0.039:bimin=0.039:rimax=0.96:gimax=0.96:bimax=0.96
```

- Make video output lighter:

```
colorlevels=rimax=0.902:gimax=0.902:bimax=0.902
```

- Increase brightness:

```
colorlevels=romin=0.5:gomin=0.5:bomin=0.5
```

10.20 colorchannelmixer# TOC

Adjust video input frames by re-mixing color channels.

This filter modifies a color channel by adding the values associated to the other channels of the same pixels. For example if the value to modify is red, the output value will be:

$$red = red * rr + blue * rb + green * rg + alpha * ra$$

The filter accepts the following options:

rr
rg
rb
ra

Adjust contribution of input red, green, blue and alpha channels for output red channel. Default is 1 for *rr*, and 0 for *rg*, *rb* and *ra*.

gr
gg
gb
ga

Adjust contribution of input red, green, blue and alpha channels for output green channel. Default is 1 for *gg*, and 0 for *gr*, *gb* and *ga*.

br
bg
bb
ba

Adjust contribution of input red, green, blue and alpha channels for output blue channel. Default is 1 for *bb*, and 0 for *br*, *bg* and *ba*.

ar
ag
ab
aa

Adjust contribution of input red, green, blue and alpha channels for output alpha channel. Default is 1 for *aa*, and 0 for *ar*, *ag* and *ab*.

Allowed ranges for options are $[-2.0, 2.0]$.

10.20.1 Examples# TOC

- Convert source to grayscale:

```
colorchannelmixer=.3:.4:.3:0:.3:.4:.3:0:.3:.4:.3
```

- Simulate sepia tones:

```
colorchannelmixer=.393:.769:.189:0:.349:.686:.168:0:.272:.534:.131
```

10.21 colormatrix# TOC

Convert color matrix.

The filter accepts the following options:

```
src  
dst
```

Specify the source and destination color matrix. Both values must be specified.

The accepted values are:

`'bt709'`

BT.709

`'fcc'`

FCC

`'bt601'`

BT.601

`'bt470'`

BT.470

`'bt470bg'`

BT.470BG

`'smpte170m'`

SMPTE-170M

`'smpte240m'`

SMPTE-240M

`'bt2020'`

BT.2020

For example to convert from BT.601 to SMPTE-240M, use the command:

```
colormatrix=bt601:smpte240m
```

10.22 colorspace# TOC

Convert colorspace, transfer characteristics or color primaries. Input video needs to have an even size.

The filter accepts the following options:

`all`

Specify all color properties at once.

The accepted values are:

`'bt470m'`

BT.470M

`'bt470bg'`

BT.470BG

`'bt601-6-525'`

BT.601-6 525

`'bt601-6-625'`

BT.601-6 625

`'bt709'`

BT.709

`'smpte170m'`

SMPTE-170M

`'smpte240m'`

SMPTE-240M

`'bt2020'`

BT.2020

space

Specify output colorspace.

The accepted values are:

`'bt709'`

BT.709

`'fcc'`

FCC

`'bt470bg'`

BT.470BG or BT.601-6 625

`'smpte170m'`

SMPTE-170M or BT.601-6 525

`'smpte240m'`

SMPTE-240M

`'ycgco'`

YCgCo

`'bt2020ncl'`

BT.2020 with non-constant luminance

trc

Specify output transfer characteristics.

The accepted values are:

`'bt709'`

BT.709

‘bt470m’

BT.470M

‘bt470bg’

BT.470BG

‘gamma22’

Constant gamma of 2.2

‘gamma28’

Constant gamma of 2.8

‘smpte170m’

SMPTE-170M, BT.601-6 625 or BT.601-6 525

‘smpte240m’

SMPTE-240M

‘srgb’

SRGB

‘iec61966-2-1’

iec61966-2-1

‘iec61966-2-4’

iec61966-2-4

‘xvycr’

xvycr

‘bt2020-10’

BT.2020 for 10-bits content

‘bt2020-12’

BT.2020 for 12-bits content

primaries

Specify output color primaries.

The accepted values are:

‘bt709’

BT.709

‘bt470m’

BT.470M

‘bt470bg’

BT.470BG or BT.601-6 625

‘smpte170m’

SMPTE-170M or BT.601-6 525

‘smpte240m’

SMPTE-240M

‘film’

film

‘smpte431’

SMPTE-431

‘smpte432’

SMPTE-432

‘bt2020’

BT.2020

‘jedec-p22’

JEDEC P22 phosphors

range

Specify output color range.

The accepted values are:

‘tv’

TV (restricted) range

‘mpeg’

MPEG (restricted) range

‘pc’

PC (full) range

‘jpeg’

JPEG (full) range

format

Specify output color format.

The accepted values are:

‘yuv420p’

YUV 4:2:0 planar 8-bits

‘yuv420p10’

YUV 4:2:0 planar 10-bits

‘yuv420p12’

YUV 4:2:0 planar 12-bits

‘yuv422p’

YUV 4:2:2 planar 8-bits

‘yuv422p10’

YUV 4:2:2 planar 10-bits

‘yuv422p12’

YUV 4:2:2 planar 12-bits

‘yuv444p’

YUV 4:4:4 planar 8-bits

‘yuv444p10’

YUV 4:4:4 planar 10-bits

‘yuv444p12’

YUV 4:4:4 planar 12-bits

fast

Do a fast conversion, which skips gamma/primary correction. This will take significantly less CPU, but will be mathematically incorrect. To get output compatible with that produced by the colormatrix filter, use fast=1.

dither

Specify dithering mode.

The accepted values are:

‘none’

No dithering

‘fsb’

Floyd-Steinberg dithering

wadapt

Whitepoint adaptation mode.

The accepted values are:

‘bradford’

Bradford whitepoint adaptation

‘vonkries’

von Kries whitepoint adaptation

`'identity'`

identity whitepoint adaptation (i.e. no whitepoint adaptation)

`iall`

Override all input properties at once. Same accepted values as all.

`ispace`

Override input colorspace. Same accepted values as space.

`iprimaries`

Override input color primaries. Same accepted values as primaries.

`itransfer`

Override input transfer characteristics. Same accepted values as trc.

`irange`

Override input color range. Same accepted values as range.

The filter converts the transfer characteristics, color space and color primaries to the specified user values. The output value, if not specified, is set to a default value based on the "all" property. If that property is also not specified, the filter will log an error. The output color range and format default to the same value as the input color range and format. The input transfer characteristics, color space, color primaries and color range should be set on the input data. If any of these are missing, the filter will log an error and no conversion will take place.

For example to convert the input to SMPTE-240M, use the command:

```
colorspace=smp240m
```

10.23 convolution# TOC

Apply convolution of 3x3, 5x5, 7x7 or horizontal/vertical up to 49 elements.

The filter accepts the following options:

`0m`

`1m`

`2m`

`3m`

Set matrix for each plane. Matrix is sequence of 9, 25 or 49 signed integers in *square* mode, and from 1 to 49 odd number of signed integers in *row* mode.

0rdiv
1rdiv
2rdiv
3rdiv

Set multiplier for calculated value for each plane. If unset or 0, it will be sum of all matrix elements.

0bias
1bias
2bias
3bias

Set bias for each plane. This value is added to the result of the multiplication. Useful for making the overall image brighter or darker. Default is 0.0.

0mode
1mode
2mode
3mode

Set matrix mode for each plane. Can be *square*, *row* or *column*. Default is *square*.

10.23.1 Examples# TOC

- Apply sharpen:

```
convolution="0 -1 0 -1 5 -1 0 -1 0:0 -1 0 -1 5 -1 0 -1 0:0 -1 0 -1 5 -1 0 -1 0:0 -1 0 -1 5 -1 0 -1 0"
```

- Apply blur:

```
convolution="1 1 1 1 1 1 1 1 1:1 1 1 1 1 1 1 1 1:1 1 1 1 1 1 1 1 1:1 1 1 1 1 1 1 1 1:1/9:1/9:1/9:1/9"
```

- Apply edge enhance:

```
convolution="0 0 0 -1 1 0 0 0 0:0 0 0 -1 1 0 0 0 0:0 0 0 -1 1 0 0 0 0:0 0 0 -1 1 0 0 0 0:5:1:1:1:0:128:128:128"
```

- Apply edge detect:

```
convolution="0 1 0 1 -4 1 0 1 0:0 1 0 1 -4 1 0 1 0:0 1 0 1 -4 1 0 1 0:0 1 0 1 -4 1 0 1 0:5:5:5:1:0:128:128:128"
```

- Apply laplacian edge detector which includes diagonals:

```
convolution="1 1 1 1 -8 1 1 1 1:1 1 1 1 1 -8 1 1 1 1:1 1 1 1 1 -8 1 1 1 1:5:5:5:1:0:128:128:0"
```

- Apply emboss:

```
convolution="-2 -1 0 -1 1 1 0 1 2:-2 -1 0 -1 1 1 0 1 2:-2 -1 0 -1 1 1 0 1 2:-2 -1 0 -1 1 1 0 1 2"
```

10.24 convolve# TOC

Apply 2D convolution of video stream in frequency domain using second stream as impulse.

The filter accepts the following options:

`planes`

Set which planes to process.

`impulse`

Set which impulse video frames will be processed, can be *first* or *all*. Default is *all*.

The `convolve` filter also supports the `framesync` options.

10.25 copy# TOC

Copy the input video source unchanged to the output. This is mainly useful for testing purposes.

10.26 coreimage# TOC

Video filtering on GPU using Apple's CoreImage API on OSX.

Hardware acceleration is based on an OpenGL context. Usually, this means it is processed by video hardware. However, software-based OpenGL implementations exist which means there is no guarantee for hardware processing. It depends on the respective OSX.

There are many filters and image generators provided by Apple that come with a large variety of options. The filter has to be referenced by its name along with its options.

The `coreimage` filter accepts the following options:

`list_filters`

List all available filters and generators along with all their respective options as well as possible minimum and maximum values along with the default values.

`list_filters=true`

`filter`

Specify all filters by their respective name and options. Use *list_filters* to determine all valid filter names and options. Numerical options are specified by a float value and are automatically clamped to their respective value range. Vector and color options have to be specified by a list of space separated float values. Character escaping has to be done. A special option name `default` is available to use default options for a filter.

It is required to specify either `default` or at least one of the filter options. All omitted options are used with their default values. The syntax of the filter string is as follows:

```
filter=<NAME>@<OPTION>=<VALUE>[@<OPTION>=<VALUE>][@...][#<NAME>@<OPTION>=<VALUE>[@<OPTION>=<VALUE>][@...][#...]
```

`output_rect`

Specify a rectangle where the output of the filter chain is copied into the input image. It is given by a list of space separated float values:

```
output_rect=x\ y\ width\ height
```

If not given, the output rectangle equals the dimensions of the input image. The output rectangle is automatically cropped at the borders of the input image. Negative values are valid for each component.

```
output_rect=25\ 25\ 100\ 100
```

Several filters can be chained for successive processing without GPU-HOST transfers allowing for fast processing of complex filter chains. Currently, only filters with zero (generators) or exactly one (filters) input image and one output image are supported. Also, transition filters are not yet usable as intended.

Some filters generate output images with additional padding depending on the respective filter kernel. The padding is automatically removed to ensure the filter output has the same size as the input image.

For image generators, the size of the output image is determined by the previous output image of the filter chain or the input image of the whole filterchain, respectively. The generators do not use the pixel information of this image to generate their output. However, the generated output is blended onto this image, resulting in partial or complete coverage of the output image.

The `coreimagesrc` video source can be used for generating input images which are directly fed into the filter chain. By using it, providing input images by another video source or an input video is not required.

10.26.1 Examples# TOC

- List all filters available:

```
coreimage=list_filters=true
```

- Use the `CIBoxBlur` filter with default options to blur an image:

```
coreimage=filter=CIBoxBlur@default
```

- Use a filter chain with `CISepiaTone` at default values and `CIVignetteEffect` with its center at 100x100 and a radius of 50 pixels:

```
coreimage=filter=CIBoxBlur@default#CIVignetteEffect@inputCenter=100\ 100@inputRadius=50
```

- Use `nullsrc` and `CIQRCodeGenerator` to create a QR code for the FFmpeg homepage, given as complete and escaped command-line for Apple's standard bash shell:

```
ffmpeg -f lavfi -i nullsrc=s=100x100,coreimage=filter=CiQRCodeGenerator@inputMessage=https\\\\\\\\://FFmpeg.org/@inputCorrectionLevel=H -frames:v 1 QRCode.png
```

10.27 crop# TOC

Crop the input video to given dimensions.

It accepts the following parameters:

`w`, `out_w`

The width of the output video. It defaults to `iw`. This expression is evaluated only once during the filter configuration, or when the `'w'` or `'out_w'` command is sent.

`h`, `out_h`

The height of the output video. It defaults to `ih`. This expression is evaluated only once during the filter configuration, or when the `'h'` or `'out_h'` command is sent.

`x`

The horizontal position, in the input video, of the left edge of the output video. It defaults to $(in_w - out_w) / 2$. This expression is evaluated per-frame.

`y`

The vertical position, in the input video, of the top edge of the output video. It defaults to $(in_h - out_h) / 2$. This expression is evaluated per-frame.

`keep_aspect`

If set to 1 will force the output display aspect ratio to be the same of the input, by changing the output sample aspect ratio. It defaults to 0.

`exact`

Enable exact cropping. If enabled, subsampled videos will be cropped at exact width/height/`x`/`y` as specified and will not be rounded to nearest smaller value. It defaults to 0.

The `out_w`, `out_h`, `x`, `y` parameters are expressions containing the following constants:

`x`

`y`

The computed values for `x` and `y`. They are evaluated for each new frame.

`in_w`

`in_h`

The input width and height.

iw
ih

These are the same as *in_w* and *in_h*.

out_w
out_h

The output (cropped) width and height.

ow
oh

These are the same as *out_w* and *out_h*.

a

same as *iw / ih*

sar

input sample aspect ratio

dar

input display aspect ratio, it is the same as $(iw / ih) * sar$

hsub
vsub

horizontal and vertical chroma subsample values. For example for the pixel format "yuv422p" *hsub* is 2 and *vsub* is 1.

n

The number of the input frame, starting from 0.

pos

the position in the file of the input frame, NAN if unknown

t

The timestamp expressed in seconds. It's NAN if the input timestamp is unknown.

The expression for *out_w* may depend on the value of *out_h*, and the expression for *out_h* may depend on *out_w*, but they cannot depend on *x* and *y*, as *x* and *y* are evaluated after *out_w* and *out_h*.

The x and y parameters specify the expressions for the position of the top-left corner of the output (non-cropped) area. They are evaluated for each frame. If the evaluated value is not valid, it is approximated to the nearest valid value.

The expression for x may depend on y , and the expression for y may depend on x .

10.27.1 Examples# TOC

- Crop area with size 100x100 at position (12,34).

```
crop=100:100:12:34
```

Using named options, the example above becomes:

```
crop=w=100:h=100:x=12:y=34
```

- Crop the central input area with size 100x100:

```
crop=100:100
```

- Crop the central input area with size 2/3 of the input video:

```
crop=2/3*in_w:2/3*in_h
```

- Crop the input video central square:

```
crop=out_w=in_h  
crop=in_h
```

- Delimit the rectangle with the top-left corner placed at position 100:100 and the right-bottom corner corresponding to the right-bottom corner of the input image.

```
crop=in_w-100:in_h-100:100:100
```

- Crop 10 pixels from the left and right borders, and 20 pixels from the top and bottom borders

```
crop=in_w-2*10:in_h-2*20
```

- Keep only the bottom right quarter of the input image:

```
crop=in_w/2:in_h/2:in_w/2:in_h/2
```

- Crop height for getting Greek harmony:

```
crop=in_w:1/PHI*in_w
```

- Apply trembling effect:

```
crop=in_w/2:in_h/2:(in_w-out_w)/2+((in_w-out_w)/2)*sin(n/10):(in_h-out_h)/2+((in_h-out_h)/2)*sin(n/7)
```

- Apply erratic camera effect depending on timestamp:

```
crop=in_w/2:in_h/2:(in_w-out_w)/2+((in_w-out_w)/2)*sin(t*10):(in_h-out_h)/2+((in_h-out_h)/2)*sin(t*13) "
```

- Set x depending on the value of y:

```
crop=in_w/2:in_h/2:y:10+10*sin(n/10)
```

10.27.2 Commands# TOC

This filter supports the following commands:

```
w, out_w  
h, out_h  
x  
y
```

Set width/height of the output video and the horizontal/vertical position in the input video. The command accepts the same syntax of the corresponding option.

If the specified expression is not valid, it is kept at its current value.

10.28 cropdetect# TOC

Auto-detect the crop size.

It calculates the necessary cropping parameters and prints the recommended parameters via the logging system. The detected dimensions correspond to the non-black area of the input video.

It accepts the following parameters:

```
limit
```

Set higher black value threshold, which can be optionally specified from nothing (0) to everything (255 for 8-bit based formats). An intensity value greater to the set value is considered non-black. It defaults to 24. You can also specify a value between 0.0 and 1.0 which will be scaled depending on the bitdepth of the pixel format.

```
round
```

The value which the width/height should be divisible by. It defaults to 16. The offset is automatically adjusted to center the video. Use 2 to get only even dimensions (needed for 4:2:2 video). 16 is best when encoding to most video codecs.

```
reset_count, reset
```

Set the counter that determines after how many frames cropdetect will reset the previously detected largest video area and start over to detect the current optimal crop area. Default value is 0.

This can be useful when channel logos distort the video area. 0 indicates 'never reset', and returns the largest area encountered during playback.

10.29 curves# TOC

Apply color adjustments using curves.

This filter is similar to the Adobe Photoshop and GIMP curves tools. Each component (red, green and blue) has its values defined by N key points tied from each other using a smooth curve. The x-axis represents the pixel values from the input frame, and the y-axis the new pixel values to be set for the output frame.

By default, a component curve is defined by the two points $(0;0)$ and $(1;1)$. This creates a straight line where each original pixel value is "adjusted" to its own value, which means no change to the image.

The filter allows you to redefine these two points and add some more. A new curve (using a natural cubic spline interpolation) will be defined to pass smoothly through all these new coordinates. The new defined points need to be strictly increasing over the x-axis, and their x and y values must be in the $[0;1]$ interval. If the computed curves happened to go outside the vector spaces, the values will be clipped accordingly.

The filter accepts the following options:

`preset`

Select one of the available color presets. This option can be used in addition to the `r`, `g`, `b` parameters; in this case, the later options take priority on the preset values. Available presets are:

```
'none'
'color_negative'
'cross_process'
'darker'
'increase_contrast'
'lighter'
'linear_contrast'
'medium_contrast'
'negative'
'strong_contrast'
'vintage'
```

Default is none.

`master, m`

Set the master key points. These points will define a second pass mapping. It is sometimes called a "luminance" or "value" mapping. It can be used with `r`, `g`, `b` or `all` since it acts like a post-processing LUT.

`red, r`

Set the key points for the red component.

`green, g`

Set the key points for the green component.

`blue, b`

Set the key points for the blue component.

`all`

Set the key points for all components (not including master). Can be used in addition to the other key points component options. In this case, the unset component(s) will fallback on this `all` setting.

`psfile`

Specify a Photoshop curves file (`.acv`) to import the settings from.

`plot`

Save Gnuplot script of the curves in specified file.

To avoid some filtergraph syntax conflicts, each key points list need to be defined using the following syntax: `x0/y0 x1/y1 x2/y2`

10.29.1 Examples# TOC

- Increase slightly the middle level of blue:

```
curves=blue='0/0 0.5/0.58 1/1'
```

- Vintage effect:

```
curves=r='0/0.11 .42/.51 1/0.95':g='0/0 0.50/0.48 1/1':b='0/0.22 .49/.44 1/0.8'
```

Here we obtain the following coordinates for each components:

red

```
(0;0.11) (0.42;0.51) (1;0.95)
```

green

```
(0;0) (0.50;0.48) (1;1)
```

blue

```
(0;0.22) (0.49;0.44) (1;0.80)
```

- The previous example can also be achieved with the associated built-in preset:

```
curves=preset=vintage
```

- Or simply:

```
curves=vintage
```

- Use a Photoshop preset and redefine the points of the green component:

```
curves=psfile='MyCurvesPresets/purple.acv':green='0/0 0.45/0.53 1/1'
```

- Check out the curves of the `cross_process` profile using `ffmpeg` and `gnuplot`:

```
ffmpeg -f lavfi -i color -vf curves=cross_process:plot=/tmp/curves.plt -frames:v 1 -f null -  
gnuplot -p /tmp/curves.plt
```

10.30 datascope# TOC

Video data analysis filter.

This filter shows hexadecimal pixel values of part of video.

The filter accepts the following options:

`size, s`

Set output video size.

`x`

Set x offset from where to pick pixels.

`y`

Set y offset from where to pick pixels.

`mode`

Set scope mode, can be one of the following:

`'mono'`

Draw hexadecimal pixel values with white color on black background.

`'color'`

Draw hexadecimal pixel values with input video pixel color on black background.

`'color2'`

Draw hexadecimal pixel values on color background picked from input video, the text color is picked in such way so its always visible.

`axis`

Draw rows and columns numbers on left and top of video.

`opacity`

Set background opacity.

10.31 dctdnoiz# TOC

Denoise frames using 2D DCT (frequency domain filtering).

This filter is not designed for real time.

The filter accepts the following options:

`sigma, s`

Set the noise sigma constant.

This *sigma* defines a hard threshold of $3 * \text{sigma}$; every DCT coefficient (absolute value) below this threshold will be dropped.

If you need a more advanced filtering, see `expr`.

Default is 0.

`overlap`

Set number overlapping pixels for each block. Since the filter can be slow, you may want to reduce this value, at the cost of a less effective filter and the risk of various artefacts.

If the overlapping value doesn't permit processing the whole input width or height, a warning will be displayed and according borders won't be denoised.

Default value is *blocksize-1*, which is the best possible setting.

`expr, e`

Set the coefficient factor expression.

For each coefficient of a DCT block, this expression will be evaluated as a multiplier value for the coefficient.

If this option is set, the `sigma` option will be ignored.

The absolute value of the coefficient can be accessed through the `c` variable.

`n`

Set the *blocksize* using the number of bits. $1 < n$ defines the *blocksize*, which is the width and height of the processed blocks.

The default value is 3 (8x8) and can be raised to 4 for a *blocksize* of 16x16. Note that changing this setting has huge consequences on the speed processing. Also, a larger block size does not necessarily mean a better de-noising.

10.31.1 Examples# TOC

Apply a denoise with a `sigma` of 4.5:

```
dctdnoiz=4.5
```

The same operation can be achieved using the expression system:

```
dctdnoiz=e'gte(c, 4.5*3)'
```

Violent denoise using a block size of 16x16:

```
dctdnoiz=15:n=4
```

10.32 deband# TOC

Remove banding artifacts from input video. It works by replacing banded pixels with average value of referenced pixels.

The filter accepts the following options:

```
1thr  
2thr  
3thr  
4thr
```

Set banding detection threshold for each plane. Default is 0.02. Valid range is 0.00003 to 0.5. If difference between current pixel and reference pixel is less than threshold, it will be considered as banded.

```
range, r
```

Banding detection range in pixels. Default is 16. If positive, random number in range 0 to set value will be used. If negative, exact absolute value will be used. The range defines square of four pixels around current pixel.

`direction, d`

Set direction in radians from which four pixel will be compared. If positive, random direction from 0 to set direction will be picked. If negative, exact of absolute value will be picked. For example direction 0, $-\pi$ or -2π radians will pick only pixels on same row and $-\pi/2$ will pick only pixels on same column.

`blur, b`

If enabled, current pixel is compared with average value of all four surrounding pixels. The default is enabled. If disabled current pixel is compared with all four surrounding pixels. The pixel is considered banded if only all four differences with surrounding pixels are less than threshold.

`coupling, c`

If enabled, current pixel is changed if and only if all pixel components are banded, e.g. banding detection threshold is triggered for all color components. The default is disabled.

10.33 deblock# TOC

Remove blocking artifacts from input video.

The filter accepts the following options:

`filter`

Set filter type, can be *weak* or *strong*. Default is *strong*. This controls what kind of deblocking is applied.

`block`

Set size of block, allowed range is from 4 to 512. Default is 8.

`alpha`

`beta`

`gamma`

`delta`

Set blocking detection thresholds. Allowed range is 0 to 1. Defaults are: *0.098* for *alpha* and *0.05* for the rest. Using higher threshold gives more deblocking strength. Setting *alpha* controls threshold detection at exact edge of block. Remaining options controls threshold detection near the edge. Each one for below/above or left/right. Setting any of those to *0* disables deblocking.

planes

Set planes to filter. Default is to filter all available planes.

10.33.1 Examples# TOC

- Deblock using weak filter and block size of 4 pixels.

```
deblock=filter=weak:block=4
```

- Deblock using strong filter, block size of 4 pixels and custom thresholds for deblocking more edges.

```
deblock=filter=strong:block=4:alpha=0.12:beta=0.07:gamma=0.06:delta=0.05
```

- Similar as above, but filter only first plane.

```
deblock=filter=strong:block=4:alpha=0.12:beta=0.07:gamma=0.06:delta=0.05:planes=1
```

- Similar as above, but filter only second and third plane.

```
deblock=filter=strong:block=4:alpha=0.12:beta=0.07:gamma=0.06:delta=0.05:planes=6
```

10.34 decimate# TOC

Drop duplicated frames at regular intervals.

The filter accepts the following options:

cycle

Set the number of frames from which one will be dropped. Setting this to N means one frame in every batch of N frames will be dropped. Default is 5.

dupthresh

Set the threshold for duplicate detection. If the difference metric for a frame is less than or equal to this value, then it is declared as duplicate. Default is 1.1

scthresh

Set scene change threshold. Default is 15.

blockx

blocky

Set the size of the x and y-axis blocks used during metric calculations. Larger blocks give better noise suppression, but also give worse detection of small movements. Must be a power of two. Default is 32.

ppsrc

Mark main input as a pre-processed input and activate clean source input stream. This allows the input to be pre-processed with various filters to help the metrics calculation while keeping the frame selection lossless. When set to 1, the first stream is for the pre-processed input, and the second stream is the clean source from where the kept frames are chosen. Default is 0.

chroma

Set whether or not chroma is considered in the metric calculations. Default is 1.

10.35 deconvolve# TOC

Apply 2D deconvolution of video stream in frequency domain using second stream as impulse.

The filter accepts the following options:

planes

Set which planes to process.

impulse

Set which impulse video frames will be processed, can be *first* or *all*. Default is *all*.

noise

Set noise when doing divisions. Default is *0.0000001*. Useful when width and height are not same and not power of 2 or if stream prior to convolving had noise.

The `deconvolve` filter also supports the `framesync` options.

10.36 deflate# TOC

Apply deflate effect to the video.

This filter replaces the pixel by the local(3x3) average by taking into account only values lower than the pixel.

It accepts the following options:

threshold0

threshold1

threshold2

threshold3

Limit the maximum change for each plane, default is 65535. If 0, plane will remain unchanged.

10.37 deflicker# TOC

Remove temporal frame luminance variations.

It accepts the following options:

`size, s`

Set moving-average filter size in frames. Default is 5. Allowed range is 2 - 129.

`mode, m`

Set averaging mode to smooth temporal luminance variations.

Available values are:

`'am'`

Arithmetic mean

`'gm'`

Geometric mean

`'hm'`

Harmonic mean

`'qm'`

Quadratic mean

`'cm'`

Cubic mean

`'pm'`

Power mean

`'median'`

Median

`bypass`

Do not actually modify frame. Useful when one only wants metadata.

10.38 dejudder# TOC

Remove judder produced by partially interlaced telecined content.

Judder can be introduced, for instance, by pullup filter. If the original source was partially telecined content then the output of `pullup`, `dejudder` will have a variable frame rate. May change the recorded frame rate of the container. Aside from that change, this filter will not affect constant frame rate video.

The option available in this filter is:

`cycle`

Specify the length of the window over which the judder repeats.

Accepts any integer greater than 1. Useful values are:

‘4’

If the original was telecined from 24 to 30 fps (Film to NTSC).

‘5’

If the original was telecined from 25 to 30 fps (PAL to NTSC).

‘20’

If a mixture of the two.

The default is ‘4’.

10.39 delogo# TOC

Suppress a TV station logo by a simple interpolation of the surrounding pixels. Just set a rectangle covering the logo and watch it disappear (and sometimes something even uglier appear - your mileage may vary).

It accepts the following parameters:

`x`

`y`

Specify the top left corner coordinates of the logo. They must be specified.

`w`

`h`

Specify the width and height of the logo to clear. They must be specified.

band, t

Specify the thickness of the fuzzy edge of the rectangle (added to w and h). The default value is 1. This option is deprecated, setting higher values should no longer be necessary and is not recommended.

show

When set to 1, a green rectangle is drawn on the screen to simplify finding the right x , y , w , and h parameters. The default value is 0.

The rectangle is drawn on the outermost pixels which will be (partly) replaced with interpolated values. The values of the next pixels immediately outside this rectangle in each direction will be used to compute the interpolated pixel values inside the rectangle.

10.39.1 Examples# TOC

- Set a rectangle covering the area with top left corner coordinates 0,0 and size 100x77, and a band of size 10:

```
delogo=x=0:y=0:w=100:h=77:band=10
```

10.40 deshake# TOC

Attempt to fix small changes in horizontal and/or vertical shift. This filter helps remove camera shake from hand-holding a camera, bumping a tripod, moving on a vehicle, etc.

The filter accepts the following options:

x
y
w
h

Specify a rectangular area where to limit the search for motion vectors. If desired the search for motion vectors can be limited to a rectangular area of the frame defined by its top left corner, width and height. These parameters have the same meaning as the drawbox filter which can be used to visualise the position of the bounding box.

This is useful when simultaneous movement of subjects within the frame might be confused for camera motion by the motion vector search.

If any or all of x , y , w and h are set to -1 then the full frame is used. This allows later options to be set without specifying the bounding box for the motion vector search.

Default - search the whole frame.

rx
ry

Specify the maximum extent of movement in x and y directions in the range 0-64 pixels. Default 16.

edge

Specify how to generate pixels to fill blanks at the edge of the frame. Available values are:

`'blank, 0'`

Fill zeroes at blank locations

`'original, 1'`

Original image at blank locations

`'clamp, 2'`

Extruded edge value at blank locations

`'mirror, 3'`

Mirrored edge at blank locations

Default value is `'mirror'`.

blocksize

Specify the blocksize to use for motion search. Range 4-128 pixels, default 8.

contrast

Specify the contrast threshold for blocks. Only blocks with more than the specified contrast (difference between darkest and lightest pixels) will be considered. Range 1-255, default 125.

search

Specify the search strategy. Available values are:

`'exhaustive, 0'`

Set exhaustive search

`'less, 1'`

Set less exhaustive search.

Default value is 'exhaustive'.

filename

If set then a detailed log of the motion search is written to the specified file.

10.41 despill# TOC

Remove unwanted contamination of foreground colors, caused by reflected color of greenscreen or bluescreen.

This filter accepts the following options:

type

Set what type of despill to use.

mix

Set how spillmap will be generated.

expand

Set how much to get rid of still remaining spill.

red

Controls amount of red in spill area.

green

Controls amount of green in spill area. Should be -1 for greenscreen.

blue

Controls amount of blue in spill area. Should be -1 for bluescreen.

brightness

Controls brightness of spill area, preserving colors.

alpha

Modify alpha from generated spillmap.

10.42 detelecine# TOC

Apply an exact inverse of the telecine operation. It requires a predefined pattern specified using the pattern option which must be the same as that passed to the telecine filter.

This filter accepts the following options:

first_field

‘top, t’

top field first

‘bottom, b’

bottom field first The default value is top.

pattern

A string of numbers representing the pulldown pattern you wish to apply. The default value is 23.

start_frame

A number representing position of the first frame with respect to the telecine pattern. This is to be used if the stream is cut. The default value is 0.

10.43 dilation# TOC

Apply dilation effect to the video.

This filter replaces the pixel by the local(3x3) maximum.

It accepts the following options:

threshold0

threshold1

threshold2

threshold3

Limit the maximum change for each plane, default is 65535. If 0, plane will remain unchanged.

coordinates

Flag which specifies the pixel to refer to. Default is 255 i.e. all eight pixels are used.

Flags to local 3x3 coordinates maps like this:

1 2 3 4 5 6 7 8

10.44 displace# TOC

Displace pixels as indicated by second and third input stream.

It takes three input streams and outputs one stream, the first input is the source, and second and third input are displacement maps.

The second input specifies how much to displace pixels along the x-axis, while the third input specifies how much to displace pixels along the y-axis. If one of displacement map streams terminates, last frame from that displacement map will be used.

Note that once generated, displacements maps can be reused over and over again.

A description of the accepted options follows.

edge

Set displace behavior for pixels that are out of range.

Available values are:

‘blank’

Missing pixels are replaced by black pixels.

‘smear’

Adjacent pixels will spread out to replace missing pixels.

‘wrap’

Out of range pixels are wrapped so they point to pixels of other side.

‘mirror’

Out of range pixels will be replaced with mirrored pixels.

Default is ‘smear’.

10.44.1 Examples# TOC

- Add ripple effect to rgb input of video size hd720:

```
ffmpeg -i INPUT -f lavfi -i nullsrc=s=hd720,lutrgb=128:128:128 -f lavfi -i nullsrc=s=hd720,geq=r=128+30*sin(2*PI*X/400+T):g=128+30*sin(2*PI*X/400+T):b=128+30*sin(2*PI*X/400+T) -lavfi '[0][1][2]displace' OUTPUT
```

- Add wave effect to rgb input of video size hd720:

```
ffmpeg -i INPUT -f lavfi -i nullsrc=hd720,geq=r=128+80*(sin(sqrt((X-W/2)*(X-W/2)+(Y-H/2)*(Y-H/2))/220*2*PI+T)):g=128+80*(sin(sqrt((X-W/2)*(X-W/2)+(Y-H/2)*(Y-H/2))/220*2*PI+T)):b=128+80*(sin(sqrt((X-W/2)*(X-W/2)+(Y-H/2)*(Y-H/2))/220*2*PI+T)) -lavfi '[1]split[a][y],[0][a][y]displace' OUTPUT
```

10.45 drawbox# TOC

Draw a colored box on the input image.

It accepts the following parameters:

`x`
`y`

The expressions which specify the top left corner coordinates of the box. It defaults to 0.

`width, w`
`height, h`

The expressions which specify the width and height of the box; if 0 they are interpreted as the input width and height. It defaults to 0.

`color, c`

Specify the color of the box to write. For the general syntax of this option, check the (ffmpeg-utils)"Color" section in the ffmpeg-utils manual. If the special value `invert` is used, the box edge color is the same as the video with inverted luma.

`thickness, t`

The expression which sets the thickness of the box edge. A value of `fill` will create a filled box. Default value is 3.

See below for the list of accepted constants.

`replace`

Applicable if the input has alpha. With value 1, the pixels of the painted box will overwrite the video's color and alpha pixels. Default is 0, which composites the box onto the input, leaving the video's alpha intact.

The parameters for `x`, `y`, `w` and `h` and `t` are expressions containing the following constants:

`dar`

The input display aspect ratio, it is the same as $(w / h) * sar$.

`hsub`
`vsub`

horizontal and vertical chroma subsample values. For example for the pixel format "yuv422p" `hsub` is 2 and `vsub` is 1.

`in_h, ih`
`in_w, iw`

The input width and height.

`sar`

The input sample aspect ratio.

`x`
`y`

The x and y offset coordinates where the box is drawn.

`w`
`h`

The width and height of the drawn box.

`t`

The thickness of the drawn box.

These constants allow the x , y , w , h and t expressions to refer to each other, so you may for example specify $y=x/\text{dar}$ or $h=w/\text{dar}$.

10.45.1 Examples# TOC

- Draw a black box around the edge of the input image:

`drawbox`

- Draw a box with color red and an opacity of 50%:

`drawbox=10:20:200:60:red@0.5`

The previous example can be specified as:

`drawbox=x=10:y=20:w=200:h=60:color=red@0.5`

- Fill the box with pink color:

`drawbox=x=10:y=10:w=100:h=100:color=pink@0.5:t=fill`

- Draw a 2-pixel red 2.40:1 mask:

`drawbox=x=-t:y=0.5*(ih-iw/2.4)-t:w=iw+t*2:h=iw/2.4+t*2:t=2:c=red`

10.46 drawgrid# TOC

Draw a grid on the input image.

It accepts the following parameters:

`x`

`y`

The expressions which specify the coordinates of some point of grid intersection (meant to configure offset). Both default to 0.

`width, w`

`height, h`

The expressions which specify the width and height of the grid cell, if 0 they are interpreted as the input width and height, respectively, minus `thickness`, so image gets framed. Default to 0.

`color, c`

Specify the color of the grid. For the general syntax of this option, check the (ffmpeg-utils)"Color" section in the ffmpeg-utils manual. If the special value `invert` is used, the grid color is the same as the video with inverted luma.

`thickness, t`

The expression which sets the thickness of the grid line. Default value is 1.

See below for the list of accepted constants.

`replace`

Applicable if the input has alpha. With 1 the pixels of the painted grid will overwrite the video's color and alpha pixels. Default is 0, which composites the grid onto the input, leaving the video's alpha intact.

The parameters for `x`, `y`, `w` and `h` and `t` are expressions containing the following constants:

`dar`

The input display aspect ratio, it is the same as $(w / h) * sar$.

`hsub`

`vsub`

horizontal and vertical chroma subsample values. For example for the pixel format "yuv422p" `hsub` is 2 and `vsub` is 1.

`in_h, ih`
`in_w, iw`

The input grid cell width and height.

`sar`

The input sample aspect ratio.

`x`
`y`

The *x* and *y* coordinates of some point of grid intersection (meant to configure offset).

`w`
`h`

The width and height of the drawn cell.

`t`

The thickness of the drawn cell.

These constants allow the *x*, *y*, *w*, *h* and *t* expressions to refer to each other, so you may for example specify *y*=*x*/*dar* or *h*=*w*/*dar*.

10.46.1 Examples# TOC

- Draw a grid with cell 100x100 pixels, thickness 2 pixels, with color red and an opacity of 50%:

```
drawgrid=width=100:height=100:thickness=2:color=red@0.5
```

- Draw a white 3x3 grid with an opacity of 50%:

```
drawgrid=w=iw/3:h=ih/3:t=2:c=white@0.5
```

10.47 drawtext# TOC

Draw a text string or text from a specified file on top of a video, using the libfreetype library.

To enable compilation of this filter, you need to configure FFmpeg with `--enable-libfreetype`. To enable default font fallback and the *font* option you need to configure FFmpeg with `--enable-libfontconfig`. To enable the *text_shaping* option, you need to configure FFmpeg with `--enable-libfribidi`.

10.47.1 Syntax# TOC

It accepts the following parameters:

`box`

Used to draw a box around text using the background color. The value must be either 1 (enable) or 0 (disable). The default value of *box* is 0.

`boxborderw`

Set the width of the border to be drawn around the box using *boxcolor*. The default value of *boxborderw* is 0.

`boxcolor`

The color to be used for drawing box around text. For the syntax of this option, check the (ffmpeg-utils)"Color" section in the ffmpeg-utils manual.

The default value of *boxcolor* is "white".

`line_spacing`

Set the line spacing in pixels of the border to be drawn around the box using *box*. The default value of *line_spacing* is 0.

`borderw`

Set the width of the border to be drawn around the text using *bordercolor*. The default value of *borderw* is 0.

`bordercolor`

Set the color to be used for drawing border around text. For the syntax of this option, check the (ffmpeg-utils)"Color" section in the ffmpeg-utils manual.

The default value of *bordercolor* is "black".

`expansion`

Select how the *text* is expanded. Can be either `none`, `strftime` (deprecated) or `normal` (default). See the Text expansion section below for details.

`basetime`

Set a start time for the count. Value is in microseconds. Only applied in the deprecated `strftime` expansion mode. To emulate in normal expansion mode use the `pts` function, supplying the start time (in seconds) as the second argument.

`fix_bounds`

If true, check and fix text coords to avoid clipping.

`fontcolor`

The color to be used for drawing fonts. For the syntax of this option, check the (ffmpeg-utils)"Color" section in the ffmpeg-utils manual.

The default value of *fontcolor* is "black".

`fontcolor_expr`

String which is expanded the same way as *text* to obtain dynamic *fontcolor* value. By default this option has empty value and is not processed. When this option is set, it overrides *fontcolor* option.

`font`

The font family to be used for drawing text. By default Sans.

`fontfile`

The font file to be used for drawing text. The path must be included. This parameter is mandatory if the fontconfig support is disabled.

`alpha`

Draw the text applying alpha blending. The value can be a number between 0.0 and 1.0. The expression accepts the same variables *x*, *y* as well. The default value is 1. Please see *fontcolor_expr*.

`fontsize`

The font size to be used for drawing text. The default value of *fontsize* is 16.

`text_shaping`

If set to 1, attempt to shape the text (for example, reverse the order of right-to-left text and join Arabic characters) before drawing it. Otherwise, just draw the text exactly as given. By default 1 (if supported).

`ft_load_flags`

The flags to be used for loading the fonts.

The flags map the corresponding flags supported by libfreetype, and are a combination of the following values:

default

no_scale
no_hinting
render
no_bitmap
vertical_layout
force_autohint
crop_bitmap
pedantic
ignore_global_advance_width
no_recurse
ignore_transform
monochrome
linear_design
no_autohint

Default value is "default".

For more information consult the documentation for the FT_LOAD_* libfreetype flags.

shadowcolor

The color to be used for drawing a shadow behind the drawn text. For the syntax of this option, check the (ffmpeg-utils)"Color" section in the ffmpeg-utils manual.

The default value of *shadowcolor* is "black".

shadowx
shadowy

The x and y offsets for the text shadow position with respect to the position of the text. They can be either positive or negative values. The default value for both is "0".

start_number

The starting frame number for the n/frame_num variable. The default value is "0".

tabsize

The size in number of spaces to use for rendering the tab. Default value is 4.

timecode

Set the initial timecode representation in "hh:mm:ss[;:].jff" format. It can be used with or without text parameter. *timecode_rate* option must be specified.

timecode_rate, rate, r

Set the timecode frame rate (timecode only). Value will be rounded to nearest integer. Minimum value is "1". Drop-frame timecode is supported for frame rates 30 & 60.

`tc24hmax`

If set to 1, the output of the timecode option will wrap around at 24 hours. Default is 0 (disabled).

`text`

The text string to be drawn. The text must be a sequence of UTF-8 encoded characters. This parameter is mandatory if no file is specified with the parameter *textfile*.

`textfile`

A text file containing text to be drawn. The text must be a sequence of UTF-8 encoded characters.

This parameter is mandatory if no text string is specified with the parameter *text*.

If both *text* and *textfile* are specified, an error is thrown.

`reload`

If set to 1, the *textfile* will be reloaded before each frame. Be sure to update it atomically, or it may be read partially, or even fail.

`x`

`y`

The expressions which specify the offsets where text will be drawn within the video frame. They are relative to the top/left border of the output image.

The default value of *x* and *y* is "0".

See below for the list of accepted constants and functions.

The parameters for *x* and *y* are expressions containing the following constants and functions:

`dar`

input display aspect ratio, it is the same as $(w / h) * sar$

`hsub`

`vsub`

horizontal and vertical chroma subsample values. For example for the pixel format "yuv422p" *hsub* is 2 and *vsub* is 1.

`line_h, lh`

the height of each text line

`main_h, h, H`

the input height

`main_w, w, W`

the input width

`max_glyph_a, ascent`

the maximum distance from the baseline to the highest/upper grid coordinate used to place a glyph outline point, for all the rendered glyphs. It is a positive value, due to the grid's orientation with the Y axis upwards.

`max_glyph_d, descent`

the maximum distance from the baseline to the lowest grid coordinate used to place a glyph outline point, for all the rendered glyphs. This is a negative value, due to the grid's orientation, with the Y axis upwards.

`max_glyph_h`

maximum glyph height, that is the maximum height for all the glyphs contained in the rendered text, it is equivalent to *ascent - descent*.

`max_glyph_w`

maximum glyph width, that is the maximum width for all the glyphs contained in the rendered text

`n`

the number of input frame, starting from 0

`rand(min, max)`

return a random number included between *min* and *max*

`sar`

The input sample aspect ratio.

`t`

timestamp expressed in seconds, NAN if the input timestamp is unknown

`text_h, th`

the height of the rendered text

`text_w, tw`

the width of the rendered text

`x`

`y`

the `x` and `y` offset coordinates where the text is drawn.

These parameters allow the `x` and `y` expressions to refer each other, so you can for example specify `y=x/dar`.

10.47.2 Text expansion# TOC

If `expansion` is set to `strftime`, the filter recognizes `strftime()` sequences in the provided text and expands them accordingly. Check the documentation of `strftime()`. This feature is deprecated.

If `expansion` is set to `none`, the text is printed verbatim.

If `expansion` is set to `normal` (which is the default), the following expansion mechanism is used.

The backslash character `'\'`, followed by any character, always expands to the second character.

Sequences of the form `%{...}` are expanded. The text between the braces is a function name, possibly followed by arguments separated by `':'`. If the arguments contain special characters or delimiters (`':'` or `'`}), they should be escaped.

Note that they probably must also be escaped as the value for the `text` option in the filter argument string and as the filter argument in the filtergraph description, and possibly also for the shell, that makes up to four levels of escaping; using a text file avoids these problems.

The following functions are available:

`expr, e`

The expression evaluation result.

It must take one argument specifying the expression to be evaluated, which accepts the same constants and functions as the `x` and `y` values. Note that not all constants should be used, for example the text size is not known when evaluating the expression, so the constants `text_w` and `text_h` will have an undefined value.

`expr_int_format, eif`

Evaluate the expression's value and output as formatted integer.

The first argument is the expression to be evaluated, just as for the *expr* function. The second argument specifies the output format. Allowed values are 'x', 'X', 'd' and 'u'. They are treated exactly as in the `printf` function. The third parameter is optional and sets the number of positions taken by the output. It can be used to add padding with zeros from the left.

`gmtime`

The time at which the filter is running, expressed in UTC. It can accept an argument: a `strftime()` format string.

`localtime`

The time at which the filter is running, expressed in the local time zone. It can accept an argument: a `strftime()` format string.

`metadata`

Frame metadata. Takes one or two arguments.

The first argument is mandatory and specifies the metadata key.

The second argument is optional and specifies a default value, used when the metadata key is not found or empty.

`n, frame_num`

The frame number, starting from 0.

`pict_type`

A 1 character description of the current picture type.

`pts`

The timestamp of the current frame. It can take up to three arguments.

The first argument is the format of the timestamp; it defaults to `flt` for seconds as a decimal number with microsecond accuracy; `hms` stands for a formatted `[-]HH:MM:SS.mmm` timestamp with millisecond accuracy. `gmtime` stands for the timestamp of the frame formatted as UTC time; `localtime` stands for the timestamp of the frame formatted as local time zone time.

The second argument is an offset added to the timestamp.

If the format is set to `hms`, a third argument `24HH` may be supplied to present the hour part of the formatted timestamp in 24h format (00-23).

If the format is set to `localtime` or `gmtime`, a third argument may be supplied: a `strftime()` format string. By default, `YYYY-MM-DD HH:MM:SS` format will be used.

10.47.3 Examples# TOC

- Draw "Test Text" with font FreeSerif, using the default values for the optional parameters.

```
drawtext="fontfile=/usr/share/fonts/truetype/freefont/FreeSerif.ttf: text='Test Text' "
```

- Draw 'Test Text' with font FreeSerif of size 24 at position x=100 and y=50 (counting from the top-left corner of the screen), text is yellow with a red box around it. Both the text and the box have an opacity of 20%.

```
drawtext="fontfile=/usr/share/fonts/truetype/freefont/FreeSerif.ttf: text='Test Text':\
x=100: y=50: fontsize=24: fontcolor=yellow@0.2: box=1: boxcolor=red@0.2"
```

Note that the double quotes are not necessary if spaces are not used within the parameter list.

- Show the text at the center of the video frame:

```
drawtext="fontsize=30:fontfile=FreeSerif.ttf:text='hello world':x=(w-text_w)/2:y=(h-text_h)/2"
```

- Show the text at a random position, switching to a new position every 30 seconds:

```
drawtext="fontsize=30:fontfile=FreeSerif.ttf:text='hello world':x=if(eq(mod(t\,30)\,0)\,rand(0\,(w-text_w))\,x):y=if(eq(mod(t\,30)\,0)\,rand(0\,(h-text_h))\,y)"
```

- Show a text line sliding from right to left in the last row of the video frame. The file LONG_LINE is assumed to contain a single line with no newlines.

```
drawtext="fontsize=15:fontfile=FreeSerif.ttf:text=LONG_LINE:y=h-line_h:x=-50*t"
```

- Show the content of file CREDITS off the bottom of the frame and scroll up.

```
drawtext="fontsize=20:fontfile=FreeSerif.ttf:textfile=CREDITS:y=h-20*t"
```

- Draw a single green letter "g", at the center of the input video. The glyph baseline is placed at half screen height.

```
drawtext="fontsize=60:fontfile=FreeSerif.ttf:fontcolor=green:text=g:x=(w-max_glyph_w)/2:y=h/2-ascent"
```

- Show text for 1 second every 3 seconds:

```
drawtext="fontfile=FreeSerif.ttf:fontcolor=white:x=100:y=x/dar:enable=1t(mod(t\,3)\,1):text='blink' "
```

- Use fontconfig to set the font. Note that the colons need to be escaped.

```
drawtext=' fontfile=Linux Libertine O-40\:style=Semibold:text=FFmpeg'
```

- Print the date of a real-time encoding (see strftime(3)):

```
drawtext=' fontfile=FreeSans.ttf:text=%{localtime\:%a %b %d %Y}'
```

- Show text fading in and out (appearing/disappearing):

```
#!/bin/sh
DD=1.0 # display start
DD=10.0 # display end
FD=1.0 # fade in duration
FDD=5 # fade out duration
ffplay -f lavfi "color,drawtext=text=TEST:fontsize=50:fontfile=FreeSerif.ttf:fontcolor=white:clip=1250:if(1"between(t\,\, DD + SPID\,\, DDE - SPID) + ((t - DDE)/SPID)"between(t\,\, DD + SPID) + ((t - DDE)/SPID)"between(t\,\, DDE - SPID)\,\, 0\,\, 255) \\\: a\\\: 2 )"
```

- Horizontally align multiple separate texts. Note that max_glyph_a and the font size value are

included in the y offset.

```
drawtext=fontfile=FreeSans.ttf:text=DOG:fontsize=24:x=10:y=20+24-max_glyph_a,  
drawtext=fontfile=FreeSans.ttf:text=cow:fontsize=24:x=80:y=20+24-max_glyph_a
```

For more information about libfreetype, check: <http://www.freetype.org/>.

For more information about fontconfig, check:
<http://freedesktop.org/software/fontconfig/fontconfig-user.html>.

For more information about libfribidi, check: <http://fribidi.org/>.

10.48 edgedetect# TOC

Detect and draw edges. The filter uses the Canny Edge Detection algorithm.

The filter accepts the following options:

low
high

Set low and high threshold values used by the Canny thresholding algorithm.

The high threshold selects the "strong" edge pixels, which are then connected through 8-connectivity with the "weak" edge pixels selected by the low threshold.

low and *high* threshold values must be chosen in the range [0,1], and *low* should be lesser or equal to *high*.

Default value for *low* is 20/255, and default value for *high* is 50/255.

mode

Define the drawing mode.

‘wires’

Draw white/gray wires on black background.

‘colormix’

Mix the colors to create a paint/cartoon effect.

‘canny’

Apply Canny edge detector on all selected planes.

Default value is *wires*.

planes

Select planes for filtering. By default all available planes are filtered.

10.48.1 Examples# TOC

- Standard edge detection with custom values for the hysteresis thresholding:

```
edgedetect=low=0.1:high=0.4
```

- Painting effect without thresholding:

```
edgedetect=mode=colormix:high=0
```

10.49 eq# TOC

Set brightness, contrast, saturation and approximate gamma adjustment.

The filter accepts the following options:

contrast

Set the contrast expression. The value must be a float value in range -2.0 to 2.0 . The default value is "1".

brightness

Set the brightness expression. The value must be a float value in range -1.0 to 1.0 . The default value is "0".

saturation

Set the saturation expression. The value must be a float in range 0.0 to 3.0 . The default value is "1".

gamma

Set the gamma expression. The value must be a float in range 0.1 to 10.0 . The default value is "1".

gamma_r

Set the gamma expression for red. The value must be a float in range 0.1 to 10.0 . The default value is "1".

gamma_g

Set the gamma expression for green. The value must be a float in range 0.1 to 10.0 . The default value is "1".

gamma_b

Set the gamma expression for blue. The value must be a float in range 0.1 to 10.0. The default value is "1".

gamma_weight

Set the gamma weight expression. It can be used to reduce the effect of a high gamma value on bright image areas, e.g. keep them from getting overamplified and just plain white. The value must be a float in range 0.0 to 1.0. A value of 0.0 turns the gamma correction all the way down while 1.0 leaves it at its full strength. Default is "1".

eval

Set when the expressions for brightness, contrast, saturation and gamma expressions are evaluated.

It accepts the following values:

`'init'`

only evaluate expressions once during the filter initialization or when a command is processed

`'frame'`

evaluate expressions for each incoming frame

Default value is `'init'`.

The expressions accept the following parameters:

n

frame count of the input frame starting from 0

pos

byte position of the corresponding packet in the input file, NAN if unspecified

r

frame rate of the input video, NAN if the input frame rate is unknown

t

timestamp expressed in seconds, NAN if the input timestamp is unknown

10.49.1 Commands# TOC

The filter supports the following commands:

`contrast`

Set the contrast expression.

`brightness`

Set the brightness expression.

`saturation`

Set the saturation expression.

`gamma`

Set the gamma expression.

`gamma_r`

Set the gamma_r expression.

`gamma_g`

Set gamma_g expression.

`gamma_b`

Set gamma_b expression.

`gamma_weight`

Set gamma_weight expression.

The command accepts the same syntax of the corresponding option.

If the specified expression is not valid, it is kept at its current value.

10.50 erosion# TOC

Apply erosion effect to the video.

This filter replaces the pixel by the local(3x3) minimum.

It accepts the following options:

threshold0
threshold1
threshold2
threshold3

Limit the maximum change for each plane, default is 65535. If 0, plane will remain unchanged.

coordinates

Flag which specifies the pixel to refer to. Default is 255 i.e. all eight pixels are used.

Flags to local 3x3 coordinates maps like this:

1 2 3 4 5 6 7 8

10.51 extractplanes# TOC

Extract color channel components from input video stream into separate grayscale video streams.

The filter accepts the following option:

planes

Set plane(s) to extract.

Available values for planes are:

'y'
'u'
'v'
'a'
'r'
'g'
'b'

Choosing planes not available in the input will result in an error. That means you cannot select r, g, b planes with y, u, v planes at same time.

10.51.1 Examples# TOC

- Extract luma, u and v color channel component from input video frame into 3 grayscale outputs:

```
ffmpeg -i video.avi -filter_complex 'extractplanes=y+u+v[y][u][v]' -map '[y]' y.avi -map '[u]' u.avi -map '[v]' v.avi
```

10.52 elbg# TOC

Apply a posterize effect using the ELBG (Enhanced LBG) algorithm.

For each input image, the filter will compute the optimal mapping from the input to the output given the codebook length, that is the number of distinct output colors.

This filter accepts the following options.

`codebook_length, l`

Set codebook length. The value must be a positive integer, and represents the number of distinct output colors. Default value is 256.

`nb_steps, n`

Set the maximum number of iterations to apply for computing the optimal mapping. The higher the value the better the result and the higher the computation time. Default value is 1.

`seed, s`

Set a random seed, must be an integer included between 0 and `UINT32_MAX`. If not specified, or if explicitly set to -1, the filter will try to use a good random seed on a best effort basis.

`pal8`

Set pal8 output pixel format. This option does not work with codebook length greater than 256.

10.53 entropy# TOC

Measure graylevel entropy in histogram of color channels of video frames.

It accepts the following parameters:

`mode`

Can be either *normal* or *diff*. Default is *normal*.

diff mode measures entropy of histogram delta values, absolute differences between neighbour histogram values.

10.54 fade# TOC

Apply a fade-in/out effect to the input video.

It accepts the following parameters:

`type, t`

The effect type can be either "in" for a fade-in, or "out" for a fade-out effect. Default is in.

`start_frame, s`

Specify the number of the frame to start applying the fade effect at. Default is 0.

`nb_frames, n`

The number of frames that the fade effect lasts. At the end of the fade-in effect, the output video will have the same intensity as the input video. At the end of the fade-out transition, the output video will be filled with the selected `color`. Default is 25.

`alpha`

If set to 1, fade only alpha channel, if one exists on the input. Default value is 0.

`start_time, st`

Specify the timestamp (in seconds) of the frame to start to apply the fade effect. If both `start_frame` and `start_time` are specified, the fade will start at whichever comes last. Default is 0.

`duration, d`

The number of seconds for which the fade effect has to last. At the end of the fade-in effect the output video will have the same intensity as the input video, at the end of the fade-out transition the output video will be filled with the selected `color`. If both `duration` and `nb_frames` are specified, `duration` is used. Default is 0 (`nb_frames` is used by default).

`color, c`

Specify the color of the fade. Default is "black".

10.54.1 Examples# TOC

- Fade in the first 30 frames of video:

```
fade=in:0:30
```

The command above is equivalent to:

```
fade=t=in:s=0:n=30
```

- Fade out the last 45 frames of a 200-frame video:

```
fade=out:155:45
fade=type=out:start_frame=155:nb_frames=45
```

- Fade in the first 25 frames and fade out the last 25 frames of a 1000-frame video:

```
fade=in:0:25, fade=out:975:25
```

- Make the first 5 frames yellow, then fade in from frame 5-24:

```
fade=in:5:20:color=yellow
```

- Fade in alpha over first 25 frames of video:

```
fade=in:0:25:alpha=1
```

- Make the first 5.5 seconds black, then fade in for 0.5 seconds:

```
fade=t=in:st=5.5:d=0.5
```

10.55 fftfilt# TOC

Apply arbitrary expressions to samples in frequency domain

dc_Y

Adjust the dc value (gain) of the luma plane of the image. The filter accepts an integer value in range 0 to 1000. The default value is set to 0.

dc_U

Adjust the dc value (gain) of the 1st chroma plane of the image. The filter accepts an integer value in range 0 to 1000. The default value is set to 0.

dc_V

Adjust the dc value (gain) of the 2nd chroma plane of the image. The filter accepts an integer value in range 0 to 1000. The default value is set to 0.

weight_Y

Set the frequency domain weight expression for the luma plane.

weight_U

Set the frequency domain weight expression for the 1st chroma plane.

weight_V

Set the frequency domain weight expression for the 2nd chroma plane.

eval

Set when the expressions are evaluated.

It accepts the following values:

`'init'`

Only evaluate expressions once during the filter initialization.

`'frame'`

Evaluate expressions for each incoming frame.

Default value is `'init'`.

The filter accepts the following variables:

X

Y

The coordinates of the current sample.

W

H

The width and height of the image.

N

The number of input frame, starting from 0.

10.55.1 Examples# TOC

- High-pass:

```
fftfilt=dc_Y=128:weight_Y='squish(1-(Y+X)/100)'
```

- Low-pass:

```
fftfilt=dc_Y=0:weight_Y='squish((Y+X)/100-1)'
```

- Sharpen:

```
fftfilt=dc_Y=0:weight_Y='1+squish(1-(Y+X)/100)'
```

- Blur:

```
fftfilt=dc_Y=0:weight_Y='exp(-4 * ((Y+X)/(W+H)))'
```

10.56 fftdnoiz# TOC

Denoise frames using 3D FFT (frequency domain filtering).

The filter accepts the following options:

`sigma`

Set the noise sigma constant. This sets denoising strength. Default value is 1. Allowed range is from 0 to 30. Using very high sigma with low overlap may give blocking artifacts.

`amount`

Set amount of denoising. By default all detected noise is reduced. Default value is 1. Allowed range is from 0 to 1.

`block`

Set size of block, Default is 4, can be 3, 4, 5 or 6. Actual size of block in pixels is 2 to power of *block*, so by default block size in pixels is 2^4 which is 16.

`overlap`

Set block overlap. Default is 0.5. Allowed range is from 0.2 to 0.8.

`prev`

Set number of previous frames to use for denoising. By default is set to 0.

`next`

Set number of next frames to use for denoising. By default is set to 0.

`planes`

Set planes which will be filtered, by default are all available filtered except alpha.

10.57 field# TOC

Extract a single field from an interlaced image using stride arithmetic to avoid wasting CPU time. The output frames are marked as non-interlaced.

The filter accepts the following options:

`type`

Specify whether to extract the top (if the value is 0 or `top`) or the bottom field (if the value is 1 or `bottom`).

10.58 fieldhint# TOC

Create new frames by copying the top and bottom fields from surrounding frames supplied as numbers by the hint file.

hint

Set file containing hints: absolute/relative frame numbers.

There must be one line for each frame in a clip. Each line must contain two numbers separated by the comma, optionally followed by `-` or `+`. Numbers supplied on each line of file can not be out of $[N-1, N+1]$ where N is current frame number for `absolute` mode or out of $[-1, 1]$ range for `relative` mode. First number tells from which frame to pick up top field and second number tells from which frame to pick up bottom field.

If optionally followed by `+` output frame will be marked as interlaced, else if followed by `-` output frame will be marked as progressive, else it will be marked same as input frame. If line starts with `#` or `;` that line is skipped.

mode

Can be item `absolute` or `relative`. Default is `absolute`.

Example of first several lines of hint file for `relative` mode:

```
0,0 - # first frame
1,0 - # second frame, use third's frame top field and second's frame bottom field
1,0 - # third frame, use fourth's frame top field and third's frame bottom field
1,0 -
0,0 -
0,0 -
1,0 -
1,0 -
1,0 -
0,0 -
0,0 -
1,0 -
1,0 -
1,0 -
0,0 -
```

10.59 fieldmatch# TOC

Field matching filter for inverse telecine. It is meant to reconstruct the progressive frames from a telecined stream. The filter does not drop duplicated frames, so to achieve a complete inverse telecine `fieldmatch` needs to be followed by a decimation filter such as `decimate` in the filtergraph.

The separation of the field matching and the decimation is notably motivated by the possibility of inserting a de-interlacing filter fallback between the two. If the source has mixed telecined and real interlaced content, `fieldmatch` will not be able to match fields for the interlaced parts. But these remaining

combed frames will be marked as interlaced, and thus can be de-interlaced by a later filter such as `yadif` before decimation.

In addition to the various configuration options, `fieldmatch` can take an optional second stream, activated through the `ppsrc` option. If enabled, the frames reconstruction will be based on the fields and frames from this second stream. This allows the first input to be pre-processed in order to help the various algorithms of the filter, while keeping the output lossless (assuming the fields are matched properly). Typically, a field-aware denoiser, or brightness/contrast adjustments can help.

Note that this filter uses the same algorithms as TIVTC/TFM (AviSynth project) and VIVTC/VFM (VapourSynth project). The later is a light clone of TFM from which `fieldmatch` is based on. While the semantic and usage are very close, some behaviour and options names can differ.

The decimate filter currently only works for constant frame rate input. If your input has mixed telecined (30fps) and progressive content with a lower framerate like 24fps use the following filterchain to produce the necessary cfr stream: `dejudder, fps=30000/1001, fieldmatch, decimate`.

The filter accepts the following options:

`order`

Specify the assumed field order of the input stream. Available values are:

`'auto'`

Auto detect parity (use FFmpeg's internal parity value).

`'bff'`

Assume bottom field first.

`'tff'`

Assume top field first.

Note that it is sometimes recommended not to trust the parity announced by the stream.

Default value is *auto*.

`mode`

Set the matching mode or strategy to use. `pc` mode is the safest in the sense that it won't risk creating jerkiness due to duplicate frames when possible, but if there are bad edits or blended fields it will end up outputting combed frames when a good match might actually exist. On the other hand, `pcn_ub` mode is the most risky in terms of creating jerkiness, but will almost always find a good frame if there is one. The other values are all somewhere in between `pc` and `pcn_ub` in terms of risking jerkiness and creating duplicate frames versus finding good matches in sections with bad edits, orphaned fields, blended fields, etc.

More details about p/c/n/u/b are available in p/c/n/u/b meaning section.

Available values are:

‘pc’

2-way matching (p/c)

‘pc_n’

2-way matching, and trying 3rd match if still combed (p/c + n)

‘pc_u’

2-way matching, and trying 3rd match (same order) if still combed (p/c + u)

‘pc_n_ub’

2-way matching, trying 3rd match if still combed, and trying 4th/5th matches if still combed (p/c + n + u/b)

‘pcn’

3-way matching (p/c/n)

‘pcn_ub’

3-way matching, and trying 4th/5th matches if all 3 of the original matches are detected as combed (p/c/n + u/b)

The parenthesis at the end indicate the matches that would be used for that mode assuming `order=tff` (and `field` on *auto* or *top*).

In terms of speed `pc` mode is by far the fastest and `pcn_ub` is the slowest.

Default value is `pc_n`.

`ppsrc`

Mark the main input stream as a pre-processed input, and enable the secondary input stream as the clean source to pick the fields from. See the filter introduction for more details. It is similar to the `clip2` feature from VFM/TFM.

Default value is 0 (disabled).

`field`

Set the field to match from. It is recommended to set this to the same value as `order` unless you experience matching failures with that setting. In certain circumstances changing the field that is used to match from can have a large impact on matching performance. Available values are:

`'auto'`

Automatic (same value as `order`).

`'bottom'`

Match from the bottom field.

`'top'`

Match from the top field.

Default value is *auto*.

`mchroma`

Set whether or not chroma is included during the match comparisons. In most cases it is recommended to leave this enabled. You should set this to 0 only if your clip has bad chroma problems such as heavy rainbowing or other artifacts. Setting this to 0 could also be used to speed things up at the cost of some accuracy.

Default value is 1.

`y0`

`y1`

These define an exclusion band which excludes the lines between `y0` and `y1` from being included in the field matching decision. An exclusion band can be used to ignore subtitles, a logo, or other things that may interfere with the matching. `y0` sets the starting scan line and `y1` sets the ending line; all lines in between `y0` and `y1` (including `y0` and `y1`) will be ignored. Setting `y0` and `y1` to the same value will disable the feature. `y0` and `y1` defaults to 0.

`scthresh`

Set the scene change detection threshold as a percentage of maximum change on the luma plane. Good values are in the `[8.0, 14.0]` range. Scene change detection is only relevant in case `combatch=sc`. The range for `scthresh` is `[0.0, 100.0]`.

Default value is `12.0`.

`combatch`

When `combatch` is not *none*, `fieldmatch` will take into account the combed scores of matches when deciding what match to use as the final match. Available values are:

`'none'`

No final matching based on combed scores.

‘sc’

Combed scores are only used when a scene change is detected.

‘full’

Use combed scores all the time.

Default is *sc*.

combdbg

Force `fieldmatch` to calculate the combed metrics for certain matches and print them. This setting is known as `micout` in TFM/VFM vocabulary. Available values are:

‘none’

No forced calculation.

‘pcn’

Force p/c/n calculations.

‘pcnub’

Force p/c/n/u/b calculations.

Default value is *none*.

cthresh

This is the area combing threshold used for combed frame detection. This essentially controls how "strong" or "visible" combing must be to be detected. Larger values mean combing must be more visible and smaller values mean combing can be less visible or strong and still be detected. Valid settings are from -1 (every pixel will be detected as combed) to 255 (no pixel will be detected as combed). This is basically a pixel difference value. A good range is $[8, 12]$.

Default value is 9 .

chroma

Sets whether or not chroma is considered in the combed frame decision. Only disable this if your source has chroma problems (rainbowing, etc.) that are causing problems for the combed frame detection with chroma enabled. Actually, using `chroma=0` is usually more reliable, except for the case where there is chroma only combing in the source.

Default value is 0.

`blockx`
`blocky`

Respectively set the x-axis and y-axis size of the window used during combed frame detection. This has to do with the size of the area in which `combpel` pixels are required to be detected as combed for a frame to be declared combed. See the `combpel` parameter description for more info. Possible values are any number that is a power of 2 starting at 4 and going up to 512.

Default value is 16.

`combpel`

The number of combed pixels inside any of the `blocky` by `blockx` size blocks on the frame for the frame to be detected as combed. While `cthresh` controls how "visible" the combing must be, this setting controls "how much" combing there must be in any localized area (a window defined by the `blockx` and `blocky` settings) on the frame. Minimum value is 0 and maximum is `blocky` x `blockx` (at which point no frames will ever be detected as combed). This setting is known as MI in TFM/VFM vocabulary.

Default value is 80.

10.59.1 p/c/n/u/b meaning# TOC

10.59.1.1 p/c/n# TOC

We assume the following telecined stream:

```
Top fields:    1 2 2 3 4
Bottom fields: 1 2 3 4 4
```

The numbers correspond to the progressive frame the fields relate to. Here, the first two frames are progressive, the 3rd and 4th are combed, and so on.

When `fieldmatch` is configured to run a matching from bottom (`field=bottom`) this is how this input stream get transformed:

```
Input stream:
      T    1 2 2 3 4
      B    1 2 3 4 4  <-- matching reference

Matches:           c c n n c

Output stream:
      T    1 2 3 4 4
      B    1 2 3 4 4
```


As a result of the field matching, we can see that some frames get duplicated. To perform a complete inverse telecine, you need to rely on a decimation filter after this operation. See for instance the decimate filter.

The same operation now matching from top fields (`field=top`) looks like this:

```
Input stream:
      T      1 2 2 3 4    <-- matching reference
      B      1 2 3 4 4

Matches:
      c c p p c

Output stream:
      T      1 2 2 3 4
      B      1 2 2 3 4
```

In these examples, we can see what p , c and n mean; basically, they refer to the frame and field of the opposite parity:

- p matches the field of the opposite parity in the previous frame
- c matches the field of the opposite parity in the current frame
- n matches the field of the opposite parity in the next frame

10.59.1.2 u/b# TOC

The u and b matching are a bit special in the sense that they match from the opposite parity flag. In the following examples, we assume that we are currently matching the 2nd frame (Top:2, bottom:2). According to the match, a 'x' is placed above and below each matched fields.

With bottom matching (`field=bottom`):

```
Match:
      c      p      n      b      u

      x      x      x      x      x
Top    1 2 2    1 2 2    1 2 2    1 2 2    1 2 2
Bottom 1 2 3    1 2 3    1 2 3    1 2 3    1 2 3
      x      x      x      x      x

Output frames:
      2      1      2      2      2
      2      2      2      1      3
```

With top matching (`field=top`):

Match:	c	p	n	b	u
	x	x	x	x	x
Top	1 2 2	1 2 2	1 2 2	1 2 2	1 2 2
Bottom	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3
	x	x	x	x	x

Output frames:	2	2	2	1	2
	2	1	3	2	2

10.59.2 Examples# TOC

Simple IVTC of a top field first telecined stream:

```
fieldmatch=order=tff:combmatch=none, decimate
```

Advanced IVTC, with fallback on yadif for still combed frames:

```
fieldmatch=order=tff:combmatch=full, yadif=deint=interlaced, decimate
```

10.60 fieldorder# TOC

Transform the field order of the input video.

It accepts the following parameters:

`order`

The output field order. Valid values are *tff* for top field first or *bff* for bottom field first.

The default value is 'tff'.

The transformation is done by shifting the picture content up or down by one line, and filling the remaining line with appropriate picture content. This method is consistent with most broadcast field order converters.

If the input video is not flagged as being interlaced, or it is already flagged as being of the required output field order, then this filter does not alter the incoming video.

It is very useful when converting to or from PAL DV material, which is bottom field first.

For example:

```
ffmpeg -i in.vob -vf "fieldorder=bff" out.dv
```

10.61 fifo, afifo# TOC

Buffer input images and send them when they are requested.

It is mainly useful when auto-inserted by the libavfilter framework.

It does not take parameters.

10.62 fillborders# TOC

Fill borders of the input video, without changing video stream dimensions. Sometimes video can have garbage at the four edges and you may not want to crop video input to keep size multiple of some number.

This filter accepts the following options:

left

Number of pixels to fill from left border.

right

Number of pixels to fill from right border.

top

Number of pixels to fill from top border.

bottom

Number of pixels to fill from bottom border.

mode

Set fill mode.

It accepts the following values:

‘smear’

fill pixels using outermost pixels

‘mirror’

fill pixels using mirroring

‘fixed’

fill pixels with constant value

Default is *smear*.

color

Set color for pixels in fixed mode. Default is *black*.

10.63 find_rect# TOC

Find a rectangular object

It accepts the following options:

object

Filepath of the object image, needs to be in gray8.

threshold

Detection threshold, default is 0.5.

mipmaps

Number of mipmaps, default is 3.

xmin, ymin, xmax, ymax

Specifies the rectangle in which to search.

10.63.1 Examples# TOC

- Generate a representative palette of a given video using ffmpeg:

```
ffmpeg -i file.ts -vf find_rect=newref.pgm,cover_rect=cover.jpg:mode=cover new.mkv
```

10.64 cover_rect# TOC

Cover a rectangular object

It accepts the following options:

cover

Filepath of the optional cover image, needs to be in yuv420.

mode

Set covering mode.

It accepts the following values:

`'cover'`

cover it by the supplied image

`'blur'`

cover it by interpolating the surrounding pixels

Default value is *blur*.

10.64.1 Examples# TOC

- Generate a representative palette of a given video using `ffmpeg`:

```
ffmpeg -i file.ts -vf find_rect=newref.pgm,cover_rect=cover.jpg:mode=cover new.mkv
```

10.65 floodfill# TOC

Flood area with values of same pixel components with another values.

It accepts the following options:

`x`

Set pixel x coordinate.

`y`

Set pixel y coordinate.

`s0`

Set source #0 component value.

`s1`

Set source #1 component value.

`s2`

Set source #2 component value.

`s3`

Set source #3 component value.

d0

Set destination #0 component value.

d1

Set destination #1 component value.

d2

Set destination #2 component value.

d3

Set destination #3 component value.

10.66 format# TOC

Convert the input video to one of the specified pixel formats. Libavfilter will try to pick one that is suitable as input to the next filter.

It accepts the following parameters:

`pix_fmts`

A '|' -separated list of pixel format names, such as "`pix_fmts=yuv420p|monow|rgb24`".

10.66.1 Examples# TOC

- Convert the input video to the *yuv420p* format

```
format=pix_fmts=yuv420p
```

Convert the input video to any of the formats in the list

```
format=pix_fmts=yuv420p|yuv444p|yuv410p
```

10.67 fps# TOC

Convert the video to specified constant frame rate by duplicating or dropping frames as necessary.

It accepts the following parameters:

`fps`

The desired output frame rate. The default is 25.

`start_time`

Assume the first PTS should be the given value, in seconds. This allows for padding/trimming at the start of stream. By default, no assumption is made about the first frame's expected PTS, so no padding or trimming is done. For example, this could be set to 0 to pad the beginning with duplicates of the first frame if a video stream starts after the audio stream or to trim any frames with a negative PTS.

`round`

Timestamp (PTS) rounding method.

Possible values are:

`zero`

round towards 0

`inf`

round away from 0

`down`

round towards -infinity

`up`

round towards +infinity

`near`

round to nearest

The default is `near`.

`eof_action`

Action performed when reading the last frame.

Possible values are:

`round`

Use same timestamp rounding method as used for other frames.

`pass`

Pass through last frame if input duration has not been reached yet.

The default is `round`.

Alternatively, the options can be specified as a flat string: `fps[:start_time[:round]]`.

See also the `setpts` filter.

10.67.1 Examples# TOC

- A typical usage in order to set the fps to 25:

```
fps=fps=25
```

- Sets the fps to 24, using abbreviation and rounding method to round to nearest:

```
fps=fps=film:round=near
```

10.68 framepack# TOC

Pack two different video streams into a stereoscopic video, setting proper metadata on supported codecs. The two views should have the same size and framerate and processing will stop when the shorter video ends. Please note that you may conveniently adjust view properties with the `scale` and `fps` filters.

It accepts the following parameters:

`format`

The desired packing format. Supported values are:

`sbs`

The views are next to each other (default).

`tab`

The views are on top of each other.

`lines`

The views are packed by line.

`columns`

The views are packed by column.

frameseq

The views are temporally interleaved.

Some examples:

```
# Convert left and right views into a frame-sequential video
ffmpeg -i LEFT -i RIGHT -filter_complex framepack=frameseq OUTPUT

# Convert views into a side-by-side video with the same output resolution as the input
ffmpeg -i LEFT -i RIGHT -filter_complex [0:v]scale=wiw/2[left],[1:v]scale=w=iw/2[right],[left][right]framepack=sbs OUTPUT
```

10.69 framerate# TOC

Change the frame rate by interpolating new video output frames from the source frames.

This filter is not designed to function correctly with interlaced media. If you wish to change the frame rate of interlaced media then you are required to deinterlace before this filter and re-interlace after this filter.

A description of the accepted options follows.

fps

Specify the output frames per second. This option can also be specified as a value alone. The default is 50.

interp_start

Specify the start of a range where the output frame will be created as a linear interpolation of two frames. The range is [0-255], the default is 15.

interp_end

Specify the end of a range where the output frame will be created as a linear interpolation of two frames. The range is [0-255], the default is 240.

scene

Specify the level at which a scene change is detected as a value between 0 and 100 to indicate a new scene; a low value reflects a low probability for the current frame to introduce a new scene, while a higher value means the current frame is more likely to be one. The default is 8.2.

flags

Specify flags influencing the filter process.

Available value for *flags* is:

scene_change_detect, scd

Enable scene change detection using the value of the option *scene*. This flag is enabled by default.

10.70 framestep# TOC

Select one frame every N-th frame.

This filter accepts the following option:

`step`

Select frame after every `step` frames. Allowed values are positive integers higher than 0. Default value is 1.

10.71 frei0r# TOC

Apply a frei0r effect to the input video.

To enable the compilation of this filter, you need to install the frei0r header and configure FFmpeg with `--enable-frei0r`.

It accepts the following parameters:

`filter_name`

The name of the frei0r effect to load. If the environment variable `FREI0R_PATH` is defined, the frei0r effect is searched for in each of the directories specified by the colon-separated list in `FREI0R_PATH`. Otherwise, the standard frei0r paths are searched, in this order:
`HOME/.frei0r-1/lib/, /usr/local/lib/frei0r-1/, /usr/lib/frei0r-1/.`

`filter_params`

A `'|'`-separated list of parameters to pass to the frei0r effect.

A frei0r effect parameter can be a boolean (its value is either "y" or "n"), a double, a color (specified as *R/G/B*, where *R*, *G*, and *B* are floating point numbers between 0.0 and 1.0, inclusive) or a color description as specified in the (ffmpeg-utils)"Color" section in the ffmpeg-utils manual, a position (specified as *X/Y*, where *X* and *Y* are floating point numbers) and/or a string.

The number and types of parameters depend on the loaded effect. If an effect parameter is not specified, the default value is set.

10.71.1 Examples# TOC

- Apply the distort0r effect, setting the first two double parameters:

```
frei0r=filter_name=distort0r:filter_params=0.5|0.01
```

- Apply the colordistance effect, taking a color as the first parameter:

```
frei0r=colordistance:0.2/0.3/0.4
frei0r=colordistance:violet
frei0r=colordistance:0x112233
```

- Apply the perspective effect, specifying the top left and top right image positions:

```
frei0r=perspective:0.2/0.2|0.8/0.2
```

For more information, see <http://frei0r.dyne.org>

10.72 fspp# TOC

Apply fast and simple postprocessing. It is a faster version of spp.

It splits (I)DCT into horizontal/vertical passes. Unlike the simple post- processing filter, one of them is performed once per block, not per pixel. This allows for much higher speed.

The filter accepts the following options:

quality

Set quality. This option defines the number of levels for averaging. It accepts an integer in the range 4-5. Default value is 4.

qp

Force a constant quantization parameter. It accepts an integer in range 0-63. If not set, the filter will use the QP from the video stream (if available).

strength

Set filter strength. It accepts an integer in range -15 to 32. Lower values mean more details but also more artifacts, while higher values make the image smoother but also blurrier. Default value is 0 â PSNR optimal.

use_bframe_qp

Enable the use of the QP from the B-Frames if set to 1. Using this option may cause flicker since the B-Frames have often larger QP. Default is 0 (not enabled).

10.73 gblur# TOC

Apply Gaussian blur filter.

The filter accepts the following options:

`sigma`

Set horizontal sigma, standard deviation of Gaussian blur. Default is 0.5.

`steps`

Set number of steps for Gaussian approximation. Defaults is 1.

`planes`

Set which planes to filter. By default all planes are filtered.

`sigmaV`

Set vertical sigma, if negative it will be same as `sigma`. Default is -1.

10.74 geq# TOC

The filter accepts the following options:

`lum_expr, lum`

Set the luminance expression.

`cb_expr, cb`

Set the chrominance blue expression.

`cr_expr, cr`

Set the chrominance red expression.

`alpha_expr, a`

Set the alpha expression.

`red_expr, r`

Set the red expression.

`green_expr, g`

Set the green expression.

`blue_expr, b`

Set the blue expression.

The colorspace is selected according to the specified options. If one of the `lum_expr`, `cb_expr`, or `cr_expr` options is specified, the filter will automatically select a YCbCr colorspace. If one of the `red_expr`, `green_expr`, or `blue_expr` options is specified, it will select an RGB colorspace.

If one of the chrominance expression is not defined, it falls back on the other one. If no alpha expression is specified it will evaluate to opaque value. If none of chrominance expressions are specified, they will evaluate to the luminance expression.

The expressions can use the following variables and functions:

`N`

The sequential number of the filtered frame, starting from 0.

`X`

`Y`

The coordinates of the current sample.

`W`

`H`

The width and height of the image.

`SW`

`SH`

Width and height scale depending on the currently filtered plane. It is the ratio between the corresponding luma plane number of pixels and the current plane ones. E.g. for YUV4:2:0 the values are 1, 1 for the luma plane, and 0.5, 0.5 for chroma planes.

`T`

Time of the current frame, expressed in seconds.

`p(x, y)`

Return the value of the pixel at location (x,y) of the current plane.

`lum(x, y)`

Return the value of the pixel at location (x,y) of the luminance plane.

`cb(x, y)`

Return the value of the pixel at location (x,y) of the blue-difference chroma plane. Return 0 if there is no such plane.

`cr(x, y)`

Return the value of the pixel at location (x,y) of the red-difference chroma plane. Return 0 if there is no such plane.

`r(x, y)`

`g(x, y)`

`b(x, y)`

Return the value of the pixel at location (x,y) of the red/green/blue component. Return 0 if there is no such component.

`alpha(x, y)`

Return the value of the pixel at location (x,y) of the alpha plane. Return 0 if there is no such plane.

For functions, if x and y are outside the area, the value will be automatically clipped to the closer edge.

10.74.1 Examples# TOC

- Flip the image horizontally:

```
geq=p(W-X\,Y)
```

- Generate a bidimensional sine wave, with angle $\text{PI}/3$ and a wavelength of 100 pixels:

```
geq=128 + 100*sin(2*(PI/100)*(cos(PI/3)*(X-50*T) + sin(PI/3)*Y)):128:128
```

- Generate a fancy enigmatic moving light:

```
nullsrc=s=256x256,geq=random(1)/hypot(X-cos(N*0.07)*W/2-W/2\,Y-sin(N*0.09)*H/2-H/2)^2*1000000*sin(N*0.02):128:128
```

- Generate a quick emboss effect:

```
format=gray,geq=lum_expr='(p(X,Y)+(256-p(X-4,Y-4)))/2'
```

- Modify RGB components depending on pixel position:

```
geq=r='X/W*r(X,Y)':g='(1-X/W)*g(X,Y)':b='(H-Y)/H*b(X,Y)'
```

- Create a radial gradient that is the same size as the input (also see the vignette filter):

```
geq=lum=255*gauss((X/W-0.5)*3)*gauss((Y/H-0.5)*3)/gauss(0)/gauss(0),format=gray
```

10.75 gradfun# TOC

Fix the banding artifacts that are sometimes introduced into nearly flat regions by truncation to 8-bit color depth. Interpolate the gradients that should go where the bands are, and dither them.

It is designed for playback only. Do not use it prior to lossy compression, because compression tends to lose the dither and bring back the bands.

It accepts the following parameters:

`strength`

The maximum amount by which the filter will change any one pixel. This is also the threshold for detecting nearly flat regions. Acceptable values range from .51 to 64; the default value is 1.2. Out-of-range values will be clipped to the valid range.

`radius`

The neighborhood to fit the gradient to. A larger radius makes for smoother gradients, but also prevents the filter from modifying the pixels near detailed regions. Acceptable values are 8-32; the default value is 16. Out-of-range values will be clipped to the valid range.

Alternatively, the options can be specified as a flat string: *strength[:radius]*

10.75.1 Examples# TOC

- Apply the filter with a 3.5 strength and radius of 8:

```
gradfun=3.5:8
```

- Specify radius, omitting the strength (which will fall-back to the default value):

```
gradfun=radius=8
```

10.76 haldclut# TOC

Apply a Hald CLUT to a video stream.

First input is the video stream to process, and second one is the Hald CLUT. The Hald CLUT input can be a simple picture or a complete video stream.

The filter accepts the following options:

`shortest`

Force termination when the shortest input terminates. Default is 0.

repeatlast

Continue applying the last CLUT after the end of the stream. A value of 0 disable the filter after the last frame of the CLUT is reached. Default is 1.

haldclut also has the same interpolation options as lut3d (both filters share the same internals).

More information about the Hald CLUT can be found on Eskil Steenberg's website (Hald CLUT author) at <http://www.quelsolaar.com/technology/clut.html>.

10.76.1 Workflow examples# TOC

10.76.1.1 Hald CLUT video stream# TOC

Generate an identity Hald CLUT stream altered with various effects:

```
ffmpeg -f lavfi -i haldclutsrc=8 -vf "hue=H=2*PI*t:s=sin(2*PI*t)+1, curves=cross_process" -t 10 -c:v ffv1 clut.nut
```

Note: make sure you use a lossless codec.

Then use it with haldclut to apply it on some random stream:

```
ffmpeg -f lavfi -i mandelbrot -i clut.nut -filter_complex '[0][1] haldclut' -t 20 mandelclut.mkv
```

The Hald CLUT will be applied to the 10 first seconds (duration of `clut.nut`), then the latest picture of that CLUT stream will be applied to the remaining frames of the mandelbrot stream.

10.76.1.2 Hald CLUT with preview# TOC

A Hald CLUT is supposed to be a squared image of `Level*Level*Level` by `Level*Level*Level` pixels. For a given Hald CLUT, FFmpeg will select the biggest possible square starting at the top left of the picture. The remaining padding pixels (bottom or right) will be ignored. This area can be used to add a preview of the Hald CLUT.

Typically, the following generated Hald CLUT will be supported by the haldclut filter:

```
ffmpeg -f lavfi -i haldclutsrc=8 -vf "
    pad=iw+320 [padded_clut];
    smptebars=s=320x256, split [a][b];
    [padded_clut][a] overlay=W-320:h, curves=color_negative [main];
    [main][b] overlay=W-320" -frames:v 1 clut.png
```

It contains the original and a preview of the effect of the CLUT: SMPTE color bars are displayed on the right-top, and below the same color bars processed by the color changes.

Then, the effect of this Hald CLUT can be visualized with:

```
ffplay input.mkv -vf "movie=clut.png, [in] haldclut"
```


10.77 hflip# TOC

Flip the input video horizontally.

For example, to horizontally flip the input video with `ffmpeg`:

```
ffmpeg -i in.avi -vf "hflip" out.avi
```

10.78 hsteq# TOC

This filter applies a global color histogram equalization on a per-frame basis.

It can be used to correct video that has a compressed range of pixel intensities. The filter redistributes the pixel intensities to equalize their distribution across the intensity range. It may be viewed as an "automatically adjusting contrast filter". This filter is useful only for correcting degraded or poorly captured source video.

The filter accepts the following options:

`strength`

Determine the amount of equalization to be applied. As the strength is reduced, the distribution of pixel intensities more-and-more approaches that of the input frame. The value must be a float number in the range [0,1] and defaults to 0.200.

`intensity`

Set the maximum intensity that can generated and scale the output values appropriately. The strength should be set as desired and then the intensity can be limited if needed to avoid washing-out. The value must be a float number in the range [0,1] and defaults to 0.210.

`antibanding`

Set the antibanding level. If enabled the filter will randomly vary the luminance of output pixels by a small amount to avoid banding of the histogram. Possible values are `none`, `weak` or `strong`. It defaults to `none`.

10.79 histogram# TOC

Compute and draw a color distribution histogram for the input video.

The computed histogram is a representation of the color component distribution in an image.

Standard histogram displays the color components distribution in an image. Displays color graph for each color component. Shows distribution of the Y, U, V, A or R, G, B components, depending on input format, in the current frame. Below each graph a color component scale meter is shown.

The filter accepts the following options:

`level_height`

Set height of level. Default value is 200. Allowed range is [50, 2048].

`scale_height`

Set height of color scale. Default value is 12. Allowed range is [0, 40].

`display_mode`

Set display mode. It accepts the following values:

`'stack'`

Per color component graphs are placed below each other.

`'parade'`

Per color component graphs are placed side by side.

`'overlay'`

Presents information identical to that in the `parade`, except that the graphs representing color components are superimposed directly over one another.

Default is `stack`.

`levels_mode`

Set mode. Can be either `linear`, or `logarithmic`. Default is `linear`.

`components`

Set what color components to display. Default is 7.

`fgopacity`

Set foreground opacity. Default is 0.7.

`bgopacity`

Set background opacity. Default is 0.5.

10.79.1 Examples# TOC

- Calculate and draw histogram:

```
ffplay -i input -vf histogram
```

10.80 hqdn3d# TOC

This is a high precision/quality 3d denoise filter. It aims to reduce image noise, producing smooth images and making still images really still. It should enhance compressibility.

It accepts the following optional parameters:

`luma_spatial`

A non-negative floating point number which specifies spatial luma strength. It defaults to 4.0.

`chroma_spatial`

A non-negative floating point number which specifies spatial chroma strength. It defaults to $3.0 * \text{luma_spatial} / 4.0$.

`luma_tmp`

A floating point number which specifies luma temporal strength. It defaults to $6.0 * \text{luma_spatial} / 4.0$.

`chroma_tmp`

A floating point number which specifies chroma temporal strength. It defaults to $\text{luma_tmp} * \text{chroma_spatial} / \text{luma_spatial}$.

10.81 hwdownload# TOC

Download hardware frames to system memory.

The input must be in hardware frames, and the output a non-hardware format. Not all formats will be supported on the output - it may be necessary to insert an additional `format` filter immediately following in the graph to get the output in a supported format.

10.82 hwmap# TOC

Map hardware frames to system memory or to another device.

This filter has several different modes of operation; which one is used depends on the input and output formats:

- Hardware frame input, normal frame output

Map the input frames to system memory and pass them to the output. If the original hardware frame is later required (for example, after overlaying something else on part of it), the `hwmap` filter can be used again in the next mode to retrieve it.

- Normal frame input, hardware frame output

If the input is actually a software-mapped hardware frame, then unmap it - that is, return the original hardware frame.

Otherwise, a device must be provided. Create new hardware surfaces on that device for the output, then map them back to the software format at the input and give those frames to the preceding filter. This will then act like the `hwupload` filter, but may be able to avoid an additional copy when the input is already in a compatible format.

- Hardware frame input and output

A device must be supplied for the output, either directly or with the `derive_device` option. The input and output devices must be of different types and compatible - the exact meaning of this is system-dependent, but typically it means that they must refer to the same underlying hardware context (for example, refer to the same graphics card).

If the input frames were originally created on the output device, then unmap to retrieve the original frames.

Otherwise, map the frames to the output device - create new hardware frames on the output corresponding to the frames on the input.

The following additional parameters are accepted:

`mode`

Set the frame mapping mode. Some combination of:

read

The mapped frame should be readable.

write

The mapped frame should be writeable.

overwrite

The mapping will always overwrite the entire frame.

This may improve performance in some cases, as the original contents of the frame need not be loaded.

direct

The mapping must not involve any copying.

Indirect mappings to copies of frames are created in some cases where either direct mapping is not possible or it would have unexpected properties. Setting this flag ensures that the mapping is direct and will fail if that is not possible.

Defaults to *read+write* if not specified.

`derive_device type`

Rather than using the device supplied at initialisation, instead derive a new device of type *type* from the device the input frames exist on.

`reverse`

In a hardware to hardware mapping, map in reverse - create frames in the sink and map them back to the source. This may be necessary in some cases where a mapping in one direction is required but only the opposite direction is supported by the devices being used.

This option is dangerous - it may break the preceding filter in undefined ways if there are any additional constraints on that filter's output. Do not use it without fully understanding the implications of its use.

10.83 hwupload# TOC

Upload system memory frames to hardware surfaces.

The device to upload to must be supplied when the filter is initialised. If using ffmpeg, select the appropriate device with the `-filter_hw_device` option.

10.84 hwupload_cuda# TOC

Upload system memory frames to a CUDA device.

It accepts the following optional parameters:

`device`

The number of the CUDA device to use

10.85 hqx# TOC

Apply a high-quality magnification filter designed for pixel art. This filter was originally created by Maxim Stepin.

It accepts the following option:

`n`

Set the scaling dimension: 2 for hq2x, 3 for hq3x and 4 for hq4x. Default is 3.

10.86 hstack# TOC

Stack input videos horizontally.

All streams must be of same pixel format and of same height.

Note that this filter is faster than using overlay and pad filter to create same output.

The filter accept the following option:

`inputs`

Set number of input streams. Default is 2.

`shortest`

If set to 1, force the output to terminate when the shortest input terminates. Default value is 0.

10.87 hue# TOC

Modify the hue and/or the saturation of the input.

It accepts the following parameters:

`h`

Specify the hue angle as a number of degrees. It accepts an expression, and defaults to "0".

`s`

Specify the saturation in the [-10,10] range. It accepts an expression and defaults to "1".

`H`

Specify the hue angle as a number of radians. It accepts an expression, and defaults to "0".

b

Specify the brightness in the [-10,10] range. It accepts an expression and defaults to "0".

h and H are mutually exclusive, and can't be specified at the same time.

The b, h, H and s option values are expressions containing the following constants:

n

frame count of the input frame starting from 0

pts

presentation timestamp of the input frame expressed in time base units

r

frame rate of the input video, NAN if the input frame rate is unknown

t

timestamp expressed in seconds, NAN if the input timestamp is unknown

tb

time base of the input video

10.87.1 Examples# TOC

- Set the hue to 90 degrees and the saturation to 1.0:

```
hue=h=90:s=1
```

- Same command but expressing the hue in radians:

```
hue=H=PI/2:s=1
```

- Rotate hue and make the saturation swing between 0 and 2 over a period of 1 second:

```
hue="H=2*PI*t: s=sin(2*PI*t)+1"
```

- Apply a 3 seconds saturation fade-in effect starting at 0:

```
hue="s=min(t/3,1)"
```

The general fade-in expression can be written as:

```
hue="s=min(0, max((t-START)/DURATION, 1))"
```

- Apply a 3 seconds saturation fade-out effect starting at 5 seconds:

```
hue="s=max(0\, min(1\, (8-t)/3))"
```

The general fade-out expression can be written as:

```
hue="s=max(0\, min(1\, (START+DURATION-t)/DURATION))"
```

10.87.2 Commands# TOC

This filter supports the following commands:

b
s
h
H

Modify the hue and/or the saturation and/or brightness of the input video. The command accepts the same syntax of the corresponding option.

If the specified expression is not valid, it is kept at its current value.

10.88 hysteresis# TOC

Grow first stream into second stream by connecting components. This makes it possible to build more robust edge masks.

This filter accepts the following options:

planes

Set which planes will be processed as bitmap, unprocessed planes will be copied from first stream. By default value 0xf, all planes will be processed.

threshold

Set threshold which is used in filtering. If pixel component value is higher than this value filter algorithm for connecting components is activated. By default value is 0.

10.89 idet# TOC

Detect video interlacing type.

This filter tries to detect if the input frames are interlaced, progressive, top or bottom field first. It will also try to detect fields that are repeated between adjacent frames (a sign of telecine).

Single frame detection considers only immediately adjacent frames when classifying each frame. Multiple frame detection incorporates the classification history of previous frames.

The filter will log these metadata values:

`single.current_frame`

Detected type of current frame using single-frame detection. One of: “tff” (top field first), “bff” (bottom field first), “progressive”, or “undetermined”

`single.tff`

Cumulative number of frames detected as top field first using single-frame detection.

`multiple.tff`

Cumulative number of frames detected as top field first using multiple-frame detection.

`single.bff`

Cumulative number of frames detected as bottom field first using single-frame detection.

`multiple.current_frame`

Detected type of current frame using multiple-frame detection. One of: “tff” (top field first), “bff” (bottom field first), “progressive”, or “undetermined”

`multiple.bff`

Cumulative number of frames detected as bottom field first using multiple-frame detection.

`single.progressive`

Cumulative number of frames detected as progressive using single-frame detection.

`multiple.progressive`

Cumulative number of frames detected as progressive using multiple-frame detection.

`single.undetermined`

Cumulative number of frames that could not be classified using single-frame detection.

`multiple.undetermined`

Cumulative number of frames that could not be classified using multiple-frame detection.

`repeated.current_frame`

Which field in the current frame is repeated from the last. One of “neither”, “top”, or “bottom”.

`repeated.neither`

Cumulative number of frames with no repeated field.

`repeated.top`

Cumulative number of frames with the top field repeated from the previous frame's top field.

`repeated.bottom`

Cumulative number of frames with the bottom field repeated from the previous frame's bottom field.

The filter accepts the following options:

`intl_thres`

Set interlacing threshold.

`prog_thres`

Set progressive threshold.

`rep_thres`

Threshold for repeated field detection.

`half_life`

Number of frames after which a given frame's contribution to the statistics is halved (i.e., it contributes only 0.5 to its classification). The default of 0 means that all frames seen are given full weight of 1.0 forever.

`analyze_interlaced_flag`

When this is not 0 then idet will use the specified number of frames to determine if the interlaced flag is accurate, it will not count undetermined frames. If the flag is found to be accurate it will be used without any further computations, if it is found to be inaccurate it will be cleared without any further computations. This allows inserting the idet filter as a low computational method to clean up the interlaced flag

10.90 il# TOC

Deinterleave or interleave fields.

This filter allows one to process interlaced images fields without deinterlacing them. Deinterleaving splits the input frame into 2 fields (so called half pictures). Odd lines are moved to the top half of the output image, even lines to the bottom half. You can process (filter) them independently and then re-interleave them.

The filter accepts the following options:

```
luma_mode, l  
chroma_mode, c  
alpha_mode, a
```

Available values for *luma_mode*, *chroma_mode* and *alpha_mode* are:

‘none’

Do nothing.

‘deinterleave, d’

Deinterleave fields, placing one above the other.

‘interleave, i’

Interleave fields. Reverse the effect of deinterleaving.

Default value is none.

```
luma_swap, ls  
chroma_swap, cs  
alpha_swap, as
```

Swap luma/chroma/alpha fields. Exchange even & odd lines. Default value is 0.

10.91 inflate# TOC

Apply inflate effect to the video.

This filter replaces the pixel by the local(3x3) average by taking into account only values higher than the pixel.

It accepts the following options:

```
threshold0  
threshold1  
threshold2  
threshold3
```

Limit the maximum change for each plane, default is 65535. If 0, plane will remain unchanged.

10.92 interlace# TOC

Simple interlacing filter from progressive contents. This interleaves upper (or lower) lines from odd frames with lower (or upper) lines from even frames, halving the frame rate and preserving image height.

Original Frame 'j'	Original Frame 'j+1'	New Frame (tff)
=====	=====	=====
Line 0 ----->		Frame 'j' Line 0
Line 1	Line 1 ---->	Frame 'j+1' Line 1
Line 2 ----->		Frame 'j' Line 2
Line 3	Line 3 ---->	Frame 'j+1' Line 3
...

New Frame + 1 will be generated by Frame 'j+2' and Frame 'j+3' and so on

It accepts the following optional parameters:

scan

This determines whether the interlaced frame is taken from the even (tff - default) or odd (bff) lines of the progressive frame.

lowpass

Vertical lowpass filter to avoid twitter interlacing and reduce moire patterns.

'0, off'

Disable vertical lowpass filter

'1, linear'

Enable linear filter (default)

'2, complex'

Enable complex filter. This will slightly less reduce twitter and moire but better retain detail and subjective sharpness impression.

10.93 kerndeint# TOC

Deinterlace input video by applying Donald Graft's adaptive kernel deinterling. Work on interlaced parts of a video to produce progressive frames.

The description of the accepted parameters follows.

thresh

Set the threshold which affects the filter's tolerance when determining if a pixel line must be processed. It must be an integer in the range [0,255] and defaults to 10. A value of 0 will result in applying the process on every pixels.

map

Paint pixels exceeding the threshold value to white if set to 1. Default is 0.

order

Set the fields order. Swap fields if set to 1, leave fields alone if 0. Default is 0.

sharp

Enable additional sharpening if set to 1. Default is 0.

twoway

Enable twoway sharpening if set to 1. Default is 0.

10.93.1 Examples# TOC

- Apply default values:

```
kerndeint=thresh=10:map=0:order=0:sharp=0:twoway=0
```

- Enable additional sharpening:

```
kerndeint=sharp=1
```

- Paint processed pixels in white:

```
kerndeint=map=1
```

10.94 lenscorrection# TOC

Correct radial lens distortion

This filter can be used to correct for radial distortion as can result from the use of wide angle lenses, and thereby re-rectify the image. To find the right parameters one can use tools available for example as part of opencv or simply trial-and-error. To use opencv use the calibration sample (under samples/cpp) from the opencv sources and extract the k1 and k2 coefficients from the resulting matrix.

Note that effectively the same filter is available in the open-source tools Krita and Digikam from the KDE project.

In contrast to the vignette filter, which can also be used to compensate lens errors, this filter corrects the distortion of the image, whereas vignette corrects the brightness distribution, so you may want to use both filters together in certain cases, though you will have to take care of ordering, i.e. whether vignetting should be applied before or after lens correction.

10.94.1 Options# TOC

The filter accepts the following options:

`cx`

Relative x-coordinate of the focal point of the image, and thereby the center of the distortion. This value has a range [0,1] and is expressed as fractions of the image width. Default is 0.5.

`cy`

Relative y-coordinate of the focal point of the image, and thereby the center of the distortion. This value has a range [0,1] and is expressed as fractions of the image height. Default is 0.5.

`k1`

Coefficient of the quadratic correction term. This value has a range [-1,1]. 0 means no correction. Default is 0.

`k2`

Coefficient of the double quadratic correction term. This value has a range [-1,1]. 0 means no correction. Default is 0.

The formula that generates the correction is:

$$r_src = r_tgt * (1 + k1 * (r_tgt / r_0)^2 + k2 * (r_tgt / r_0)^4)$$

where r_0 is halve of the image diagonal and r_src and r_tgt are the distances from the focal point in the source and target images, respectively.

10.95 libvmaf# TOC

Obtain the VMAF (Video Multi-Method Assessment Fusion) score between two input videos.

The obtained VMAF score is printed through the logging system.

It requires Netflix's vmaf library (libvmaf) as a pre-requisite. After installing the library it can be enabled using: `./configure --enable-libvmaf`. If no model path is specified it uses the default model: `vmaf_v0.6.1.pkl`.

The filter has following options:

`model_path`

Set the model path which is to be used for SVM. Default value: `"vmaf_v0.6.1.pkl"`

`log_path`

Set the file path to be used to store logs.

`log_fmt`

Set the format of the log file (xml or json).

`enable_transform`

Enables transform for computing vmaf.

`phone_model`

Invokes the phone model which will generate VMAF scores higher than in the regular model, which is more suitable for laptop, TV, etc. viewing conditions.

`psnr`

Enables computing psnr along with vmaf.

`ssim`

Enables computing ssim along with vmaf.

`ms_ssim`

Enables computing ms_ssim along with vmaf.

`pool`

Set the pool method (mean, min or harmonic mean) to be used for computing vmaf.

This filter also supports the framesync options.

On the below examples the input file `main.mpg` being processed is compared with the reference file `ref.mpg`.

```
ffmpeg -i main.mpg -i ref.mpg -lavfi libvmaf -f null -
```

Example with options:

```
ffmpeg -i main.mpg -i ref.mpg -lavfi libvmaf="psnr=1:enable-transform=1" -f null -
```

10.96 limiter# TOC

Limits the pixel components values to the specified range [min, max].

The filter accepts the following options:

`min`

Lower bound. Defaults to the lowest allowed value for the input.

`max`

Upper bound. Defaults to the highest allowed value for the input.

`planes`

Specify which planes will be processed. Defaults to all available.

10.97 `loop#` TOC

Loop video frames.

The filter accepts the following options:

`loop`

Set the number of loops. Setting this value to -1 will result in infinite loops. Default is 0.

`size`

Set maximal size in number of frames. Default is 0.

`start`

Set first frame of loop. Default is 0.

10.98 `lut3d#` TOC

Apply a 3D LUT to an input video.

The filter accepts the following options:

`file`

Set the 3D LUT file name.

Currently supported formats:

`'3dl'`

AfterEffects

`'cube'`

Iridas

`'dat'`

DaVinci

`'m3d'`

Pandora

`interp`

Select interpolation mode.

Available values are:

`'nearest'`

Use values from the nearest defined point.

`'trilinear'`

Interpolate values using the 8 points defining a cube.

`'tetrahedral'`

Interpolate values using a tetrahedron.

This filter also supports the framesync options.

10.99 lumakey# TOC

Turn certain luma values into transparency.

The filter accepts the following options:

`threshold`

Set the luma which will be used as base for transparency. Default value is 0.

`tolerance`

Set the range of luma values to be keyed out. Default value is 0.

`softness`

Set the range of softness. Default value is 0. Use this to control gradual transition from zero to full transparency.

10.100 lut, lutrgb, lutyuv# TOC

Compute a look-up table for binding each pixel component input value to an output value, and apply it to the input video.

lutyuv applies a lookup table to a YUV input video, *lutrgb* to an RGB input video.

These filters accept the following parameters:

c0

set first pixel component expression

c1

set second pixel component expression

c2

set third pixel component expression

c3

set fourth pixel component expression, corresponds to the alpha component

r

set red component expression

g

set green component expression

b

set blue component expression

a

alpha component expression

y

set Y/luminance component expression

u

set U/Cb component expression

v

set V/Cr component expression

Each of them specifies the expression to use for computing the lookup table for the corresponding pixel component values.

The exact component associated to each of the *c** options depends on the format in input.

The *lut* filter requires either YUV or RGB pixel formats in input, *lutrgb* requires RGB pixel formats in input, and *lutyuv* requires YUV.

The expressions can contain the following constants and functions:

w

h

The input width and height.

val

The input value for the pixel component.

clipval

The input value, clipped to the *minval-maxval* range.

maxval

The maximum value for the pixel component.

minval

The minimum value for the pixel component.

negval

The negated value for the pixel component value, clipped to the *minval-maxval* range; it corresponds to the expression "maxval-clipval+minval".

clip(val)

The computed value in *val*, clipped to the *minval-maxval* range.

`gamma_val (gamma)`

The computed gamma correction value of the pixel component value, clipped to the *minval-maxval* range. It corresponds to the expression

`"pow((clipval-minval)/(maxval-minval)\,gamma)*(maxval-minval)+minval"`

All expressions default to "val".

10.100.1 Examples# TOC

- Negate input video:

```
lutrgb="r=maxval+minval-val:g=maxval+minval-val:b=maxval+minval-val"
lutyuv="y=maxval+minval-val:u=maxval+minval-val:v=maxval+minval-val"
```

The above is the same as:

```
lutrgb="r=negval:g=negval:b=negval"
lutyuv="y=negval:u=negval:v=negval"
```

- Negate luminance:

```
lutyuv=y=negval
```

- Remove chroma components, turning the video into a graytone image:

```
lutyuv="u=128:v=128"
```

- Apply a luma burning effect:

```
lutyuv="y=2*val"
```

- Remove green and blue components:

```
lutrgb="g=0:b=0"
```

- Set a constant alpha channel value on input:

```
format=rgba,lutrgb=a="maxval-minval/2"
```

- Correct luminance gamma by a factor of 0.5:

```
lutyuv=y=gammaval(0.5)
```

- Discard least significant bits of luma:

```
lutyuv=y='bitand(val, 128+64+32)'
```

- Technicolor like effect:

```
lutyuv=u='(val-maxval/2)*2+maxval/2':v='(val-maxval/2)*2+maxval/2'
```

10.101 lut2, tlut2# TOC

The `lut2` filter takes two input streams and outputs one stream.

The `tlut2` (time lut2) filter takes two consecutive frames from one single stream.

This filter accepts the following parameters:

`c0`

set first pixel component expression

`c1`

set second pixel component expression

`c2`

set third pixel component expression

`c3`

set fourth pixel component expression, corresponds to the alpha component

Each of them specifies the expression to use for computing the lookup table for the corresponding pixel component values.

The exact component associated to each of the `c*` options depends on the format in inputs.

The expressions can contain the following constants:

`w`

`h`

The input width and height.

`x`

The first input value for the pixel component.

`y`

The second input value for the pixel component.

`bdx`

The first input video bit depth.

bdy

The second input video bit depth.

All expressions default to "x".

10.101.1 Examples# TOC

- Highlight differences between two RGB video streams:

```
lut2='ifnot (x-y, 0, pow(2, bdx)-1):ifnot (x-y, 0, pow(2, bdx)-1):ifnot (x-y, 0, pow(2, bdx)-1)'
```

- Highlight differences between two YUV video streams:

```
lut2='ifnot (x-y, 0, pow(2, bdx)-1):ifnot (x-y, pow(2, bdx-1), pow(2, bdx)-1):ifnot (x-y, pow(2, bdx-1), pow(2, bdx)-1)'
```

- Show max difference between two video streams:

```
lut2='if (lt(x,y), 0, if(gt(x,y), pow(2, bdx)-1, pow(2, bdx-1))):if (lt(x,y), 0, if(gt(x,y), pow(2, bdx)-1, pow(2, bdx-1))):if (lt(x,y), 0, if(gt(x,y), pow(2, bdx)-1, pow(2, bdx-1)))'
```

10.102 maskedclamp# TOC

Clamp the first input stream with the second input and third input stream.

Returns the value of first stream to be between second input stream - undershoot and third input stream + overshoot.

This filter accepts the following options:

undershoot

Default value is 0.

overshoot

Default value is 0.

planes

Set which planes will be processed as bitmap, unprocessed planes will be copied from first stream.
By default value 0xf, all planes will be processed.

10.103 maskedmerge# TOC

Merge the first input stream with the second input stream using per pixel weights in the third input stream.

A value of 0 in the third stream pixel component means that pixel component from first stream is returned unchanged, while maximum value (eg. 255 for 8-bit videos) means that pixel component from second stream is returned unchanged. Intermediate values define the amount of merging between both input stream's pixel components.

This filter accepts the following options:

`planes`

Set which planes will be processed as bitmap, unprocessed planes will be copied from first stream.
By default value 0xf, all planes will be processed.

10.104 mcdeint# TOC

Apply motion-compensation deinterlacing.

It needs one field per frame as input and must thus be used together with `yadif=1/3` or equivalent.

This filter accepts the following options:

`mode`

Set the deinterlacing mode.

It accepts one of the following values:

`'fast'`

`'medium'`

`'slow'`

use iterative motion estimation

`'extra_slow'`

like `'slow'`, but use multiple reference frames.

Default value is `'fast'`.

`parity`

Set the picture field parity assumed for the input video. It must be one of the following values:

`'0, tff'`

assume top field first

`'1, bff'`

assume bottom field first

Default value is `'bff'`.

`qp`

Set per-block quantization parameter (QP) used by the internal encoder.

Higher values should result in a smoother motion vector field but less optimal individual vectors.
Default value is 1.

10.105 mergeplanes# TOC

Merge color channel components from several video streams.

The filter accepts up to 4 input streams, and merge selected input planes to the output video.

This filter accepts the following options:

mapping

Set input to output plane mapping. Default is 0.

The mappings is specified as a bitmap. It should be specified as a hexadecimal number in the form 0xAa[Bb[Cc[Dd]]]. 'Aa' describes the mapping for the first plane of the output stream. 'A' sets the number of the input stream to use (from 0 to 3), and 'a' the plane number of the corresponding input to use (from 0 to 3). The rest of the mappings is similar, 'Bb' describes the mapping for the output stream second plane, 'Cc' describes the mapping for the output stream third plane and 'Dd' describes the mapping for the output stream fourth plane.

format

Set output pixel format. Default is yuva444p.

10.105.1 Examples# TOC

- Merge three gray video streams of same width and height into single video stream:

```
[a0][a1][a2]mergeplanes=0x001020:yuv444p
```

- Merge 1st yuv444p stream and 2nd gray video stream into yuva444p video stream:

```
[a0][a1]mergeplanes=0x00010210:yuva444p
```

- Swap Y and A plane in yuva444p stream:

```
format=yuva444p,mergeplanes=0x03010200:yuva444p
```

- Swap U and V plane in yuv420p stream:

```
format=yuv420p,mergeplanes=0x000201:yuv420p
```

- Cast a rgb24 clip to yuv444p:


```
format=rgb24,mergeplanes=0x000102:yuv444p
```

10.106 mestimate# TOC

Estimate and export motion vectors using block matching algorithms. Motion vectors are stored in frame side data to be used by other filters.

This filter accepts the following options:

`method`

Specify the motion estimation method. Accepts one of the following values:

`'esa'`

Exhaustive search algorithm.

`'tss'`

Three step search algorithm.

`'tdls'`

Two dimensional logarithmic search algorithm.

`'ntss'`

New three step search algorithm.

`'fss'`

Four step search algorithm.

`'ds'`

Diamond search algorithm.

`'hexbs'`

Hexagon-based search algorithm.

`'epzs'`

Enhanced predictive zonal search algorithm.

`'umh'`

Uneven multi-hexagon search algorithm.

Default value is 'esa'.

`mb_size`

Macroblock size. Default 16.

`search_param`

Search parameter. Default 7.

10.107 midequalizer# TOC

Apply Midway Image Equalization effect using two video streams.

Midway Image Equalization adjusts a pair of images to have the same histogram, while maintaining their dynamics as much as possible. It's useful for e.g. matching exposures from a pair of stereo cameras.

This filter has two inputs and one output, which must be of same pixel format, but may be of different sizes. The output of filter is first input adjusted with midway histogram of both inputs.

This filter accepts the following option:

`planes`

Set which planes to process. Default is 15, which is all available planes.

10.108 minterpolate# TOC

Convert the video to specified frame rate using motion interpolation.

This filter accepts the following options:

`fps`

Specify the output frame rate. This can be rational e.g. 60000/1001. Frames are dropped if *fps* is lower than source fps. Default 60.

`mi_mode`

Motion interpolation mode. Following values are accepted:

'dup'

Duplicate previous or next frame for interpolating new ones.

'blend'

Blend source frames. Interpolated frame is mean of previous and next frames.

`'mci'`

Motion compensated interpolation. Following options are effective when this mode is selected:

`'mc_mode'`

Motion compensation mode. Following values are accepted:

`'obmc'`

Overlapped block motion compensation.

`'aobmc'`

Adaptive overlapped block motion compensation. Window weighting coefficients are controlled adaptively according to the reliabilities of the neighboring motion vectors to reduce oversmoothing.

Default mode is `'obmc'`.

`'me_mode'`

Motion estimation mode. Following values are accepted:

`'bidir'`

Bidirectional motion estimation. Motion vectors are estimated for each source frame in both forward and backward directions.

`'bilat'`

Bilateral motion estimation. Motion vectors are estimated directly for interpolated frame.

Default mode is `'bilat'`.

`'me'`

The algorithm to be used for motion estimation. Following values are accepted:

`'esa'`

Exhaustive search algorithm.

`'tss'`

Three step search algorithm.

`'tdls'`

Two dimensional logarithmic search algorithm.

`'ntss'`

New three step search algorithm.

`'fss'`

Four step search algorithm.

`'ds'`

Diamond search algorithm.

`'hexbs'`

Hexagon-based search algorithm.

`'epzs'`

Enhanced predictive zonal search algorithm.

`'umh'`

Uneven multi-hexagon search algorithm.

Default algorithm is `'epzs'`.

`'mb_size'`

Macroblock size. Default 16.

`'search_param'`

Motion estimation search parameter. Default 32.

`'vsbmc'`

Enable variable-size block motion compensation. Motion estimation is applied with smaller block sizes at object boundaries in order to make the them less blur. Default is 0 (disabled).

`scd`

Scene change detection method. Scene change leads motion vectors to be in random direction. Scene change detection replace interpolated frames by duplicate ones. May not be needed for other modes. Following values are accepted:

`'none'`

Disable scene change detection.

`'fdiff'`

Frame difference. Corresponding pixel values are compared and if it satisfies *scd_threshold* scene change is detected.

Default method is `'fdiff'`.

`scd_threshold`

Scene change detection threshold. Default is 5.0.

10.109 mix# TOC

Mix several video input streams into one video stream.

A description of the accepted options follows.

`nb_inputs`

The number of inputs. If unspecified, it defaults to 2.

`weights`

Specify weight of each input video stream as sequence. Each weight is separated by space. If number of weights is smaller than number of *frames* last specified weight will be used for all remaining unset weights.

`scale`

Specify scale, if it is set it will be multiplied with sum of each weight multiplied with pixel values to give final destination pixel value. By default *scale* is auto scaled to sum of weights.

`duration`

Specify how end of stream is determined.

`'longest'`

The duration of the longest input. (default)

`'shortest'`

The duration of the shortest input.

`'first'`

The duration of the first input.

10.110 `mpdecimate`# TOC

Drop frames that do not differ greatly from the previous frame in order to reduce frame rate.

The main use of this filter is for very-low-bitrate encoding (e.g. streaming over dialup modem), but it could in theory be used for fixing movies that were inverse-telecined incorrectly.

A description of the accepted options follows.

`max`

Set the maximum number of consecutive frames which can be dropped (if positive), or the minimum interval between dropped frames (if negative). If the value is 0, the frame is dropped disregarding the number of previous sequentially dropped frames.

Default value is 0.

`hi`

`lo`

`frac`

Set the dropping threshold values.

Values for `hi` and `lo` are for 8x8 pixel blocks and represent actual pixel value differences, so a threshold of 64 corresponds to 1 unit of difference for each pixel, or the same spread out differently over the block.

A frame is a candidate for dropping if no 8x8 blocks differ by more than a threshold of `hi`, and if no more than `frac` blocks (1 meaning the whole image) differ by more than a threshold of `lo`.

Default value for `hi` is 64*12, default value for `lo` is 64*5, and default value for `frac` is 0.33.

10.111 `negate`# TOC

Negate input video.

It accepts an integer in input; if non-zero it negates the alpha component (if available). The default value in input is 0.

10.112 `nlmeans`# TOC

Denoise frames using Non-Local Means algorithm.

Each pixel is adjusted by looking for other pixels with similar contexts. This context similarity is defined by comparing their surrounding patches of size $p \times p$. Patches are searched in an area of $r \times r$ around the pixel.

Note that the research area defines centers for patches, which means some patches will be made of pixels outside that research area.

The filter accepts the following options.

`s`

Set denoising strength.

`p`

Set patch size.

`pc`

Same as `p` but for chroma planes.

The default value is *0* and means automatic.

`r`

Set research size.

`rc`

Same as `r` but for chroma planes.

The default value is *0* and means automatic.

10.113 `nnedi`# TOC

Deinterlace video using neural network edge directed interpolation.

This filter accepts the following options:

`weights`

Mandatory option, without binary file filter can not work. Currently file can be found here:
https://github.com/dubhater/vapoursynth-nnedi3/blob/master/src/nnedi3_weights.bin

`deint`

Set which frames to deinterlace, by default it is `all`. Can be `all` or `interlaced`.

field

Set mode of operation.

Can be one of the following:

‘af’

Use frame flags, both fields.

‘a’

Use frame flags, single field.

‘t’

Use top field only.

‘b’

Use bottom field only.

‘tf’

Use both fields, top first.

‘bf’

Use both fields, bottom first.

planes

Set which planes to process, by default filter process all frames.

nsize

Set size of local neighborhood around each pixel, used by the predictor neural network.

Can be one of the following:

‘s8x6’

‘s16x6’

‘s32x6’

‘s48x6’

‘s8x4’

‘s16x4’

‘s32x4’

nns

Set the number of neurons in predictor neural network. Can be one of the following:

'n16'
'n32'
'n64'
'n128'
'n256'

qual

Controls the number of different neural network predictions that are blended together to compute the final output value. Can be `fast`, `default` or `slow`.

etype

Set which set of weights to use in the predictor. Can be one of the following:

'a'

weights trained to minimize absolute error

's'

weights trained to minimize squared error

pscrn

Controls whether or not the prescreener neural network is used to decide which pixels should be processed by the predictor neural network and which can be handled by simple cubic interpolation. The prescreener is trained to know whether cubic interpolation will be sufficient for a pixel or whether it should be predicted by the predictor nn. The computational complexity of the prescreener nn is much less than that of the predictor nn. Since most pixels can be handled by cubic interpolation, using the prescreener generally results in much faster processing. The prescreener is pretty accurate, so the difference between using it and not using it is almost always unnoticeable.

Can be one of the following:

'none'
'original'
'new'

Default is `new`.

fapprox

Set various debugging flags.

10.114 noformat# TOC

Force libavfilter not to use any of the specified pixel formats for the input to the next filter.

It accepts the following parameters:

`pix_fmts`

A `'|'`-separated list of pixel format names, such as `pix_fmts=yuv420p|monow|rgb24`.

10.114.1 Examples# TOC

- Force libavfilter to use a format different from *yuv420p* for the input to the *vflip* filter:

```
noformat=pix_fmts=yuv420p,vflip
```

- Convert the input video to any of the formats not contained in the list:

```
noformat=yuv420p|yuv444p|yuv410p
```

10.115 noise# TOC

Add noise on video input frame.

The filter accepts the following options:

`all_seed`

`c0_seed`

`c1_seed`

`c2_seed`

`c3_seed`

Set noise seed for specific pixel component or all pixel components in case of *all_seed*. Default value is 123457.

`all_strength, alls`

`c0_strength, c0s`

`c1_strength, c1s`

`c2_strength, c2s`

`c3_strength, c3s`

Set noise strength for specific pixel component or all pixel components in case *all_strength*. Default value is 0. Allowed range is [0, 100].

`all_flags, allf`

`c0_flags, c0f`

`c1_flags, c1f`

```
c2_flags, c2f  
c3_flags, c3f
```

Set pixel component flags or set flags for all components if *all_flags*. Available values for component flags are:

‘a’

averaged temporal noise (smoother)

‘p’

mix random noise with a (semi)regular pattern

‘t’

temporal noise (noise pattern changes between frames)

‘u’

uniform noise (gaussian otherwise)

10.115.1 Examples# TOC

Add temporal and uniform noise to input video:

```
noise=allf=20:allf=t+u
```

10.116 normalize# TOC

Normalize RGB video (aka histogram stretching, contrast stretching). See:
[https://en.wikipedia.org/wiki/Normalization_\(image_processing\)](https://en.wikipedia.org/wiki/Normalization_(image_processing))

For each channel of each frame, the filter computes the input range and maps it linearly to the user-specified output range. The output range defaults to the full dynamic range from pure black to pure white.

Temporal smoothing can be used on the input range to reduce flickering (rapid changes in brightness) caused when small dark or bright objects enter or leave the scene. This is similar to the auto-exposure (automatic gain control) on a video camera, and, like a video camera, it may cause a period of over- or under-exposure of the video.

The R,G,B channels can be normalized independently, which may cause some color shifting, or linked together as a single channel, which prevents color shifting. Linked normalization preserves hue. Independent normalization does not, so it can be used to remove some color casts. Independent and linked normalization can be combined in any ratio.

The normalize filter accepts the following options:

`blackpt`
`whitept`

Colors which define the output range. The minimum input value is mapped to the *blackpt*. The maximum input value is mapped to the *whitept*. The defaults are black and white respectively. Specifying white for *blackpt* and black for *whitept* will give color-inverted, normalized video. Shades of grey can be used to reduce the dynamic range (contrast). Specifying saturated colors here can create some interesting effects.

`smoothing`

The number of previous frames to use for temporal smoothing. The input range of each channel is smoothed using a rolling average over the current frame and the *smoothing* previous frames. The default is 0 (no temporal smoothing).

`independence`

Controls the ratio of independent (color shifting) channel normalization to linked (color preserving) normalization. 0.0 is fully linked, 1.0 is fully independent. Defaults to 1.0 (fully independent).

`strength`

Overall strength of the filter. 1.0 is full strength. 0.0 is a rather expensive no-op. Defaults to 1.0 (full strength).

10.116.1 Examples# TOC

Stretch video contrast to use the full dynamic range, with no temporal smoothing; may flicker depending on the source content:

```
normalize=blackpt=black:whitept=white:smoothing=0
```

As above, but with 50 frames of temporal smoothing; flicker should be reduced, depending on the source content:

```
normalize=blackpt=black:whitept=white:smoothing=50
```

As above, but with hue-preserving linked channel normalization:

```
normalize=blackpt=black:whitept=white:smoothing=50:independence=0
```

As above, but with half strength:

```
normalize=blackpt=black:whitept=white:smoothing=50:independence=0:strength=0.5
```

Map the darkest input color to red, the brightest input color to cyan:

`normalize=blackpt=red:whitept=cyan`

10.117 null# TOC

Pass the video source unchanged to the output.

10.118 ocr# TOC

Optical Character Recognition

This filter uses Tesseract for optical character recognition. To enable compilation of this filter, you need to configure FFmpeg with `--enable-libtesseract`.

It accepts the following options:

`datapath`

Set datapath to tesseract data. Default is to use whatever was set at installation.

`language`

Set language, default is "eng".

`whitelist`

Set character whitelist.

`blacklist`

Set character blacklist.

The filter exports recognized text as the frame metadata `lavfi.ocr.text`.

10.119 ocv# TOC

Apply a video transform using libopencv.

To enable this filter, install the libopencv library and headers and configure FFmpeg with `--enable-libopencv`.

It accepts the following parameters:

`filter_name`

The name of the libopencv filter to apply.

`filter_params`

The parameters to pass to the libopencv filter. If not specified, the default values are assumed.

Refer to the official libopencv documentation for more precise information:

<http://docs.opencv.org/master/modules/imgproc/doc/filtering.html>

Several libopencv filters are supported; see the following subsections.

10.119.1 dilate# TOC

Dilate an image by using a specific structuring element. It corresponds to the libopencv function `cvDilate`.

It accepts the parameters: *struct_el*|*nb_iterations*.

struct_el represents a structuring element, and has the syntax: *cols**x**rows*+*anchor_xx**anchor_y*/*shape*

cols and *rows* represent the number of columns and rows of the structuring element, *anchor_x* and *anchor_y* the anchor point, and *shape* the shape for the structuring element. *shape* must be "rect", "cross", "ellipse", or "custom".

If the value for *shape* is "custom", it must be followed by a string of the form "=*filename*". The file with name *filename* is assumed to represent a binary image, with each printable character corresponding to a bright pixel. When a custom *shape* is used, *cols* and *rows* are ignored, the number of columns and rows of the read file are assumed instead.

The default value for *struct_el* is "3x3+0x0/rect".

nb_iterations specifies the number of times the transform is applied to the image, and defaults to 1.

Some examples:

```
# Use the default values
ocv=dilate

# Dilate using a structuring element with a 5x5 cross, iterating two times
ocv=filter_name=dilate:filter_params=5x5+2x2/cross|2

# Read the shape from the file diamond.shape, iterating two times.
# The file diamond.shape may contain a pattern of characters like this
#   *
#  ***
# *****
#   ***
#    *
# The specified columns and rows are ignored
# but the anchor point coordinates are not
ocv=dilate:0x0+2x2/custom=diamond.shape|2
```

10.119.2 erode# TOC

Erode an image by using a specific structuring element. It corresponds to the libopencv function `cvErode`.

It accepts the parameters: *struct_el:nb_iterations*, with the same syntax and semantics as the dilate filter.

10.119.3 smooth# TOC

Smooth the input video.

The filter takes the following parameters: *type|param1|param2|param3|param4*.

type is the type of smooth filter to apply, and must be one of the following values: "blur", "blur_no_scale", "median", "gaussian", or "bilateral". The default value is "gaussian".

The meaning of *param1*, *param2*, *param3*, and *param4* depend on the smooth type. *param1* and *param2* accept integer positive values or 0. *param3* and *param4* accept floating point values.

The default value for *param1* is 3. The default value for the other parameters is 0.

These parameters correspond to the parameters assigned to the libopencv function `cvSmooth`.

10.120 oscilloscope# TOC

2D Video Oscilloscope.

Useful to measure spatial impulse, step responses, chroma delays, etc.

It accepts the following parameters:

x

Set scope center x position.

y

Set scope center y position.

s

Set scope size, relative to frame diagonal.

t

Set scope tilt/rotation.

o

Set trace opacity.

tx

Set trace center x position.

ty

Set trace center y position.

tw

Set trace width, relative to width of frame.

th

Set trace height, relative to height of frame.

c

Set which components to trace. By default it traces first three components.

g

Draw trace grid. By default is enabled.

st

Draw some statistics. By default is enabled.

sc

Draw scope. By default is enabled.

10.120.1 Examples# TOC

- Inspect full first row of video frame.

```
oscilloscope=x=0.5:y=0:s=1
```

- Inspect full last row of video frame.

```
oscilloscope=x=0.5:y=1:s=1
```

- Inspect full 5th line of video frame of height 1080.

```
oscilloscope=x=0.5:y=5/1080:s=1
```

- Inspect full last column of video frame.

`oscilloscope=x=1:y=0.5:s=1:t=1`

10.121 overlay# TOC

Overlay one video on top of another.

It takes two inputs and has one output. The first input is the "main" video on which the second input is overlaid.

It accepts the following parameters:

A description of the accepted options follows.

`x`

`y`

Set the expression for the x and y coordinates of the overlaid video on the main video. Default value is "0" for both expressions. In case the expression is invalid, it is set to a huge value (meaning that the overlay will not be displayed within the output visible area).

`eof_action`

See framesync.

`eval`

Set when the expressions for x, and y are evaluated.

It accepts the following values:

`'init'`

only evaluate expressions once during the filter initialization or when a command is processed

`'frame'`

evaluate expressions for each incoming frame

Default value is `'frame'`.

`shortest`

See framesync.

`format`

Set the format for the output video.

It accepts the following values:

`'yuv420'`

force YUV420 output

`'yuv422'`

force YUV422 output

`'yuv444'`

force YUV444 output

`'rgb'`

force packed RGB output

`'gbrp'`

force planar RGB output

`'auto'`

automatically pick format

Default value is `'yuv420'`.

`repeatlast`

See `framesync`.

`alpha`

Set format of alpha of the overlaid video, it can be *straight* or *premultiplied*. Default is *straight*.

The `x`, and `y` expressions can contain the following parameters.

`main_w, W`

`main_h, H`

The main input width and height.

`overlay_w, w`

`overlay_h, h`

The overlay input width and height.

x
 y

The computed values for x and y . They are evaluated for each new frame.

$hsub$
 $vsub$

horizontal and vertical chroma subsample values of the output format. For example for the pixel format "yuv422p" $hsub$ is 2 and $vsub$ is 1.

n

the number of input frame, starting from 0

pos

the position in the file of the input frame, NAN if unknown

t

The timestamp, expressed in seconds. It's NAN if the input timestamp is unknown.

This filter also supports the framesync options.

Note that the n , pos , t variables are available only when evaluation is done *per frame*, and will evaluate to NAN when `eval` is set to 'init'.

Be aware that frames are taken from each input video in timestamp order, hence, if their initial timestamps differ, it is a good idea to pass the two inputs through a `setpts=PTS-STARTPTS` filter to have them begin in the same zero timestamp, as the example for the *movie* filter does.

You can chain together more overlays but you should test the efficiency of such approach.

10.121.1 Commands# TOC

This filter supports the following commands:

x
 y

Modify the x and y of the overlay input. The command accepts the same syntax of the corresponding option.

If the specified expression is not valid, it is kept at its current value.

10.121.2 Examples# TOC

- Draw the overlay at 10 pixels from the bottom right corner of the main video:

```
overlay=main_w-overlay_w-10:main_h-overlay_h-10
```

Using named options the example above becomes:

```
overlay=x=main_w-overlay_w-10:y=main_h-overlay_h-10
```

- Insert a transparent PNG logo in the bottom left corner of the input, using the `ffmpeg` tool with the `-filter_complex` option:

```
ffmpeg -i input -i logo -filter_complex 'overlay=10:main_h-overlay_h-10' output
```

- Insert 2 different transparent PNG logos (second logo on bottom right corner) using the `ffmpeg` tool:

```
ffmpeg -i input -i logo1 -i logo2 -filter_complex 'overlay=x=10:y=H-h-10,overlay=x=W-w-10:y=H-h-10' output
```

- Add a transparent color layer on top of the main video; `WxH` must specify the size of the main input to the overlay filter:

```
color=color=red@.3:size=WxH [over]; [in][over] overlay [out]
```

- Play an original video and a filtered version (here with the `deshake` filter) side by side using the `ffplay` tool:

```
ffplay input.avi -vf 'split[a][b]; [a]pad=iw*2:ih[src]; [b]deshake[filt]; [src][filt]overlay=w'
```

The above command is the same as:

```
ffplay input.avi -vf 'split[b], pad=iw*2[src], [b]deshake, [src]overlay=w'
```

- Make a sliding overlay appearing from the left to the right top part of the screen starting since time 2:

```
overlay=x='if(gte(t,2), -w+(t-2)*20, NAN)':y=0
```

- Compose output by putting two input videos side to side:

```
ffmpeg -i left.avi -i right.avi -filter_complex "
nullsrc=size=200x100 [background];
[0:v] setpts=PTS-STARTPTS, scale=100x100 [left];
[1:v] setpts=PTS-STARTPTS, scale=100x100 [right];
[background][left] overlay=shortest=1 [background+left];
[background+left][right] overlay=shortest=1:x=100 [left+right]
"
```

- Mask 10-20 seconds of a video by applying the `delogo` filter to a section

```
ffmpeg -i test.avi -codec:v:0 h264 -ar 11025 -b:v 9000k
-vf '[in]split[split_main][split_delogo]; [split_delogo]trim=start=360:end=371,delogo=0:0:640:480[delogoed]; [split_main][delogoed]overlay=eof_action=pass[out]'
```

masked.avi

- Chain several overlays in cascade:

```

nullsrc=s=200x200 [bg];
testsrc=s=100x100, split=4 [in0][in1][in2][in3];
[in0] lutrgb=r=0, [bg] overlay=0:0 [mid0];
[in1] lutrgb=g=0, [mid0] overlay=100:0 [mid1];
[in2] lutrgb=b=0, [mid1] overlay=0:100 [mid2];
[in3] null, [mid2] overlay=100:100 [out0]

```

10.122 owdenoise# TOC

Apply Overcomplete Wavelet denoiser.

The filter accepts the following options:

depth

Set depth.

Larger depth values will denoise lower frequency components more, but slow down filtering.

Must be an int in the range 8-16, default is 8.

luma_strength, ls

Set luma strength.

Must be a double value in the range 0-1000, default is 1.0.

chroma_strength, cs

Set chroma strength.

Must be a double value in the range 0-1000, default is 1.0.

10.123 pad# TOC

Add paddings to the input image, and place the original input at the provided x, y coordinates.

It accepts the following parameters:

width, w

height, h

Specify an expression for the size of the output image with the paddings added. If the value for *width* or *height* is 0, the corresponding input size is used for the output.

The *width* expression can reference the value set by the *height* expression, and vice versa.

The default value of *width* and *height* is 0.

x
y

Specify the offsets to place the input image at within the padded area, with respect to the top/left border of the output image.

The *x* expression can reference the value set by the *y* expression, and vice versa.

The default value of *x* and *y* is 0.

If *x* or *y* evaluate to a negative number, they'll be changed so the input image is centered on the padded area.

color

Specify the color of the padded area. For the syntax of this option, check the (ffmpeg-utils)"Color" section in the ffmpeg-utils manual.

The default value of *color* is "black".

eval

Specify when to evaluate *width*, *height*, *x* and *y* expression.

It accepts the following values:

`'init'`

Only evaluate expressions once during the filter initialization or when a command is processed.

`'frame'`

Evaluate expressions for each incoming frame.

Default value is `'init'`.

aspect

Pad to aspect instead to a resolution.

The value for the *width*, *height*, *x*, and *y* options are expressions containing the following constants:

in_w
in_h

The input video width and height.

iw

`ih`

These are the same as *in_w* and *in_h*.

`out_w`

`out_h`

The output width and height (the size of the padded area), as specified by the *width* and *height* expressions.

`ow`

`oh`

These are the same as *out_w* and *out_h*.

`x`

`y`

The x and y offsets as specified by the *x* and *y* expressions, or NAN if not yet specified.

`a`

same as *iw / ih*

`sar`

input sample aspect ratio

`dar`

input display aspect ratio, it is the same as $(iw / ih) * sar$

`hsub`

`vsub`

The horizontal and vertical chroma subsample values. For example for the pixel format "yuv422p" *hsub* is 2 and *vsub* is 1.

10.123.1 Examples# TOC

- Add paddings with the color "violet" to the input video. The output video size is 640x480, and the top-left corner of the input video is placed at column 0, row 40

```
pad=640:480:0:40:violet
```

The example above is equivalent to the following command:

```
pad=width=640:height=480:x=0:y=40:color=violet
```

- Pad the input to get an output with dimensions increased by 3/2, and put the input video at the center

of the padded area:

```
pad="3/2*iw:3/2*ih:(ow-iw)/2:(oh-ih)/2"
```

- Pad the input to get a squared output with size equal to the maximum value between the input width and height, and put the input video at the center of the padded area:

```
pad="max(iw\,ih):ow:(ow-iw)/2:(oh-ih)/2"
```

- Pad the input to get a final w/h ratio of 16:9:

```
pad="ih*16/9:ih:(ow-iw)/2:(oh-ih)/2"
```

- In case of anamorphic video, in order to set the output display aspect correctly, it is necessary to use *sar* in the expression, according to the relation:

```
(ih * X / ih) * sar = output_dar  
X = output_dar / sar
```

Thus the previous example needs to be modified to:

```
pad="ih*16/9/sar:ih:(ow-iw)/2:(oh-ih)/2"
```

- Double the output size and put the input video in the bottom-right corner of the output padded area:

```
pad="2*iw:2*ih:ow-iw:oh-ih"
```

10.124 palettegen# TOC

Generate one palette for a whole video stream.

It accepts the following options:

`max_colors`

Set the maximum number of colors to quantize in the palette. Note: the palette will still contain 256 colors; the unused palette entries will be black.

`reserve_transparent`

Create a palette of 255 colors maximum and reserve the last one for transparency. Reserving the transparency color is useful for GIF optimization. If not set, the maximum of colors in the palette will be 256. You probably want to disable this option for a standalone image. Set by default.

`transparency_color`

Set the color that will be used as background for transparency.

`stats_mode`

Set statistics mode.

It accepts the following values:

`'full'`

Compute full frame histograms.

`'diff'`

Compute histograms only for the part that differs from previous frame. This might be relevant to give more importance to the moving part of your input if the background is static.

`'single'`

Compute new histogram for each frame.

Default value is *full*.

The filter also exports the frame metadata `lavfi.color_quant_ratio(nb_color_in / nb_color_out)` which you can use to evaluate the degree of color quantization of the palette. This information is also visible at *info* logging level.

10.124.1 Examples# TOC

- Generate a representative palette of a given video using `ffmpeg`:

```
ffmpeg -i input.mkv -vf palettegen palette.png
```

10.125 paletteuse# TOC

Use a palette to downsample an input video stream.

The filter takes two inputs: one video stream and a palette. The palette must be a 256 pixels image.

It accepts the following options:

`dither`

Select dithering mode. Available algorithms are:

`'bayer'`

Ordered 8x8 bayer dithering (deterministic)

`'heckbert'`

Dithering as defined by Paul Heckbert in 1982 (simple error diffusion). Note: this dithering is sometimes considered "wrong" and is included as a reference.

`'floyd_steinberg'`

Floyd and Steingberg dithering (error diffusion)

`'sierra2'`

Frankie Sierra dithering v2 (error diffusion)

`'sierra2_4a'`

Frankie Sierra dithering v2 "Lite" (error diffusion)

Default is *sierra2_4a*.

`bayer_scale`

When *bayer* dithering is selected, this option defines the scale of the pattern (how much the crosshatch pattern is visible). A low value means more visible pattern for less banding, and higher value means less visible pattern at the cost of more banding.

The option must be an integer value in the range [0,5]. Default is 2.

`diff_mode`

If set, define the zone to process

`'rectangle'`

Only the changing rectangle will be reprocessed. This is similar to GIF cropping/offsetting compression mechanism. This option can be useful for speed if only a part of the image is changing, and has use cases such as limiting the scope of the error diffusal *dither* to the rectangle that bounds the moving scene (it leads to more deterministic output if the scene doesn't change much, and as a result less moving noise and better GIF compression).

Default is *none*.

`new`

Take new palette for each output frame.

`alpha_threshold`

Sets the alpha threshold for transparency. Alpha values above this threshold will be treated as completely opaque, and values below this threshold will be treated as completely transparent.

The option must be an integer value in the range [0,255]. Default is *128*.

10.125.1 Examples# TOC

- Use a palette (generated for example with `palettegen`) to encode a GIF using `ffmpeg`:

```
ffmpeg -i input.mkv -i palette.png -lavfi paletteuse output.gif
```

10.126 perspective# TOC

Correct perspective of video not recorded perpendicular to the screen.

A description of the accepted parameters follows.

x0
y0
x1
y1
x2
y2
x3
y3

Set coordinates expression for top left, top right, bottom left and bottom right corners. Default values are `0:0:W:0:0:H:W:H` with which perspective will remain unchanged. If the `sense` option is set to `source`, then the specified points will be sent to the corners of the destination. If the `sense` option is set to `destination`, then the corners of the source will be sent to the specified coordinates.

The expressions can use the following variables:

W
H

the width and height of video frame.

in

Input frame count.

on

Output frame count.

interpolation

Set interpolation for perspective correction.

It accepts the following values:

`'linear'`
`'cubic'`

Default value is `'linear'`.

sense

Set interpretation of coordinate options.

It accepts the following values:

`'0, source'`

Send point in the source specified by the given coordinates to the corners of the destination.

`'1, destination'`

Send the corners of the source to the point in the destination specified by the given coordinates.

Default value is `'source'`.

eval

Set when the expressions for coordinates $x_0, y_0, \dots, x_3, y_3$ are evaluated.

It accepts the following values:

`'init'`

only evaluate expressions once during the filter initialization or when a command is processed

`'frame'`

evaluate expressions for each incoming frame

Default value is `'init'`.

10.127 phase# TOC

Delay interlaced video by one field time so that the field order changes.

The intended use is to fix PAL movies that have been captured with the opposite field order to the film-to-video transfer.

A description of the accepted parameters follows.

mode

Set phase mode.

It accepts the following values:

‘t’

Capture field order top-first, transfer bottom-first. Filter will delay the bottom field.

‘b’

Capture field order bottom-first, transfer top-first. Filter will delay the top field.

‘p’

Capture and transfer with the same field order. This mode only exists for the documentation of the other options to refer to, but if you actually select it, the filter will faithfully do nothing.

‘a’

Capture field order determined automatically by field flags, transfer opposite. Filter selects among ‘t’ and ‘b’ modes on a frame by frame basis using field flags. If no field information is available, then this works just like ‘u’.

‘u’

Capture unknown or varying, transfer opposite. Filter selects among ‘t’ and ‘b’ on a frame by frame basis by analyzing the images and selecting the alternative that produces best match between the fields.

‘T’

Capture top-first, transfer unknown or varying. Filter selects among ‘t’ and ‘p’ using image analysis.

‘B’

Capture bottom-first, transfer unknown or varying. Filter selects among ‘b’ and ‘p’ using image analysis.

‘A’

Capture determined by field flags, transfer unknown or varying. Filter selects among ‘t’, ‘b’ and ‘p’ using field flags and image analysis. If no field information is available, then this works just like ‘U’. This is the default mode.

‘U’

Both capture and transfer unknown or varying. Filter selects among ‘t’, ‘b’ and ‘p’ using image analysis only.

10.128 pixdesctest# TOC

Pixel format descriptor test filter, mainly useful for internal testing. The output video should be equal to the input video.

For example:

```
format=monow, pixdesctest
```

can be used to test the monowhite pixel format descriptor definition.

10.129 pixscope# TOC

Display sample values of color channels. Mainly useful for checking color and levels. Minimum supported resolution is 640x480.

The filters accept the following options:

x

Set scope X position, relative offset on X axis.

y

Set scope Y position, relative offset on Y axis.

w

Set scope width.

h

Set scope height.

o

Set window opacity. This window also holds statistics about pixel area.

wx

Set window X position, relative offset on X axis.

wy

Set window Y position, relative offset on Y axis.

10.130 pp# TOC

Enable the specified chain of postprocessing subfilters using libpostproc. This library should be automatically selected with a GPL build (`--enable-gpl`). Subfilters must be separated by '/' and can be disabled by prepending a '-'. Each subfilter and some options have a short and a long name that can be used interchangeably, i.e. `dr/dering` are the same.

The filters accept the following options:

`subfilters`

Set postprocessing subfilters string.

All subfilters share common options to determine their scope:

`a/autoq`

Honor the quality commands for this subfilter.

`c/chrom`

Do chrominance filtering, too (default).

`y/nochrom`

Do luminance filtering only (no chrominance).

`n/noluma`

Do chrominance filtering only (no luminance).

These options can be appended after the subfilter name, separated by a '|'.

Available subfilters are:

`hb/hdeblock[|difference[|flatness]]`

Horizontal deblocking filter

`difference`

Difference factor where higher values mean more deblocking (default: 32).

`flatness`

Flatness threshold where lower values mean more deblocking (default: 39).

`vb/vdeblock[|difference[|flatness]]`

Vertical deblocking filter

`difference`

Difference factor where higher values mean more deblocking (default: 32).

`flatness`

Flatness threshold where lower values mean more deblocking (default: 39).

`ha/hadeblock[|difference[|flatness]]`

Accurate horizontal deblocking filter

`difference`

Difference factor where higher values mean more deblocking (default: 32).

`flatness`

Flatness threshold where lower values mean more deblocking (default: 39).

`va/vadeblock[|difference[|flatness]]`

Accurate vertical deblocking filter

`difference`

Difference factor where higher values mean more deblocking (default: 32).

`flatness`

Flatness threshold where lower values mean more deblocking (default: 39).

The horizontal and vertical deblocking filters share the difference and flatness values so you cannot set different horizontal and vertical thresholds.

`h1/x1hdeblock`

Experimental horizontal deblocking filter

`v1/x1vdeblock`

Experimental vertical deblocking filter

dr/dering

Deringing filter

tn/tmpnoise[|threshold1[|threshold2[|threshold3]]], temporal noise reducer

threshold1

larger -> stronger filtering

threshold2

larger -> stronger filtering

threshold3

larger -> stronger filtering

al/autolevels[:f/fullyrange], automatic brightness / contrast correction

f/fullyrange

Stretch luminance to 0-255.

lb/linblenddeint

Linear blend deinterlacing filter that deinterlaces the given block by filtering all lines with a (1 2 1) filter.

li/linipoldeint

Linear interpolating deinterlacing filter that deinterlaces the given block by linearly interpolating every second line.

ci/cubicipoldeint

Cubic interpolating deinterlacing filter deinterlaces the given block by cubically interpolating every second line.

md/mediandeint

Median deinterlacing filter that deinterlaces the given block by applying a median filter to every second line.

fd/ffmpegdeint

FFmpeg deinterlacing filter that deinterlaces the given block by filtering every second line with a (-1 4 2 4 -1) filter.

l5/lowpass5

Vertically applied FIR lowpass deinterlacing filter that deinterlaces the given block by filtering all lines with a $(-1 \ 2 \ 6 \ 2 \ -1)$ filter.

fq/forceQuant[|quantizer]

Overrides the quantizer table from the input with the constant quantizer you specify.

quantizer

Quantizer to use

de/default

Default pp filter combination (hb|a,vb|a,dr|a)

fa/fast

Fast pp filter combination (h1|a,v1|a,dr|a)

ac

High quality pp filter combination (ha|a|128|7,va|a,dr|a)

10.130.1 Examples# TOC

- Apply horizontal and vertical deblocking, deringing and automatic brightness/contrast:

pp=hb/vb/dr/al

- Apply default filters without brightness/contrast correction:

pp=de/-al

- Apply default filters and temporal denoiser:

pp=default/tmpnoise|1|2|3

- Apply deblocking on luminance only, and switch vertical deblocking on or off automatically depending on available CPU time:

pp=hb|y/vb|a

10.131 pp7# TOC

Apply Postprocessing filter 7. It is variant of the spp filter, similar to spp = 6 with 7 point DCT, where only the center sample is used after IDCT.

The filter accepts the following options:

`qp`

Force a constant quantization parameter. It accepts an integer in range 0 to 63. If not set, the filter will use the QP from the video stream (if available).

`mode`

Set thresholding mode. Available modes are:

`'hard'`

Set hard thresholding.

`'soft'`

Set soft thresholding (better de-ringing effect, but likely blurrier).

`'medium'`

Set medium thresholding (good results, default).

10.132 `premultiply`# TOC

Apply alpha premultiply effect to input video stream using first plane of second stream as alpha.

Both streams must have same dimensions and same pixel format.

The filter accepts the following option:

`planes`

Set which planes will be processed, unprocessed planes will be copied. By default value 0xf, all planes will be processed.

`inplace`

Do not require 2nd input for processing, instead use alpha plane from input stream.

10.133 `prewitt`# TOC

Apply prewitt operator to input video stream.

The filter accepts the following option:

`planes`

Set which planes will be processed, unprocessed planes will be copied. By default value 0xf, all planes will be processed.

scale

Set value which will be multiplied with filtered result.

delta

Set value which will be added to filtered result.

10.134 program_openc1# TOC

Filter video using an OpenCL program.

source

OpenCL program source file.

kernel

Kernel name in program.

inputs

Number of inputs to the filter. Defaults to 1.

size, s

Size of output frames. Defaults to the same as the first input.

The program source file must contain a kernel function with the given name, which will be run once for each plane of the output. Each run on a plane gets enqueued as a separate 2D global NDRange with one work-item for each pixel to be generated. The global ID offset for each work-item is therefore the coordinates of a pixel in the destination image.

The kernel function needs to take the following arguments:

- Destination image, *__write_only image2d_t*.

This image will become the output; the kernel should write all of it.

- Frame index, *unsigned int*.

This is a counter starting from zero and increasing by one for each frame.

- Source images, *__read_only image2d_t*.

These are the most recent images on each input. The kernel may read from them to generate the output, but they can't be written to.

Example programs:

- Copy the input to the output (output must be the same size as the input).

```
__kernel void copy(__write_only image2d_t destination,
                  unsigned int index,
                  __read_only image2d_t source)
{
    const sampler_t sampler = CLK_NORMALIZED_COORDS_FALSE;

    int2 location = (int2)(get_global_id(0), get_global_id(1));

    float4 value = read_imagef(source, sampler, location);

    write_imagef(destination, location, value);
}
```

- Apply a simple transformation, rotating the input by an amount increasing with the index counter. Pixel values are linearly interpolated by the sampler, and the output need not have the same dimensions as the input.

```
__kernel void rotate_image(__write_only image2d_t dst,
                          unsigned int index,
                          __read_only image2d_t src)
{
    const sampler_t sampler = (CLK_NORMALIZED_COORDS_FALSE |
                              CLK_FILTER_LINEAR);

    float angle = (float)index / 100.0f;

    float2 dst_dim = convert_float2(get_image_dim(dst));
    float2 src_dim = convert_float2(get_image_dim(src));

    float2 dst_cen = dst_dim / 2.0f;
    float2 src_cen = src_dim / 2.0f;

    int2 dst_loc = (int2)(get_global_id(0), get_global_id(1));

    float2 dst_pos = convert_float2(dst_loc) - dst_cen;
    float2 src_pos = {
        cos(angle) * dst_pos.x - sin(angle) * dst_pos.y,
        sin(angle) * dst_pos.x + cos(angle) * dst_pos.y
    };
    src_pos = src_pos * src_dim / dst_dim;

    float2 src_loc = src_pos + src_cen;

    if (src_loc.x < 0.0f || src_loc.y < 0.0f ||
        src_loc.x > src_dim.x || src_loc.y > src_dim.y)
        write_imagef(dst, dst_loc, 0.5f);
    else
        write_imagef(dst, dst_loc, read_imagef(src, sampler, src_loc));
}
```

- Blend two inputs together, with the amount of each input used varying with the index counter.

```
__kernel void blend_images(__write_only image2d_t dst,
                          unsigned int index,
                          __read_only image2d_t src1,
                          __read_only image2d_t src2)
{
    const sampler_t sampler = (CLK_NORMALIZED_COORDS_FALSE |
                              CLK_FILTER_LINEAR);

    float blend = (cos((float)index / 50.0f) + 1.0f) / 2.0f;

    int2 dst_loc = (int2)(get_global_id(0), get_global_id(1));
    int2 src1_loc = dst_loc * get_image_dim(src1) / get_image_dim(dst);
    int2 src2_loc = dst_loc * get_image_dim(src2) / get_image_dim(dst);

    float4 val1 = read_imagef(src1, sampler, src1_loc);
    float4 val2 = read_imagef(src2, sampler, src2_loc);

    write_imagef(dst, dst_loc, val1 * blend + val2 * (1.0f - blend));
}
```

10.135 pseudocolor# TOC

Alter frame colors in video with pseudocolors.

This filter accept the following options:

c0

set pixel first component expression

c1

set pixel second component expression

c2

set pixel third component expression

c3

set pixel fourth component expression, corresponds to the alpha component

i

set component to use as base for altering colors

Each of them specifies the expression to use for computing the lookup table for the corresponding pixel component values.

The expressions can contain the following constants and functions:

w
h

The input width and height.

val

The input value for the pixel component.

ymin, umin, vmin, amin

The minimum allowed component value.

ymax, umax, vmax, amax

The maximum allowed component value.

All expressions default to "val".

10.135.1 Examples# TOC

- Change too high luma values to gradient:

```
pseudocolor="if(between(val,ymax,amax),lerp(ymin,ymax,(val-ymax)/(amax-ymax)),-1):if(between(val,ymax,amax),lerp(umax,umin,(val-ymax)/(amax-ymax)),-1):if(between(val,ymax,amax),lerp(vmin,vmax,(val-ymax)/(amax-ymax)),-1):-1"
```

10.136 psnr# TOC

Obtain the average, maximum and minimum PSNR (Peak Signal to Noise Ratio) between two input videos.

This filter takes in input two input videos, the first input is considered the "main" source and is passed unchanged to the output. The second input is used as a "reference" video for computing the PSNR.

Both video inputs must have the same resolution and pixel format for this filter to work correctly. Also it assumes that both inputs have the same number of frames, which are compared one by one.

The obtained average PSNR is printed through the logging system.

The filter stores the accumulated MSE (mean squared error) of each frame, and at the end of the processing it is averaged across all frames equally, and the following formula is applied to obtain the PSNR:

$$\text{PSNR} = 10 \cdot \log_{10} (\text{MAX}^2 / \text{MSE})$$

Where MAX is the average of the maximum values of each component of the image.

The description of the accepted parameters follows.

`stats_file, f`

If specified the filter will use the named file to save the PSNR of each individual frame. When filename equals "-" the data is sent to standard output.

`stats_version`

Specifies which version of the stats file format to use. Details of each format are written below. Default value is 1.

`stats_add_max`

Determines whether the max value is output to the stats log. Default value is 0. Requires `stats_version >= 2`. If this is set and `stats_version < 2`, the filter will return an error.

This filter also supports the framesync options.

The file printed if *stats_file* is selected, contains a sequence of key/value pairs of the form *key:value* for each compared couple of frames.

If a *stats_version* greater than 1 is specified, a header line precedes the list of per-frame-pair stats, with key value pairs following the frame format with the following parameters:

`psnr_log_version`

The version of the log file format. Will match *stats_version*.

`fields`

A comma separated list of the per-frame-pair parameters included in the log.

A description of each shown per-frame-pair parameter follows:

`n`

sequential number of the input frame, starting from 1

`mse_avg`

Mean Square Error pixel-by-pixel average difference of the compared frames, averaged over all the image components.

`mse_y, mse_u, mse_v, mse_r, mse_g, mse_b, mse_a`

Mean Square Error pixel-by-pixel average difference of the compared frames for the component specified by the suffix.

`psnr_y, psnr_u, psnr_v, psnr_r, psnr_g, psnr_b, psnr_a`

Peak Signal to Noise ratio of the compared frames for the component specified by the suffix.

`max_avg, max_y, max_u, max_v`

Maximum allowed value for each channel, and average over all channels.

For example:

```
movie=ref_movie.mpg, setpts=PTS-STARTPTS [main];  
[main][ref] psnr="stats_file=stats.log" [out]
```

On this example the input file being processed is compared with the reference file `ref_movie.mpg`. The PSNR of each individual frame is stored in `stats.log`.

10.137 pullup# TOC

Pulldown reversal (inverse telecine) filter, capable of handling mixed hard-telecine, 24000/1001 fps progressive, and 30000/1001 fps progressive content.

The pullup filter is designed to take advantage of future context in making its decisions. This filter is stateless in the sense that it does not lock onto a pattern to follow, but it instead looks forward to the following fields in order to identify matches and rebuild progressive frames.

To produce content with an even framerate, insert the fps filter after pullup, use `fps=24000/1001` if the input frame rate is 29.97fps, `fps=24` for 30fps and the (rare) telecined 25fps input.

The filter accepts the following options:

`jl`
`jr`
`jt`
`jb`

These options set the amount of "junk" to ignore at the left, right, top, and bottom of the image, respectively. Left and right are in units of 8 pixels, while top and bottom are in units of 2 lines. The default is 8 pixels on each side.

`sb`

Set the strict breaks. Setting this option to 1 will reduce the chances of filter generating an occasional mismatched frame, but it may also cause an excessive number of frames to be dropped during high motion sequences. Conversely, setting it to -1 will make filter match fields more easily. This may help processing of video where there is slight blurring between the fields, but may also cause there to be interlaced frames in the output. Default value is 0.

`mp`

Set the metric plane to use. It accepts the following values:

‘1’

Use luma plane.

‘u’

Use chroma blue plane.

‘v’

Use chroma red plane.

This option may be set to use chroma plane instead of the default luma plane for doing filter’s computations. This may improve accuracy on very clean source material, but more likely will decrease accuracy, especially if there is chroma noise (rainbow effect) or any grayscale video. The main purpose of setting `mp` to a chroma plane is to reduce CPU load and make pullup usable in realtime on slow machines.

For best results (without duplicated frames in the output file) it is necessary to change the output frame rate. For example, to inverse telecine NTSC input:

```
ffmpeg -i input -vf pullup -r 24000/1001 ...
```

10.138 `qp#` TOC

Change video quantization parameters (QP).

The filter accepts the following option:

`qp`

Set expression for quantization parameter.

The expression is evaluated through the eval API and can contain, among others, the following constants:

known

1 if index is not 129, 0 otherwise.

qp

Sequential index starting from -129 to 128.

10.138.1 Examples# TOC

- Some equation like:

$qp=2+2*\sin(\pi*qp)$

10.139 random# TOC

Flush video frames from internal cache of frames into a random order. No frame is discarded. Inspired by frei0r nervous filter.

`frames`

Set size in number of frames of internal cache, in range from 2 to 512. Default is 30.

`seed`

Set seed for random number generator, must be an integer included between 0 and `UINT32_MAX`. If not specified, or if explicitly set to less than 0, the filter will try to use a good random seed on a best effort basis.

10.140 readeia608# TOC

Read closed captioning (EIA-608) information from the top lines of a video frame.

This filter adds frame metadata for `lavfi.readeia608.X.cc` and `lavfi.readeia608.X.line`, where X is the number of the identified line with EIA-608 data (starting from 0). A description of each metadata value follows:

`lavfi.readeia608.X.cc`

The two bytes stored as EIA-608 data (printed in hexadecimal).

`lavfi.readeia608.X.line`

The number of the line on which the EIA-608 data was identified and read.

This filter accepts the following options:

`scan_min`

Set the line to start scanning for EIA-608 data. Default is 0.

`scan_max`

Set the line to end scanning for EIA-608 data. Default is 29.

mac

Set minimal acceptable amplitude change for sync codes detection. Default is 0.2. Allowed range is [0.001 - 1].

spw

Set the ratio of width reserved for sync code detection. Default is 0.27. Allowed range is [0.01 - 0.7].

mhd

Set the max peaks height difference for sync code detection. Default is 0.1. Allowed range is [0.0 - 0.5].

mpd

Set max peaks period difference for sync code detection. Default is 0.1. Allowed range is [0.0 - 0.5].

msd

Set the first two max start code bits differences. Default is 0.02. Allowed range is [0.0 - 0.5].

bhd

Set the minimum ratio of bits height compared to 3rd start code bit. Default is 0.75. Allowed range is [0.01 - 1].

th_w

Set the white color threshold. Default is 0.35. Allowed range is [0.1 - 1].

th_b

Set the black color threshold. Default is 0.15. Allowed range is [0.0 - 0.5].

chp

Enable checking the parity bit. In the event of a parity error, the filter will output 0x00 for that character. Default is false.

10.140.1 Examples# TOC

- Output a csv with presentation time and the first two lines of identified EIA-608 captioning data.

```
ffprobe -f lavfi -i movie=captioned_video.mov,readeia608 -show_entries frame=pkt_pts_time:frame_tags=lavfi.readeia608.0.cc,lavfi.readeia608.1.cc -of csv
```

10.141 readvitic# TOC

Read vertical interval timecode (VITC) information from the top lines of a video frame.

The filter adds frame metadata key `lavfi.readvitic.tc_str` with the timecode value, if a valid timecode has been detected. Further metadata key `lavfi.readvitic.found` is set to 0/1 depending on whether timecode data has been found or not.

This filter accepts the following options:

`scan_max`

Set the maximum number of lines to scan for VITC data. If the value is set to `-1` the full video frame is scanned. Default is `45`.

`thr_b`

Set the luma threshold for black. Accepts float numbers in the range `[0.0,1.0]`, default value is `0.2`. The value must be equal or less than `thr_w`.

`thr_w`

Set the luma threshold for white. Accepts float numbers in the range `[0.0,1.0]`, default value is `0.6`. The value must be equal or greater than `thr_b`.

10.141.1 Examples# TOC

- Detect and draw VITC data onto the video frame; if no valid VITC is detected, draw `--:--:--:--` as a placeholder:

```
ffmpeg -i input.avi -filter:v 'readvitic,drawtext=fontfile=FreeMono.ttf:text=%{metadata\\:lavfi.readvitic.tc_str\\:--\\\\\\\\\\\\:--\\\\\\\\\\\\:--\\\\\\\\\\\\:--}:x=(w-tw)/2:y=400-ascent'
```

10.142 remap# TOC

Remap pixels using 2nd: Xmap and 3rd: Ymap input video stream.

Destination pixel at position (X, Y) will be picked from source (x, y) position where $x = \text{Xmap}(X, Y)$ and $y = \text{Ymap}(X, Y)$. If mapping values are out of range, zero value for pixel will be used for destination pixel.

Xmap and Ymap input video streams must be of same dimensions. Output video stream will have Xmap/Ymap video stream dimensions. Xmap and Ymap input video streams are 16bit depth, single channel.

10.143 removegrain# TOC

The removegrain filter is a spatial denoiser for progressive video.

m0

Set mode for the first plane.

m1

Set mode for the second plane.

m2

Set mode for the third plane.

m3

Set mode for the fourth plane.

Range of mode is from 0 to 24. Description of each mode follows:

0

Leave input plane unchanged. Default.

1

Clips the pixel with the minimum and maximum of the 8 neighbour pixels.

2

Clips the pixel with the second minimum and maximum of the 8 neighbour pixels.

3

Clips the pixel with the third minimum and maximum of the 8 neighbour pixels.

4

Clips the pixel with the fourth minimum and maximum of the 8 neighbour pixels. This is equivalent to a median filter.

5

Line-sensitive clipping giving the minimal change.

6

Line-sensitive clipping, intermediate.

7

Line-sensitive clipping, intermediate.

8

Line-sensitive clipping, intermediate.

9

Line-sensitive clipping on a line where the neighbours pixels are the closest.

10

Replaces the target pixel with the closest neighbour.

11

[1 2 1] horizontal and vertical kernel blur.

12

Same as mode 11.

13

Bob mode, interpolates top field from the line where the neighbours pixels are the closest.

14

Bob mode, interpolates bottom field from the line where the neighbours pixels are the closest.

15

Bob mode, interpolates top field. Same as 13 but with a more complicated interpolation formula.

16

Bob mode, interpolates bottom field. Same as 14 but with a more complicated interpolation formula.

17

Clips the pixel with the minimum and maximum of respectively the maximum and minimum of each pair of opposite neighbour pixels.

18

Line-sensitive clipping using opposite neighbours whose greatest distance from the current pixel is minimal.

19

Replaces the pixel with the average of its 8 neighbours.

20

Averages the 9 pixels ([1 1 1] horizontal and vertical blur).

21

Clips pixels using the averages of opposite neighbour.

22

Same as mode 21 but simpler and faster.

23

Small edge and halo removal, but reputed useless.

24

Similar as 23.

10.144 removelogo# TOC

Suppress a TV station logo, using an image file to determine which pixels comprise the logo. It works by filling in the pixels that comprise the logo with neighboring pixels.

The filter accepts the following options:

`filename, f`

Set the filter bitmap file, which can be any image format supported by libavformat. The width and height of the image file must match those of the video stream being processed.

Pixels in the provided bitmap image with a value of zero are not considered part of the logo, non-zero pixels are considered part of the logo. If you use white (255) for the logo and black (0) for the rest, you will be safe. For making the filter bitmap, it is recommended to take a screen capture of a black frame with the logo visible, and then using a threshold filter followed by the erode filter once or twice.

If needed, little splotches can be fixed manually. Remember that if logo pixels are not covered, the filter quality will be much reduced. Marking too many pixels as part of the logo does not hurt as much, but it will increase the amount of blurring needed to cover over the image and will destroy more information than necessary, and extra pixels will slow things down on a large logo.

10.145 repeatfields# TOC

This filter uses the repeat_field flag from the Video ES headers and hard repeats fields based on its value.

10.146 reverse# TOC

Reverse a video clip.

Warning: This filter requires memory to buffer the entire clip, so trimming is suggested.

10.146.1 Examples# TOC

- Take the first 5 seconds of a clip, and reverse it.

```
trim=end=5,reverse
```

10.147 roberts# TOC

Apply roberts cross operator to input video stream.

The filter accepts the following option:

planes

Set which planes will be processed, unprocessed planes will be copied. By default value 0xf, all planes will be processed.

scale

Set value which will be multiplied with filtered result.

delta

Set value which will be added to filtered result.

10.148 rotate# TOC

Rotate video by an arbitrary angle expressed in radians.

The filter accepts the following options:

A description of the optional parameters follows.

angle, a

Set an expression for the angle by which to rotate the input video clockwise, expressed as a number of radians. A negative value will result in a counter-clockwise rotation. By default it is set to "0".

This expression is evaluated for each frame.

`out_w, ow`

Set the output width expression, default value is "iw". This expression is evaluated just once during configuration.

`out_h, oh`

Set the output height expression, default value is "ih". This expression is evaluated just once during configuration.

`bilinear`

Enable bilinear interpolation if set to 1, a value of 0 disables it. Default value is 1.

`fillcolor, c`

Set the color used to fill the output area not covered by the rotated image. For the general syntax of this option, check the (ffmpeg-utils)"Color" section in the ffmpeg-utils manual. If the special value "none" is selected then no background is printed (useful for example if the background is never shown).

Default value is "black".

The expressions for the angle and the output size can contain the following constants and functions:

`n`

sequential number of the input frame, starting from 0. It is always NAN before the first frame is filtered.

`t`

time in seconds of the input frame, it is set to 0 when the filter is configured. It is always NAN before the first frame is filtered.

`hsub`

`vsub`

horizontal and vertical chroma subsample values. For example for the pixel format "yuv422p" *hsub* is 2 and *vsub* is 1.

`in_w, iw`

`in_h, ih`

the input video width and height

```
out_w, ow
out_h, oh
```

the output width and height, that is the size of the padded area as specified by the *width* and *height* expressions

```
roth(a)
roth(a)
```

the minimal width/height required for completely containing the input video rotated by *a* radians.

These are only available when computing the `out_w` and `out_h` expressions.

10.148.1 Examples# TOC

- Rotate the input by $\pi/6$ radians clockwise:

```
rotate=PI/6
```

- Rotate the input by $\pi/6$ radians counter-clockwise:

```
rotate=-PI/6
```

- Rotate the input by 45 degrees clockwise:

```
rotate=45*PI/180
```

- Apply a constant rotation with period *T*, starting from an angle of $\pi/3$:

```
rotate=PI/3+2*PI*t/T
```

- Make the input video rotation oscillating with a period of *T* seconds and an amplitude of *A* radians:

```
rotate=A*sin(2*PI/T*t)
```

- Rotate the video, output size is chosen so that the whole rotating input video is always completely contained in the output:

```
rotate='2*PI*t:ow=hypot(iw,ih):oh=ow'
```

- Rotate the video, reduce the output size so that no background is ever shown:

```
rotate=2*PI*t:ow='min(iw,ih)/sqrt(2)':oh=ow:c=none
```

10.148.2 Commands# TOC

The filter supports the following commands:

a, *angle*

Set the angle expression. The command accepts the same syntax of the corresponding option.

If the specified expression is not valid, it is kept at its current value.

10.149 sab# TOC

Apply Shape Adaptive Blur.

The filter accepts the following options:

`luma_radius, lr`

Set luma blur filter strength, must be a value in range 0.1-4.0, default value is 1.0. A greater value will result in a more blurred image, and in slower processing.

`luma_pre_filter_radius, lpfr`

Set luma pre-filter radius, must be a value in the 0.1-2.0 range, default value is 1.0.

`luma_strength, ls`

Set luma maximum difference between pixels to still be considered, must be a value in the 0.1-100.0 range, default value is 1.0.

`chroma_radius, cr`

Set chroma blur filter strength, must be a value in range -0.9-4.0. A greater value will result in a more blurred image, and in slower processing.

`chroma_pre_filter_radius, cpfr`

Set chroma pre-filter radius, must be a value in the -0.9-2.0 range.

`chroma_strength, cs`

Set chroma maximum difference between pixels to still be considered, must be a value in the -0.9-100.0 range.

Each chroma option value, if not explicitly specified, is set to the corresponding luma option value.

10.150 scale# TOC

Scale (resize) the input video, using the libswscale library.

The scale filter forces the output display aspect ratio to be the same of the input, by changing the output sample aspect ratio.

If the input image format is different from the format requested by the next filter, the scale filter will convert the input to the requested format.

10.150.1 Options# TOC

The filter accepts the following options, or any of the options supported by the libswscale scaler.

See (ffmpeg-scaler)the ffmpeg-scaler manual for the complete list of scaler options.

`width, w`
`height, h`

Set the output video dimension expression. Default value is the input dimension.

If the *width* or *w* value is 0, the input width is used for the output. If the *height* or *h* value is 0, the input height is used for the output.

If one and only one of the values is -n with $n \geq 1$, the scale filter will use a value that maintains the aspect ratio of the input image, calculated from the other specified dimension. After that it will, however, make sure that the calculated dimension is divisible by n and adjust the value if necessary.

If both values are -n with $n \geq 1$, the behavior will be identical to both values being set to 0 as previously detailed.

See below for the list of accepted constants for use in the dimension expression.

`eval`

Specify when to evaluate *width* and *height* expression. It accepts the following values:

`'init'`

Only evaluate expressions once during the filter initialization or when a command is processed.

`'frame'`

Evaluate expressions for each incoming frame.

Default value is `'init'`.

`interl`

Set the interlacing mode. It accepts the following values:

`'1'`

Force interlaced aware scaling.

`'0'`

Do not apply interlaced scaling.

`'-1'`

Select interlaced aware scaling depending on whether the source frames are flagged as interlaced or not.

Default value is `'0'`.

`flags`

Set libswscale scaling flags. See (ffmpeg-scaler)the ffmpeg-scaler manual for the complete list of values. If not explicitly specified the filter applies the default flags.

`param0, param1`

Set libswscale input parameters for scaling algorithms that need them. See (ffmpeg-scaler)the ffmpeg-scaler manual for the complete documentation. If not explicitly specified the filter applies empty parameters.

`size, s`

Set the video size. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual.

`in_color_matrix`

`out_color_matrix`

Set in/output YCbCr color space type.

This allows the autodetected value to be overridden as well as allows forcing a specific value used for the output and encoder.

If not specified, the color space type depends on the pixel format.

Possible values:

`'auto'`

Choose automatically.

`'bt709'`

Format conforming to International Telecommunication Union (ITU) Recommendation BT.709.

`'fcc'`

Set color space conforming to the United States Federal Communications Commission (FCC) Code of Federal Regulations (CFR) Title 47 (2003) 73.682 (a).

`'bt601'`

Set color space conforming to:

- ITU Radiocommunication Sector (ITU-R) Recommendation BT.601
- ITU-R Rec. BT.470-6 (1998) Systems B, B1, and G
- Society of Motion Picture and Television Engineers (SMPTE) ST 170:2004

`'smpte240m'`

Set color space conforming to SMPTE ST 240:1999.

`in_range`

`out_range`

Set in/output YCbCr sample range.

This allows the autodetected value to be overridden as well as allows forcing a specific value used for the output and encoder. If not specified, the range depends on the pixel format. Possible values:

`'auto/unknown'`

Choose automatically.

`'jpeg/full/pc'`

Set full range (0-255 in case of 8-bit luma).

`'mpeg/limited/tv'`

Set "MPEG" range (16-235 in case of 8-bit luma).

`force_original_aspect_ratio`

Enable decreasing or increasing output video width or height if necessary to keep the original aspect ratio. Possible values:

`'disable'`

Scale the video as specified and disable this feature.

`'decrease'`

The output video dimensions will automatically be decreased if needed.

`'increase'`

The output video dimensions will automatically be increased if needed.

One useful instance of this option is that when you know a specific device's maximum allowed resolution, you can use this to limit the output video to that, while retaining the aspect ratio. For example, device A allows 1280x720 playback, and your video is 1920x800. Using this option (set it to decrease) and specifying 1280x720 to the command line makes the output 1280x533.

Please note that this is a different thing than specifying -1 for w or h, you still need to specify the output resolution for this option to work.

The values of the w and h options are expressions containing the following constants:

in_w
in_h

The input width and height

iw
ih

These are the same as *in_w* and *in_h*.

out_w
out_h

The output (scaled) width and height

ow
oh

These are the same as *out_w* and *out_h*

a

The same as *iw* / *ih*

sar

input sample aspect ratio

dar

The input display aspect ratio. Calculated from $(iw / ih) * sar$.

hsub
vsub

horizontal and vertical input chroma subsample values. For example for the pixel format "yuv422p" *hsub* is 2 and *vsub* is 1.

ohsub

ovsub

horizontal and vertical output chroma subsample values. For example for the pixel format "yuv422p" *hsub* is 2 and *vsub* is 1.

10.150.2 Examples# TOC

- Scale the input video to a size of 200x100

```
scale=w=200:h=100
```

This is equivalent to:

```
scale=200:100
```

or:

```
scale=200x100
```

- Specify a size abbreviation for the output size:

```
scale=qcif
```

which can also be written as:

```
scale=size=qcif
```

- Scale the input to 2x:

```
scale=w=2*iw:h=2*ih
```

- The above is the same as:

```
scale=2*in_w:2*in_h
```

- Scale the input to 2x with forced interlaced scaling:

```
scale=2*iw:2*ih:interl=1
```

- Scale the input to half size:

```
scale=w=iw/2:h=ih/2
```

- Increase the width, and set the height to the same size:

```
scale=3/2*iw:ow
```

- Seek Greek harmony:

```
scale=iw:1/PHI*iw
scale=ih*PHI:ih
```

- Increase the height, and set the width to 3/2 of the height:

```
scale=w=3/2*oh:h=3/5*ih
```

- Increase the size, making the size a multiple of the chroma subsample values:

```
scale="trunc(3/2*iw/hsub)*hsub:trunc(3/2*ih/vsub)*vsub"
```

- Increase the width to a maximum of 500 pixels, keeping the same aspect ratio as the input:

```
scale=w='min(500\, iw*3/2):h=-1'
```

- Make pixels square by combining scale and setsar:

```
scale='trunc(ih*dar):ih',setsar=1/1
```

- Make pixels square by combining scale and setsar, making sure the resulting resolution is even (required by some codecs):

```
scale='trunc(ih*dar/2)*2:trunc(ih/2)*2',setsar=1/1
```

10.150.3 Commands# TOC

This filter supports the following commands:

```
width, w
height, h
```

Set the output video dimension expression. The command accepts the same syntax of the corresponding option.

If the specified expression is not valid, it is kept at its current value.

10.151 scale_npp# TOC

Use the NVIDIA Performance Primitives (libnpp) to perform scaling and/or pixel format conversion on CUDA video frames. Setting the output width and height works in the same way as for the *scale* filter.

The following additional options are accepted:

```
format
```

The pixel format of the output CUDA frames. If set to the string "same" (the default), the input format will be kept. Note that automatic format negotiation and conversion is not yet supported for hardware frames

```
interp_algo
```

The interpolation algorithm used for resizing. One of the following:

`nn`

Nearest neighbour.

`linear`

`cubic`

`cubic2p_bspline`

2-parameter cubic ($B=1$, $C=0$)

`cubic2p_catmullrom`

2-parameter cubic ($B=0$, $C=1/2$)

`cubic2p_b05c03`

2-parameter cubic ($B=1/2$, $C=3/10$)

`super`

Supersampling

`lanczos`

10.152 scale2ref# TOC

Scale (resize) the input video, based on a reference video.

See the scale filter for available options, scale2ref supports the same but uses the reference video instead of the main input as basis. scale2ref also supports the following additional constants for the *w* and *h* options:

main_w

main_h

The main input video's width and height

main_a

The same as *main_w* / *main_h*

main_sar

The main input video's sample aspect ratio

main_dar, *mdar*

The main input video's display aspect ratio. Calculated from $(\text{main_w} / \text{main_h}) * \text{main_sar}$.

main_hsub

main_vsub

The main input video's horizontal and vertical chroma subsample values. For example for the pixel format "yuv422p" *hsub* is 2 and *vsub* is 1.

10.152.1 Examples# TOC

- Scale a subtitle stream (b) to match the main video (a) in size before overlaying

```
'scale2ref[b][a];[a][b]overlay'
```

10.153 selectivecolor# TOC

Adjust cyan, magenta, yellow and black (CMYK) to certain ranges of colors (such as "reds", "yellows", "greens", "cyans", ...). The adjustment range is defined by the "purity" of the color (that is, how saturated it already is).

This filter is similar to the Adobe Photoshop Selective Color tool.

The filter accepts the following options:

correction_method

Select color correction method.

Available values are:

`'absolute'`

Specified adjustments are applied "as-is" (added/subtracted to original pixel component value).

`'relative'`

Specified adjustments are relative to the original component value.

Default is `absolute`.

reds

Adjustments for red pixels (pixels where the red component is the maximum)

yellows

Adjustments for yellow pixels (pixels where the blue component is the minimum)

greens

Adjustments for green pixels (pixels where the green component is the maximum)

cyans

Adjustments for cyan pixels (pixels where the red component is the minimum)

blues

Adjustments for blue pixels (pixels where the blue component is the maximum)

magentas

Adjustments for magenta pixels (pixels where the green component is the minimum)

whites

Adjustments for white pixels (pixels where all components are greater than 128)

neutrals

Adjustments for all pixels except pure black and pure white

blacks

Adjustments for black pixels (pixels where all components are lesser than 128)

psfile

Specify a Photoshop selective color file (.asv) to import the settings from.

All the adjustment settings (reds, yellows, ...) accept up to 4 space separated floating point adjustment values in the [-1,1] range, respectively to adjust the amount of cyan, magenta, yellow and black for the pixels of its range.

10.153.1 Examples# TOC

- Increase cyan by 50% and reduce yellow by 33% in every green areas, and increase magenta by 27% in blue areas:

```
selectivecolor=greens=.5 0 -.33 0:blues=0 .27
```

- Use a Photoshop selective color preset:

```
selectivecolor=psfile=MySelectiveColorPresets/Misty.asv
```

10.154 separatefields# TOC

The `separatefields` takes a frame-based video input and splits each frame into its components fields, producing a new half height clip with twice the frame rate and twice the frame count.

This filter use field-dominance information in frame to decide which of each pair of fields to place first in the output. If it gets it wrong use `setfield` filter before `separatefields` filter.

10.155 setdar, setsar# TOC

The `setdar` filter sets the Display Aspect Ratio for the filter output video.

This is done by changing the specified Sample (aka Pixel) Aspect Ratio, according to the following equation:

$$DAR = HORIZONTAL_RESOLUTION / VERTICAL_RESOLUTION * SAR$$

Keep in mind that the `setdar` filter does not modify the pixel dimensions of the video frame. Also, the display aspect ratio set by this filter may be changed by later filters in the filterchain, e.g. in case of scaling or if another "setdar" or a "setsar" filter is applied.

The `setsar` filter sets the Sample (aka Pixel) Aspect Ratio for the filter output video.

Note that as a consequence of the application of this filter, the output display aspect ratio will change according to the equation above.

Keep in mind that the sample aspect ratio set by the `setsar` filter may be changed by later filters in the filterchain, e.g. if another "setsar" or a "setdar" filter is applied.

It accepts the following parameters:

`r, ratio, dar (setdar only), sar (setsar only)`

Set the aspect ratio used by the filter.

The parameter can be a floating point number string, an expression, or a string of the form *num:den*, where *num* and *den* are the numerator and denominator of the aspect ratio. If the parameter is not specified, it is assumed the value "0". In case the form "*num:den*" is used, the `:` character should be escaped.

`max`

Set the maximum integer value to use for expressing numerator and denominator when reducing the expressed aspect ratio to a rational. Default value is 100.

The parameter *sar* is an expression containing the following constants:

`E, PI, PHI`

These are approximated values for the mathematical constants *e* (Euler's number), *pi* (Greek *pi*), and *phi* (the golden ratio).

`w, h`

The input width and height.

`a`

These are the same as w / h .

`sar`

The input sample aspect ratio.

`dar`

The input display aspect ratio. It is the same as $(w / h) * sar$.

`hsub, vsub`

Horizontal and vertical chroma subsample values. For example, for the pixel format "yuv422p" *hsub* is 2 and *vsub* is 1.

10.155.1 Examples# TOC

- To change the display aspect ratio to 16:9, specify one of the following:

```
setdar=dar=1.77777
setdar=dar=16/9
```

- To change the sample aspect ratio to 10:11, specify:

```
setsar=sar=10/11
```

- To set a display aspect ratio of 16:9, and specify a maximum integer value of 1000 in the aspect ratio reduction, use the command:

```
setdar=ratio=16/9:max=1000
```

10.156 setfield# TOC

Force field for the output video frame.

The `setfield` filter marks the interlace type field for the output frames. It does not change the input frame, but only sets the corresponding property, which affects how the frame is treated by following filters (e.g. `fieldorder` or `yadif`).

The filter accepts the following options:

mode

Available values are:

`'auto'`

Keep the same field property.

`'bff'`

Mark the frame as bottom-field-first.

`'tff'`

Mark the frame as top-field-first.

`'prog'`

Mark the frame as progressive.

10.157 showinfo# TOC

Show a line containing various information for each input video frame. The input video is not modified.

The shown line contains a sequence of key/value pairs of the form *key:value*.

The following values are shown in the output:

n

The (sequential) number of the input frame, starting from 0.

pts

The Presentation TimeStamp of the input frame, expressed as a number of time base units. The time base unit depends on the filter input pad.

pts_time

The Presentation TimeStamp of the input frame, expressed as a number of seconds.

pos

The position of the frame in the input stream, or -1 if this information is unavailable and/or meaningless (for example in case of synthetic video).

`fmt`

The pixel format name.

`sar`

The sample aspect ratio of the input frame, expressed in the form *num/den*.

`s`

The size of the input frame. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual.

`i`

The type of interlaced mode ("P" for "progressive", "T" for top field first, "B" for bottom field first).

`iskey`

This is 1 if the frame is a key frame, 0 otherwise.

`type`

The picture type of the input frame ("I" for an I-frame, "P" for a P-frame, "B" for a B-frame, or "?" for an unknown type). Also refer to the documentation of the `AVPictureType` enum and of the `av_get_picture_type_char` function defined in `libavutil/avutil.h`.

`checksum`

The Adler-32 checksum (printed in hexadecimal) of all the planes of the input frame.

`plane_checksum`

The Adler-32 checksum (printed in hexadecimal) of each plane of the input frame, expressed in the form "[*c0 c1 c2 c3*]".

10.158 showpalette# TOC

Displays the 256 colors palette of each frame. This filter is only relevant for *pal8* pixel format frames.

It accepts the following option:

`s`

Set the size of the box used to represent one palette color entry. Default is 30 (for a 30×30 pixel box).

10.159 shuffleframes# TOC

Reorder and/or duplicate and/or drop video frames.

It accepts the following parameters:

mapping

Set the destination indexes of input frames. This is space or '|' separated list of indexes that maps input frames to output frames. Number of indexes also sets maximal value that each index may have. '-1' index have special meaning and that is to drop frame.

The first frame has the index 0. The default is to keep the input unchanged.

10.159.1 Examples# TOC

- Swap second and third frame of every three frames of the input:

```
ffmpeg -i INPUT -vf "shuffleframes=0 2 1" OUTPUT
```

- Swap 10th and 1st frame of every ten frames of the input:

```
ffmpeg -i INPUT -vf "shuffleframes=9 1 2 3 4 5 6 7 8 0" OUTPUT
```

10.160 shuffleplanes# TOC

Reorder and/or duplicate video planes.

It accepts the following parameters:

map0

The index of the input plane to be used as the first output plane.

map1

The index of the input plane to be used as the second output plane.

map2

The index of the input plane to be used as the third output plane.

map3

The index of the input plane to be used as the fourth output plane.

The first plane has the index 0. The default is to keep the input unchanged.

10.160.1 Examples# TOC

- Swap the second and third planes of the input:

```
ffmpeg -i INPUT -vf shuffleplanes=0:2:1:3 OUTPUT
```

10.161 signalstats# TOC

Evaluate various visual metrics that assist in determining issues associated with the digitization of analog video media.

By default the filter will log these metadata values:

YMIN

Display the minimal Y value contained within the input frame. Expressed in range of [0-255].

YLOW

Display the Y value at the 10% percentile within the input frame. Expressed in range of [0-255].

YAVG

Display the average Y value within the input frame. Expressed in range of [0-255].

YHIGH

Display the Y value at the 90% percentile within the input frame. Expressed in range of [0-255].

YMAX

Display the maximum Y value contained within the input frame. Expressed in range of [0-255].

UMIN

Display the minimal U value contained within the input frame. Expressed in range of [0-255].

ULOW

Display the U value at the 10% percentile within the input frame. Expressed in range of [0-255].

UAVG

Display the average U value within the input frame. Expressed in range of [0-255].

UHIGH

Display the U value at the 90% percentile within the input frame. Expressed in range of [0-255].

UMAX

Display the maximum U value contained within the input frame. Expressed in range of [0-255].

VMIN

Display the minimal V value contained within the input frame. Expressed in range of [0-255].

VLOW

Display the V value at the 10% percentile within the input frame. Expressed in range of [0-255].

VAVG

Display the average V value within the input frame. Expressed in range of [0-255].

VHIGH

Display the V value at the 90% percentile within the input frame. Expressed in range of [0-255].

VMAX

Display the maximum V value contained within the input frame. Expressed in range of [0-255].

SATMIN

Display the minimal saturation value contained within the input frame. Expressed in range of [0~181.02].

SATLOW

Display the saturation value at the 10% percentile within the input frame. Expressed in range of [0~181.02].

SATAVG

Display the average saturation value within the input frame. Expressed in range of [0~181.02].

SATHIGH

Display the saturation value at the 90% percentile within the input frame. Expressed in range of [0~181.02].

SATMAX

Display the maximum saturation value contained within the input frame. Expressed in range of [0~181.02].

HUEMED

Display the median value for hue within the input frame. Expressed in range of [0-360].

HUEAVG

Display the average value for hue within the input frame. Expressed in range of [0-360].

YDIF

Display the average of sample value difference between all values of the Y plane in the current frame and corresponding values of the previous input frame. Expressed in range of [0-255].

UDIF

Display the average of sample value difference between all values of the U plane in the current frame and corresponding values of the previous input frame. Expressed in range of [0-255].

VDIF

Display the average of sample value difference between all values of the V plane in the current frame and corresponding values of the previous input frame. Expressed in range of [0-255].

YBITDEPTH

Display bit depth of Y plane in current frame. Expressed in range of [0-16].

UBITDEPTH

Display bit depth of U plane in current frame. Expressed in range of [0-16].

VBITDEPTH

Display bit depth of V plane in current frame. Expressed in range of [0-16].

The filter accepts the following options:

`stat`

`out`

`stat` specify an additional form of image analysis. `out` output video with the specified type of pixel highlighted.

Both options accept the following values:

`'tout'`

Identify *temporal outliers* pixels. A *temporal outlier* is a pixel unlike the neighboring pixels of the same field. Examples of temporal outliers include the results of video dropouts, head clogs, or tape tracking issues.

`'vrep'`

Identify *vertical line repetition*. Vertical line repetition includes similar rows of pixels within a frame. In born-digital video vertical line repetition is common, but this pattern is uncommon in video digitized from an analog source. When it occurs in video that results from the digitization of an analog source it can indicate concealment from a dropout compensator.

`'brng'`

Identify pixels that fall outside of legal broadcast range.

`color, c`

Set the highlight color for the `out` option. The default color is yellow.

10.161.1 Examples# TOC

- Output data of various video metrics:

```
ffprobe -f lavfi movie=example.mov,signalstats="stat=tout+vrep+brng" -show_frames
```

- Output specific data about the minimum and maximum values of the Y plane per frame:

```
ffprobe -f lavfi movie=example.mov,signalstats -show_entries frame_tags=lavfi.signalstats.YMAX,lavfi.signalstats.YMIN
```

- Playback video while highlighting pixels that are outside of broadcast range in red.

```
ffplay example.mov -vf signalstats="out=brng:color=red"
```

- Playback video with signalstats metadata drawn over the frame.

```
ffplay example.mov -vf signalstats=stat=brng+vrep+tout,drawtext=fontfile=FreeSerif.ttf:textfile=signalstat_drawtext.txt
```

The contents of `signalstat_drawtext.txt` used in the command are:

```
time %{pts:hms}
Y (%{metadata:lavfi.signalstats.YMIN})-%{metadata:lavfi.signalstats.YMAX})
U (%{metadata:lavfi.signalstats.UMIN})-%{metadata:lavfi.signalstats.UMAX})
V (%{metadata:lavfi.signalstats.VMIN})-%{metadata:lavfi.signalstats.VMAX})
saturation maximum: %{metadata:lavfi.signalstats.SATMAX}
```

10.162 signature# TOC

Calculates the MPEG-7 Video Signature. The filter can handle more than one input. In this case the matching between the inputs can be calculated additionally. The filter always passes through the first input. The signature of each stream can be written into a file.

It accepts the following options:

detectmode

Enable or disable the matching process.

Available values are:

‘off’

Disable the calculation of a matching (default).

‘full’

Calculate the matching for the whole video and output whether the whole video matches or only parts.

‘fast’

Calculate only until a matching is found or the video ends. Should be faster in some cases.

nb_inputs

Set the number of inputs. The option value must be a non negative integer. Default value is 1.

filename

Set the path to which the output is written. If there is more than one input, the path must be a prototype, i.e. must contain %d or %0nd (where n is a positive integer), that will be replaced with the input number. If no filename is specified, no output will be written. This is the default.

format

Choose the output format.

Available values are:

‘binary’

Use the specified binary representation (default).

‘xml’

Use the specified xml representation.

th_d

Set threshold to detect one word as similar. The option value must be an integer greater than zero. The default value is 9000.

th_dc

Set threshold to detect all words as similar. The option value must be an integer greater than zero. The default value is 60000.

th_xh

Set threshold to detect frames as similar. The option value must be an integer greater than zero. The default value is 116.

th_di

Set the minimum length of a sequence in frames to recognize it as matching sequence. The option value must be a non negative integer value. The default value is 0.

th_it

Set the minimum relation, that matching frames to all frames must have. The option value must be a double value between 0 and 1. The default value is 0.5.

10.162.1 Examples# TOC

- To calculate the signature of an input video and store it in signature.bin:

```
ffmpeg -i input.mkv -vf signature=filename=signature.bin -map 0:v -f null -
```

- To detect whether two videos match and store the signatures in XML format in signature0.xml and signature1.xml:

```
ffmpeg -i input1.mkv -i input2.mkv -filter_complex "[0:v][1:v] signature=nb_inputs=2:detectmode=full:format=xml:filename=signature%d.xml" -map :v -f null -
```

10.163 smartblur# TOC

Blur the input video without impacting the outlines.

It accepts the following options:

luma_radius, lr

Set the luma radius. The option value must be a float number in the range [0.1,5.0] that specifies the variance of the gaussian filter used to blur the image (slower if larger). Default value is 1.0.

luma_strength, ls

Set the luma strength. The option value must be a float number in the range [-1.0,1.0] that configures the blurring. A value included in [0.0,1.0] will blur the image whereas a value included in [-1.0,0.0] will sharpen the image. Default value is 1.0.

`luma_threshold, lt`

Set the luma threshold used as a coefficient to determine whether a pixel should be blurred or not. The option value must be an integer in the range [-30,30]. A value of 0 will filter all the image, a value included in [0,30] will filter flat areas and a value included in [-30,0] will filter edges. Default value is 0.

`chroma_radius, cr`

Set the chroma radius. The option value must be a float number in the range [0.1,5.0] that specifies the variance of the gaussian filter used to blur the image (slower if larger). Default value is `luma_radius`.

`chroma_strength, cs`

Set the chroma strength. The option value must be a float number in the range [-1.0,1.0] that configures the blurring. A value included in [0.0,1.0] will blur the image whereas a value included in [-1.0,0.0] will sharpen the image. Default value is `luma_strength`.

`chroma_threshold, ct`

Set the chroma threshold used as a coefficient to determine whether a pixel should be blurred or not. The option value must be an integer in the range [-30,30]. A value of 0 will filter all the image, a value included in [0,30] will filter flat areas and a value included in [-30,0] will filter edges. Default value is `luma_threshold`.

If a chroma option is not explicitly set, the corresponding luma value is set.

10.164 ssim# TOC

Obtain the SSIM (Structural SIilarity Metric) between two input videos.

This filter takes in input two input videos, the first input is considered the "main" source and is passed unchanged to the output. The second input is used as a "reference" video for computing the SSIM.

Both video inputs must have the same resolution and pixel format for this filter to work correctly. Also it assumes that both inputs have the same number of frames, which are compared one by one.

The filter stores the calculated SSIM of each frame.

The description of the accepted parameters follows.

`stats_file, f`

If specified the filter will use the named file to save the SSIM of each individual frame. When filename equals "-" the data is sent to standard output.

The file printed if *stats_file* is selected, contains a sequence of key/value pairs of the form *key:value* for each compared couple of frames.

A description of each shown parameter follows:

n

sequential number of the input frame, starting from 1

Y, U, V, R, G, B

SSIM of the compared frames for the component specified by the suffix.

All

SSIM of the compared frames for the whole frame.

dB

Same as above but in dB representation.

This filter also supports the framesync options.

For example:

```
movie=ref_movie.mpg, setpts=PTS-STARTPTS [main];  
[main][ref] ssim="stats_file=stats.log" [out]
```

On this example the input file being processed is compared with the reference file *ref_movie.mpg*. The SSIM of each individual frame is stored in *stats.log*.

Another example with both psnr and ssim at same time:

```
ffmpeg -i main.mpg -i ref.mpg -lavfi "ssim;[0:v][1:v]psnr" -f null -
```

10.165 stereo3d# TOC

Convert between different stereoscopic image formats.

The filters accept the following options:

in

Set stereoscopic image format of input.

Available values for input image formats are:

`'sbsl'`

side by side parallel (left eye left, right eye right)

‘sbsr’

side by side crosseye (right eye left, left eye right)

‘sbs2l’

side by side parallel with half width resolution (left eye left, right eye right)

‘sbs2r’

side by side crosseye with half width resolution (right eye left, left eye right)

‘abl’

above-below (left eye above, right eye below)

‘abr’

above-below (right eye above, left eye below)

‘ab2l’

above-below with half height resolution (left eye above, right eye below)

‘ab2r’

above-below with half height resolution (right eye above, left eye below)

‘al’

alternating frames (left eye first, right eye second)

‘ar’

alternating frames (right eye first, left eye second)

‘irl’

interleaved rows (left eye has top row, right eye starts on next row)

‘irr’

interleaved rows (right eye has top row, left eye starts on next row)

‘icl’

interleaved columns, left eye first

‘icr’

interleaved columns, right eye first

Default value is ‘sbsl’.

out

Set stereoscopic image format of output.

‘sbsl’

side by side parallel (left eye left, right eye right)

‘sbsr’

side by side crosseye (right eye left, left eye right)

‘sbs2l’

side by side parallel with half width resolution (left eye left, right eye right)

‘sbs2r’

side by side crosseye with half width resolution (right eye left, left eye right)

‘abl’

above-below (left eye above, right eye below)

‘abr’

above-below (right eye above, left eye below)

‘ab2l’

above-below with half height resolution (left eye above, right eye below)

‘ab2r’

above-below with half height resolution (right eye above, left eye below)

‘al’

alternating frames (left eye first, right eye second)

‘ar’

alternating frames (right eye first, left eye second)

‘irl’

interleaved rows (left eye has top row, right eye starts on next row)

‘irr’

interleaved rows (right eye has top row, left eye starts on next row)

‘arbg’

anaglyph red/blue gray (red filter on left eye, blue filter on right eye)

‘argg’

anaglyph red/green gray (red filter on left eye, green filter on right eye)

‘arcg’

anaglyph red/cyan gray (red filter on left eye, cyan filter on right eye)

‘arch’

anaglyph red/cyan half colored (red filter on left eye, cyan filter on right eye)

‘arcc’

anaglyph red/cyan color (red filter on left eye, cyan filter on right eye)

‘arcd’

anaglyph red/cyan color optimized with the least squares projection of dubois (red filter on left eye, cyan filter on right eye)

‘agmg’

anaglyph green/magenta gray (green filter on left eye, magenta filter on right eye)

‘agmh’

anaglyph green/magenta half colored (green filter on left eye, magenta filter on right eye)

‘agmc’

anaglyph green/magenta colored (green filter on left eye, magenta filter on right eye)

‘agmd’

anaglyph green/magenta color optimized with the least squares projection of dubois (green filter on left eye, magenta filter on right eye)

‘aybg’

anaglyph yellow/blue gray (yellow filter on left eye, blue filter on right eye)

‘aybh’

anaglyph yellow/blue half colored (yellow filter on left eye, blue filter on right eye)

‘aybc’

anaglyph yellow/blue colored (yellow filter on left eye, blue filter on right eye)

‘aybd’

anaglyph yellow/blue color optimized with the least squares projection of dubois (yellow filter on left eye, blue filter on right eye)

‘ml’

mono output (left eye only)

‘mr’

mono output (right eye only)

‘chl’

checkerboard, left eye first

‘chr’

checkerboard, right eye first

‘icl’

interleaved columns, left eye first

‘icr’

interleaved columns, right eye first

‘hdm1’

HDMI frame pack

Default value is 'arcd'.

10.165.1 Examples# TOC

- Convert input video from side by side parallel to anaglyph yellow/blue dubois:

```
stereo3d=sbsl:aybd
```

- Convert input video from above below (left eye above, right eye below) to side by side crosseye.

```
stereo3d=abl:sbsr
```

10.166 streamselect, astreamselect# TOC

Select video or audio streams.

The filter accepts the following options:

inputs

Set number of inputs. Default is 2.

map

Set input indexes to remap to outputs.

10.166.1 Commands# TOC

The streamselect and astreamselect filter supports the following commands:

map

Set input indexes to remap to outputs.

10.166.2 Examples# TOC

- Select first 5 seconds 1st stream and rest of time 2nd stream:

```
sendcmd='5.0 streamselect map 1',streamselect=inputs=2:map=0
```

- Same as above, but for audio:

```
asendcmd='5.0 astreamselect map 1',astreamselect=inputs=2:map=0
```

10.167 sobel# TOC

Apply sobel operator to input video stream.

The filter accepts the following option:

`planes`

Set which planes will be processed, unprocessed planes will be copied. By default value 0xf, all planes will be processed.

`scale`

Set value which will be multiplied with filtered result.

`delta`

Set value which will be added to filtered result.

10.168 spp# TOC

Apply a simple postprocessing filter that compresses and decompresses the image at several (or - in the case of `quality` level 6 - all) shifts and average the results.

The filter accepts the following options:

`quality`

Set quality. This option defines the number of levels for averaging. It accepts an integer in the range 0-6. If set to 0, the filter will have no effect. A value of 6 means the higher quality. For each increment of that value the speed drops by a factor of approximately 2. Default value is 3.

`qp`

Force a constant quantization parameter. If not set, the filter will use the QP from the video stream (if available).

`mode`

Set thresholding mode. Available modes are:

`'hard'`

Set hard thresholding (default).

`'soft'`

Set soft thresholding (better de-ringing effect, but likely blurrier).

`use_bframe_qp`

Enable the use of the QP from the B-Frames if set to 1. Using this option may cause flicker since the B-Frames have often larger QP. Default is 0 (not enabled).

10.169 subtitles# TOC

Draw subtitles on top of input video using the libass library.

To enable compilation of this filter you need to configure FFmpeg with `--enable-libass`. This filter also requires a build with libavcodec and libavformat to convert the passed subtitles file to ASS (Advanced Substation Alpha) subtitles format.

The filter accepts the following options:

`filename, f`

Set the filename of the subtitle file to read. It must be specified.

`original_size`

Specify the size of the original video, the video for which the ASS file was composed. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual. Due to a misdesign in ASS aspect ratio arithmetic, this is necessary to correctly scale the fonts if the aspect ratio has been changed.

`fontsdir`

Set a directory path containing fonts that can be used by the filter. These fonts will be used in addition to whatever the font provider uses.

`alpha`

Process alpha channel, by default alpha channel is untouched.

`charenc`

Set subtitles input character encoding. `subtitles` filter only. Only useful if not UTF-8.

`stream_index, si`

Set subtitles stream index. `subtitles` filter only.

`force_style`

Override default style or script info parameters of the subtitles. It accepts a string containing ASS style format `KEY=VALUE` couples separated by `,`.

If the first key is not specified, it is assumed that the first value specifies the `filename`.

For example, to render the file `sub.srt` on top of the input video, use the command:

```
subtitles=sub.srt
```

which is equivalent to:

```
subtitles=filename=sub.srt
```

To render the default subtitles stream from file `video.mkv`, use:

```
subtitles=video.mkv
```

To render the second subtitles stream from that file, use:

```
subtitles=video.mkv:si=1
```

To make the subtitles stream from `sub.srt` appear in 80% transparent blue `DejaVu Serif`, use:

```
subtitles=sub.srt:force_style='FontName=DejaVu Serif,PrimaryColour=&HCCFF0000'
```

10.170 super2xsai# TOC

Scale the input by 2x and smooth using the Super2xSaI (Scale and Interpolate) pixel art scaling algorithm.

Useful for enlarging pixel art images without reducing sharpness.

10.171 swaprect# TOC

Swap two rectangular objects in video.

This filter accepts the following options:

`w`

Set object width.

`h`

Set object height.

`x1`

Set 1st rect x coordinate.

`y1`

Set 1st rect y coordinate.

`x2`

Set 2nd rect x coordinate.

`y2`

Set 2nd rect y coordinate.

All expressions are evaluated once for each frame.

The all options are expressions containing the following constants:

`w`

`h`

The input width and height.

`a`

same as w / h

`sar`

input sample aspect ratio

`dar`

input display aspect ratio, it is the same as $(w / h) * sar$

`n`

The number of the input frame, starting from 0.

`t`

The timestamp expressed in seconds. It's NAN if the input timestamp is unknown.

`pos`

the position in the file of the input frame, NAN if unknown

10.172 swapuv# TOC

Swap U & V plane.

10.173 telecine# TOC

Apply telecine process to the video.

This filter accepts the following options:

`first_field`
`‘top, t’`

`top field first`

`‘bottom, b’`

`bottom field first` The default value is `top`.

`pattern`

A string of numbers representing the pulldown pattern you wish to apply. The default value is 23.

Some typical patterns:

NTSC output (30i):

27.5p: 32222

24p: 23 (classic)

24p: 2332 (preferred)

20p: 33

18p: 334

16p: 3444

PAL output (25i):

27.5p: 12222

24p: 222222222223 ("Euro pulldown")

16.67p: 33

16p: 33333334

10.174 threshold# TOC

Apply threshold effect to video stream.

This filter needs four video streams to perform thresholding. First stream is stream we are filtering. Second stream is holding threshold values, third stream is holding min values, and last, fourth stream is holding max values.

The filter accepts the following option:

`planes`

Set which planes will be processed, unprocessed planes will be copied. By default value 0xf, all planes will be processed.

For example if first stream pixel's component value is less then threshold value of pixel component from 2nd threshold stream, third stream value will be picked, otherwise fourth stream pixel component value will be picked.

Using color source filter one can perform various types of thresholding:

10.174.1 Examples# TOC

- Binary threshold, using gray color as threshold:

```
ffmpeg -i 320x240.avi -f lavfi -i color=gray -f lavfi -i color=black -f lavfi -i color=white -lavfi threshold output.avi
```

- Inverted binary threshold, using gray color as threshold:

```
ffmpeg -i 320x240.avi -f lavfi -i color=gray -f lavfi -i color=white -f lavfi -i color=black -lavfi threshold output.avi
```

- Truncate binary threshold, using gray color as threshold:

```
ffmpeg -i 320x240.avi -f lavfi -i color=gray -i 320x240.avi -f lavfi -i color=gray -lavfi threshold output.avi
```

- Threshold to zero, using gray color as threshold:

```
ffmpeg -i 320x240.avi -f lavfi -i color=gray -f lavfi -i color=white -i 320x240.avi -lavfi threshold output.avi
```

- Inverted threshold to zero, using gray color as threshold:

```
ffmpeg -i 320x240.avi -f lavfi -i color=gray -i 320x240.avi -f lavfi -i color=white -lavfi threshold output.avi
```

10.175 thumbnail# TOC

Select the most representative frame in a given sequence of consecutive frames.

The filter accepts the following options:

n

Set the frames batch size to analyze; in a set of n frames, the filter will pick one of them, and then handle the next batch of n frames until the end. Default is 100.

Since the filter keeps track of the whole frames sequence, a bigger n value will result in a higher memory usage, so a high value is not recommended.

10.175.1 Examples# TOC

- Extract one picture each 50 frames:

```
thumbnail=50
```

- Complete example of a thumbnail creation with ffmpeg:

```
ffmpeg -i in.avi -vf thumbnail,scale=300:200 -frames:v 1 out.png
```

10.176 tile# TOC

Tile several successive frames together.

The filter accepts the following options:

`layout`

Set the grid size (i.e. the number of lines and columns). For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual.

`nb_frames`

Set the maximum number of frames to render in the given area. It must be less than or equal to $w \times h$. The default value is 0, meaning all the area will be used.

`margin`

Set the outer border margin in pixels.

`padding`

Set the inner border thickness (i.e. the number of pixels between frames). For more advanced padding options (such as having different values for the edges), refer to the pad video filter.

`color`

Specify the color of the unused area. For the syntax of this option, check the (ffmpeg-utils)"Color" section in the ffmpeg-utils manual. The default value of *color* is "black".

`overlap`

Set the number of frames to overlap when tiling several successive frames together. The value must be between 0 and $nb_frames - 1$.

`init_padding`

Set the number of frames to initially be empty before displaying first output frame. This controls how soon will one get first output frame. The value must be between 0 and $nb_frames - 1$.

10.176.1 Examples# TOC

- Produce 8x8 PNG tiles of all keyframes (`-skip_frame nokey`) in a movie:

```
ffmpeg -skip_frame nokey -i file.avi -vf 'scale=128:72,tile=8x8' -an -vsync 0 keyframes%03d.png
```

The `-vsync 0` is necessary to prevent ffmpeg from duplicating each output frame to accommodate the originally detected frame rate.

- Display 5 pictures in an area of 3x2 frames, with 7 pixels between them, and 2 pixels of initial margin, using mixed flat and named options:

```
tile=3x2:nb_frames=5:padding=7:margin=2
```

10.177 tinterlace# TOC

Perform various types of temporal field interlacing.

Frames are counted starting from 1, so the first input frame is considered odd.

The filter accepts the following options:

mode

Specify the mode of the interlacing. This option can also be specified as a value alone. See below for a list of values for this option.

Available values are:

‘merge, 0’

Move odd frames into the upper field, even into the lower field, generating a double height frame at half frame rate.

```
-----> time
Input:
Frame 1      Frame 2      Frame 3      Frame 4

11111        22222        33333        44444
11111        22222        33333        44444
11111        22222        33333        44444
11111        22222        33333        44444

Output:
11111        33333
22222        44444
11111        33333
22222        44444
11111        33333
22222        44444
11111        33333
22222        44444
```

‘drop_even, 1’

Only output odd frames, even frames are dropped, generating a frame with unchanged height at half frame rate.

```
-----> time
Input:
Frame 1      Frame 2      Frame 3      Frame 4
```

11111	22222	33333	44444
11111	22222	33333	44444
11111	22222	33333	44444
11111	22222	33333	44444

Output:

11111	33333
11111	33333
11111	33333
11111	33333

‘drop_odd, 2’

Only output even frames, odd frames are dropped, generating a frame with unchanged height at half frame rate.

```
-----> time
```

Input:

Frame 1	Frame 2	Frame 3	Frame 4
11111	22222	33333	44444
11111	22222	33333	44444
11111	22222	33333	44444
11111	22222	33333	44444

Output:

22222	44444
22222	44444
22222	44444
22222	44444

‘pad, 3’

Expand each frame to full height, but pad alternate lines with black, generating a frame with double height at the same input frame rate.

```
-----> time
```

Input:

Frame 1	Frame 2	Frame 3	Frame 4
11111	22222	33333	44444
11111	22222	33333	44444
11111	22222	33333	44444
11111	22222	33333	44444

Output:

11111	.....	33333	.....
.....	22222	.....	44444
11111	.....	33333	.....
.....	22222	.....	44444
11111	.....	33333	.....
.....	22222	.....	44444
11111	.....	33333	.....
.....	22222	.....	44444

`'interleave_top, 4'`

Interleave the upper field from odd frames with the lower field from even frames, generating a frame with unchanged height at half frame rate.

```
-----> time
Input:
Frame 1          Frame 2          Frame 3          Frame 4

11111<-          22222          33333<-          44444
11111            22222<-          33333            44444<-
11111<-          22222          33333<-          44444
11111            22222<-          33333            44444<-

Output:
11111            33333
22222            44444
11111            33333
22222            44444
```

`'interleave_bottom, 5'`

Interleave the lower field from odd frames with the upper field from even frames, generating a frame with unchanged height at half frame rate.

```
-----> time
Input:
Frame 1          Frame 2          Frame 3          Frame 4

11111            22222<-          33333            44444<-
11111<-          22222            33333<-          44444
11111            22222<-          33333            44444<-
11111<-          22222            33333<-          44444

Output:
22222            44444
11111            33333
22222            44444
11111            33333
```

`'interlacedx2, 6'`

Double frame rate with unchanged height. Frames are inserted each containing the second temporal field from the previous input frame and the first temporal field from the next input frame. This mode relies on the `top_field_first` flag. Useful for interlaced video displays with no field synchronisation.

```
-----> time
Input:
Frame 1          Frame 2          Frame 3          Frame 4

11111            22222            33333            44444
 11111            22222            33333            44444
11111            22222            33333            44444
 11111            22222            33333            44444
```

```

Output:
11111  22222  22222  33333  33333  44444  44444
 11111  11111  22222  22222  33333  33333  44444
11111  22222  22222  33333  33333  44444  44444
 11111  11111  22222  22222  33333  33333  44444

```

`'mergex2, 7'`

Move odd frames into the upper field, even into the lower field, generating a double height frame at same frame rate.

```

-----> time
Input:
Frame 1          Frame 2          Frame 3          Frame 4

11111           22222           33333           44444
11111           22222           33333           44444
11111           22222           33333           44444
11111           22222           33333           44444

Output:
11111           33333           33333           55555
22222           22222           44444           44444
11111           33333           33333           55555
22222           22222           44444           44444
11111           33333           33333           55555
22222           22222           44444           44444
11111           33333           33333           55555
22222           22222           44444           44444

```

Numeric values are deprecated but are accepted for backward compatibility reasons.

Default mode is merge.

flags

Specify flags influencing the filter process.

Available value for *flags* is:

`low_pass_filter, vlfp`

Enable linear vertical low-pass filtering in the filter. Vertical low-pass filtering is required when creating an interlaced destination from a progressive source which contains high-frequency vertical detail. Filtering will reduce interlace 'twitter' and Moire patterning.

`complex_filter, cvlfp`

Enable complex vertical low-pass filtering. This will slightly less reduce interlace 'twitter' and Moire patterning but better retain detail and subjective sharpness impression.

Vertical low-pass filtering can only be enabled for mode *interleave_top* and *interleave_bottom*.

10.178 **tmix# TOC**

Mix successive video frames.

A description of the accepted options follows.

`frames`

The number of successive frames to mix. If unspecified, it defaults to 3.

`weights`

Specify weight of each input video frame. Each weight is separated by space. If number of weights is smaller than number of *frames* last specified weight will be used for all remaining unset weights.

`scale`

Specify scale, if it is set it will be multiplied with sum of each weight multiplied with pixel values to give final destination pixel value. By default *scale* is auto scaled to sum of weights.

10.178.1 **Examples# TOC**

- Average 7 successive frames:

```
tmix=frames=7:weights="1 1 1 1 1 1 1"
```

- Apply simple temporal convolution:

```
tmix=frames=3:weights="-1 3 -1"
```

- Similar as above but only showing temporal differences:

```
tmix=frames=3:weights="-1 2 -1":scale=1
```

10.179 **tonemap# TOC**

Tone map colors from different dynamic ranges.

This filter expects data in single precision floating point, as it needs to operate on (and can output) out-of-range values. Another filter, such as *zscale*, is needed to convert the resulting frame to a usable format.

The tonemapping algorithms implemented only work on linear light, so input data should be linearized beforehand (and possibly correctly tagged).

```
ffmpeg -i INPUT -vf zscale=transfer=linear,tonemap=clip,zscale=transfer=bt709,format=yuv420p OUTPUT
```

10.179.1 Options# TOC

The filter accepts the following options.

`tonemap`

Set the tone map algorithm to use.

Possible values are:

none

Do not apply any tone map, only desaturate overbright pixels.

clip

Hard-clip any out-of-range values. Use it for perfect color accuracy for in-range values, while distorting out-of-range values.

linear

Stretch the entire reference gamut to a linear multiple of the display.

gamma

Fit a logarithmic transfer between the tone curves.

reinhard

Preserve overall image brightness with a simple curve, using nonlinear contrast, which results in flattening details and degrading color accuracy.

hable

Preserve both dark and bright details better than *reinhard*, at the cost of slightly darkening everything. Use it when detail preservation is more important than color and brightness accuracy.

mobius

Smoothly map out-of-range values, while retaining contrast and colors for in-range material as much as possible. Use it when color accuracy is more important than detail preservation.

Default is none.

`param`

Tune the tone mapping algorithm.

This affects the following algorithms:

none

Ignored.

linear

Specifies the scale factor to use while stretching. Default to 1.0.

gamma

Specifies the exponent of the function. Default to 1.8.

clip

Specify an extra linear coefficient to multiply into the signal before clipping. Default to 1.0.

reinhard

Specify the local contrast coefficient at the display peak. Default to 0.5, which means that in-gamut values will be about half as bright as when clipping.

hable

Ignored.

mobius

Specify the transition point from linear to mobius transform. Every value below this point is guaranteed to be mapped 1:1. The higher the value, the more accurate the result will be, at the cost of losing bright details. Default to 0.3, which due to the steep initial slope still preserves in-range colors fairly accurately.

desat

Apply desaturation for highlights that exceed this level of brightness. The higher the parameter, the more color information will be preserved. This setting helps prevent unnaturally blown-out colors for super-highlights, by (smoothly) turning into white instead. This makes images feel more natural, at the cost of reducing information about out-of-range colors.

The default of 2.0 is somewhat conservative and will mostly just apply to skies or directly sunlit surfaces. A setting of 0.0 disables this option.

This option works only if the input frame has a supported color tag.

peak

Override signal/nominal/reference peak with this value. Useful when the embedded peak information in display metadata is not reliable or when tone mapping from a lower range to a higher range.

10.180 transpose# TOC

Transpose rows with columns in the input video and optionally flip it.

It accepts the following parameters:

`dir`

Specify the transposition direction.

Can assume the following values:

`'0, 4, cclock_flip'`

Rotate by 90 degrees counterclockwise and vertically flip (default), that is:

L.R		L.l
. .	->	. .
l.r		R.r

`'1, 5, clock'`

Rotate by 90 degrees clockwise, that is:

L.R		l.L
. .	->	. .
l.r		r.R

`'2, 6, cclock'`

Rotate by 90 degrees counterclockwise, that is:

L.R		R.r
. .	->	. .
l.r		L.l

`'3, 7, clock_flip'`

Rotate by 90 degrees clockwise and vertically flip, that is:

L.R		r.R
. .	->	. .
l.r		l.L

For values between 4-7, the transposition is only done if the input video geometry is portrait and not landscape. These values are deprecated, the `passthrough` option should be used instead.

Numerical values are deprecated, and should be dropped in favor of symbolic constants.

`passthrough`

Do not apply the transposition if the input geometry matches the one specified by the specified value.
It accepts the following values:

‘none’

Always apply transposition.

‘portrait’

Preserve portrait geometry (when *height* \geq *width*).

‘landscape’

Preserve landscape geometry (when *width* \geq *height*).

Default value is none.

For example to rotate by 90 degrees clockwise and preserve portrait layout:

```
transpose=dir=1:passthrough=portrait
```

The command above can also be specified as:

```
transpose=1:portrait
```

10.181 trim# TOC

Trim the input so that the output contains one continuous subpart of the input.

It accepts the following parameters:

`start`

Specify the time of the start of the kept section, i.e. the frame with the timestamp *start* will be the first frame in the output.

`end`

Specify the time of the first frame that will be dropped, i.e. the frame immediately preceding the one with the timestamp *end* will be the last frame in the output.

`start_pts`

This is the same as *start*, except this option sets the start timestamp in timebase units instead of seconds.

`end_pts`

This is the same as *end*, except this option sets the end timestamp in timebase units instead of seconds.

`duration`

The maximum duration of the output in seconds.

`start_frame`

The number of the first frame that should be passed to the output.

`end_frame`

The number of the first frame that should be dropped.

`start`, `end`, and `duration` are expressed as time duration specifications; see (ffmpeg-utils)the Time duration section in the ffmpeg-utils(1) manual for the accepted syntax.

Note that the first two sets of the `start/end` options and the `duration` option look at the frame timestamp, while the `_frame` variants simply count the frames that pass through the filter. Also note that this filter does not modify the timestamps. If you wish for the output timestamps to start at zero, insert a `setpts` filter after the trim filter.

If multiple `start` or `end` options are set, this filter tries to be greedy and keep all the frames that match at least one of the specified constraints. To keep only the part that matches all the constraints at once, chain multiple trim filters.

The defaults are such that all the input is kept. So it is possible to set e.g. just the end values to keep everything before the specified time.

Examples:

- Drop everything except the second minute of input:

```
ffmpeg -i INPUT -vf trim=60:120
```

- Keep only the first second:

```
ffmpeg -i INPUT -vf trim=duration=1
```

10.182 unpremultiply# TOC

Apply alpha unpremultiply effect to input video stream using first plane of second stream as alpha.

Both streams must have same dimensions and same pixel format.

The filter accepts the following option:

`planes`

Set which planes will be processed, unprocessed planes will be copied. By default value 0xf, all planes will be processed.

If the format has 1 or 2 components, then luma is bit 0. If the format has 3 or 4 components: for RGB formats bit 0 is green, bit 1 is blue and bit 2 is red; for YUV formats bit 0 is luma, bit 1 is chroma-U and bit 2 is chroma-V. If present, the alpha channel is always the last bit.

`inplace`

Do not require 2nd input for processing, instead use alpha plane from input stream.

10.183 unsharp# TOC

Sharpen or blur the input video.

It accepts the following parameters:

`luma_msize_x, lx`

Set the luma matrix horizontal size. It must be an odd integer between 3 and 23. The default value is 5.

`luma_msize_y, ly`

Set the luma matrix vertical size. It must be an odd integer between 3 and 23. The default value is 5.

`luma_amount, la`

Set the luma effect strength. It must be a floating point number, reasonable values lay between -1.5 and 1.5.

Negative values will blur the input video, while positive values will sharpen it, a value of zero will disable the effect.

Default value is 1.0.

`chroma_msize_x, cx`

Set the chroma matrix horizontal size. It must be an odd integer between 3 and 23. The default value is 5.

`chroma_msize_y, cy`

Set the chroma matrix vertical size. It must be an odd integer between 3 and 23. The default value is 5.

`chroma_amount, ca`

Set the chroma effect strength. It must be a floating point number, reasonable values lay between -1.5 and 1.5.

Negative values will blur the input video, while positive values will sharpen it, a value of zero will disable the effect.

Default value is 0.0.

All parameters are optional and default to the equivalent of the string '5:5:1.0:5:5:0.0'.

10.183.1 Examples# TOC

- Apply strong luma sharpen effect:

```
unsharp=luma_msize_x=7:luma_msize_y=7:luma_amount=2.5
```

- Apply a strong blur of both luma and chroma parameters:

```
unsharp=7:7:-2:7:7:-2
```

10.184 uspp# TOC

Apply ultra slow/simple postprocessing filter that compresses and decompresses the image at several (or - in the case of `quality` level 8 - all) shifts and average the results.

The way this differs from the behavior of `spp` is that `uspp` actually encodes & decodes each case with libavcodec Snow, whereas `spp` uses a simplified intra only 8x8 DCT similar to MJPEG.

The filter accepts the following options:

`quality`

Set quality. This option defines the number of levels for averaging. It accepts an integer in the range 0-8. If set to 0, the filter will have no effect. A value of 8 means the higher quality. For each increment of that value the speed drops by a factor of approximately 2. Default value is 3.

`qp`

Force a constant quantization parameter. If not set, the filter will use the QP from the video stream (if available).

10.185 vaguedenoiser# TOC

Apply a wavelet based denoiser.

It transforms each frame from the video input into the wavelet domain, using Cohen-Daubechies-Feauveau 9/7. Then it applies some filtering to the obtained coefficients. It does an inverse wavelet transform after. Due to wavelet properties, it should give a nice smoothed result, and reduced noise, without blurring picture features.

This filter accepts the following options:

`threshold`

The filtering strength. The higher, the more filtered the video will be. Hard thresholding can use a higher threshold than soft thresholding before the video looks overfiltered. Default value is 2.

`method`

The filtering method the filter will use.

It accepts the following values:

`'hard'`

All values under the threshold will be zeroed.

`'soft'`

All values under the threshold will be zeroed. All values above will be reduced by the threshold.

`'garrote'`

Scales or nullifies coefficients - intermediary between (more) soft and (less) hard thresholding.

Default is garrote.

`nsteps`

Number of times, the wavelet will decompose the picture. Picture can't be decomposed beyond a particular point (typically, 8 for a 640x480 frame - as $2^9 = 512 > 480$). Valid values are integers between 1 and 32. Default value is 6.

`percent`

Partial of full denoising (limited coefficients shrinking), from 0 to 100. Default value is 85.

`planes`

A list of the planes to process. By default all planes are processed.

10.186 vectorscope# TOC

Display 2 color component values in the two dimensional graph (which is called a vectorscope).

This filter accepts the following options:

`mode, m`

Set vectorscope mode.

It accepts the following values:

`'gray'`

Gray values are displayed on graph, higher brightness means more pixels have same component color value on location in graph. This is the default mode.

`'color'`

Gray values are displayed on graph. Surrounding pixels values which are not present in video frame are drawn in gradient of 2 color components which are set by option `x` and `y`. The 3rd color component is static.

`'color2'`

Actual color components values present in video frame are displayed on graph.

`'color3'`

Similar as `color2` but higher frequency of same values `x` and `y` on graph increases value of another color component, which is luminance by default values of `x` and `y`.

`'color4'`

Actual colors present in video frame are displayed on graph. If two different colors map to same position on graph then color with higher value of component not present in graph is picked.

`'color5'`

Gray values are displayed on graph. Similar to `color` but with 3rd color component picked from radial gradient.

`x`

Set which color component will be represented on X-axis. Default is 1.

y

Set which color component will be represented on Y-axis. Default is 2.

intensity, i

Set intensity, used by modes: gray, color, color3 and color5 for increasing brightness of color component which represents frequency of (X, Y) location in graph.

envelope, e
'none'

No envelope, this is default.

'instant'

Instant envelope, even darkest single pixel will be clearly highlighted.

'peak'

Hold maximum and minimum values presented in graph over time. This way you can still spot out of range values without constantly looking at vectorscope.

'peak+instant'

Peak and instant envelope combined together.

graticule, g

Set what kind of graticule to draw.

'none'
'green'
'color'

opacity, o

Set graticule opacity.

flags, f

Set graticule flags.

'white'

Draw graticule for white point.

'black'

Draw graticule for black point.

`'name'`

Draw color points short names.

`bgopacity, b`

Set background opacity.

`lthreshold, l`

Set low threshold for color component not represented on X or Y axis. Values lower than this value will be ignored. Default is 0. Note this value is multiplied with actual max possible value one pixel component can have. So for 8-bit input and low threshold value of 0.1 actual threshold is $0.1 * 255 = 25$.

`hthreshold, h`

Set high threshold for color component not represented on X or Y axis. Values higher than this value will be ignored. Default is 1. Note this value is multiplied with actual max possible value one pixel component can have. So for 8-bit input and high threshold value of 0.9 actual threshold is $0.9 * 255 = 230$.

`colorspace, c`

Set what kind of colorspace to use when drawing graticule.

`'auto'`

`'601'`

`'709'`

Default is auto.

10.187 vidstabdetect# TOC

Analyze video stabilization/deshaking. Perform pass 1 of 2, see vidstabtransform for pass 2.

This filter generates a file with relative translation and rotation transform information about subsequent frames, which is then used by the vidstabtransform filter.

To enable compilation of this filter you need to configure FFmpeg with `--enable-libvidstab`.

This filter accepts the following options:

`result`

Set the path to the file used to write the transforms information. Default value is `transforms.trf`.

`shakiness`

Set how shaky the video is and how quick the camera is. It accepts an integer in the range 1-10, a value of 1 means little shakiness, a value of 10 means strong shakiness. Default value is 5.

`accuracy`

Set the accuracy of the detection process. It must be a value in the range 1-15. A value of 1 means low accuracy, a value of 15 means high accuracy. Default value is 15.

`stepsize`

Set stepsize of the search process. The region around minimum is scanned with 1 pixel resolution. Default value is 6.

`mincontrast`

Set minimum contrast. Below this value a local measurement field is discarded. Must be a floating point value in the range 0-1. Default value is 0.3.

`tripod`

Set reference frame number for tripod mode.

If enabled, the motion of the frames is compared to a reference frame in the filtered stream, identified by the specified number. The idea is to compensate all movements in a more-or-less static scene and keep the camera view absolutely still.

If set to 0, it is disabled. The frames are counted starting from 1.

`show`

Show fields and transforms in the resulting frames. It accepts an integer in the range 0-2. Default value is 0, which disables any visualization.

10.187.1 Examples# TOC

- Use default values:

```
vidstabdetect
```

- Analyze strongly shaky movie and put the results in file `mytransforms.trf`:

```
vidstabdetect=shakiness=10:accuracy=15:result="mytransforms.trf"
```

- Visualize the result of internal transformations in the resulting video:

```
vidstabdetect=show=1
```

- Analyze a video with medium shakiness using `ffmpeg`:

```
ffmpeg -i input -vf vidstabdetect=shakiness=5:show=1 dummy.avi
```

10.188 vidstabtransform# TOC

Video stabilization/deshaking: pass 2 of 2, see `vidstabdetect` for pass 1.

Read a file with transform information for each frame and apply/compensate them. Together with the `vidstabdetect` filter this can be used to deshake videos. See also <http://public.hronopik.de/vid.stab>. It is important to also use the `unsharp` filter, see below.

To enable compilation of this filter you need to configure FFmpeg with `--enable-libvidstab`.

10.188.1 Options# TOC

`input`

Set path to the file used to read the transforms. Default value is `transforms.trf`.

`smoothing`

Set the number of frames ($\text{value} * 2 + 1$) used for lowpass filtering the camera movements. Default value is 10.

For example a number of 10 means that 21 frames are used (10 in the past and 10 in the future) to smoothen the motion in the video. A larger value leads to a smoother video, but limits the acceleration of the camera (pan/tilt movements). 0 is a special case where a static camera is simulated.

`optalgo`

Set the camera path optimization algorithm.

Accepted values are:

`'gauss'`

gaussian kernel low-pass filter on camera motion (default)

`'avg'`

averaging on transformations

`maxshift`

Set maximal number of pixels to translate frames. Default value is -1, meaning no limit.

maxangle

Set maximal angle in radians ($\text{degree} \cdot \pi / 180$) to rotate frames. Default value is -1, meaning no limit.

crop

Specify how to deal with borders that may be visible due to movement compensation.

Available values are:

‘keep’

keep image information from previous frame (default)

‘black’

fill the border black

invert

Invert transforms if set to 1. Default value is 0.

relative

Consider transforms as relative to previous frame if set to 1, absolute if set to 0. Default value is 0.

zoom

Set percentage to zoom. A positive value will result in a zoom-in effect, a negative value in a zoom-out effect. Default value is 0 (no zoom).

optzoom

Set optimal zooming to avoid borders.

Accepted values are:

‘0’

disabled

‘1’

optimal static zoom value is determined (only very strong movements will lead to visible borders) (default)

‘2’

optimal adaptive zoom value is determined (no borders will be visible), see zoomspeed

Note that the value given at zoom is added to the one calculated here.

zoomspeed

Set percent to zoom maximally each frame (enabled when optzoom is set to 2). Range is from 0 to 5, default value is 0.25.

interpol

Specify type of interpolation.

Available values are:

‘no’

no interpolation

‘linear’

linear only horizontal

‘bilinear’

linear in both directions (default)

‘bicubic’

cubic in both directions (slow)

tripod

Enable virtual tripod mode if set to 1, which is equivalent to relative=0:smoothing=0.
Default value is 0.

Use also tripod option of vidstabdetect.

debug

Increase log verbosity if set to 1. Also the detected global motions are written to the temporary file `global_motions.trf`. Default value is 0.

10.188.2 Examples# TOC

- Use `ffmpeg` for a typical stabilization with default values:

```
ffmpeg -i inp.mpeg -vf vidstabtransform,unsharp=5:5:0.8:3:3:0.4 inp_stabilized.mpeg
```

Note the use of the `unsharp` filter which is always recommended.

- Zoom in a bit more and load transform data from a given file:

```
vidstabtransform=zoom=5:input="mytransforms.trf"
```

- Smoothen the video even more:

```
vidstabtransform=smoothing=30
```

10.189 vflip# TOC

Flip the input video vertically.

For example, to vertically flip a video with `ffmpeg`:

```
ffmpeg -i in.avi -vf "vflip" out.avi
```

10.190 vfrdet# TOC

Detect variable frame rate video.

This filter tries to detect if the input is variable or constant frame rate.

At end it will output number of frames detected as having variable delta pts, and ones with constant delta pts. If there was frames with variable delta, than it will also show min and max delta encountered.

10.191 vignette# TOC

Make or reverse a natural vignetting effect.

The filter accepts the following options:

`angle, a`

Set lens angle expression as a number of radians.

The value is clipped in the $[0, \pi/2]$ range.

Default value: `"PI/5"`

x0

y0

Set center coordinates expressions. Respectively "w/2" and "h/2" by default.

mode

Set forward/backward mode.

Available modes are:

`'forward'`

The larger the distance from the central point, the darker the image becomes.

`'backward'`

The larger the distance from the central point, the brighter the image becomes. This can be used to reverse a vignette effect, though there is no automatic detection to extract the lens angle and other settings (yet). It can also be used to create a burning effect.

Default value is `'forward'`.

eval

Set evaluation mode for the expressions (angle, x0, y0).

It accepts the following values:

`'init'`

Evaluate expressions only once during the filter initialization.

`'frame'`

Evaluate expressions for each incoming frame. This is way slower than the `'init'` mode since it requires all the scalars to be re-computed, but it allows advanced dynamic expressions.

Default value is `'init'`.

dither

Set dithering to reduce the circular banding effects. Default is 1 (enabled).

aspect

Set vignette aspect. This setting allows one to adjust the shape of the vignette. Setting this value to the SAR of the input will make a rectangular vignetting following the dimensions of the video.

Default is 1/1.

10.191.1 Expressions# TOC

The alpha, x0 and y0 expressions can contain the following parameters.

w
h

input width and height

n

the number of input frame, starting from 0

pts

the PTS (Presentation TimeStamp) time of the filtered video frame, expressed in *TB* units, NAN if undefined

r

frame rate of the input video, NAN if the input frame rate is unknown

t

the PTS (Presentation TimeStamp) of the filtered video frame, expressed in seconds, NAN if undefined

tb

time base of the input video

10.191.2 Examples# TOC

- Apply simple strong vignetting effect:

```
vignette=PI/4
```

- Make a flickering vignetting:

```
vignette='PI/4+random(1)*PI/50':eval=frame
```

10.192 vmafmotion# TOC

Obtain the average vmaf motion score of a video. It is one of the component filters of VMAF.

The obtained average motion score is printed through the logging system.

In the below example the input file `ref.mpg` is being processed and score is computed.

```
ffmpeg -i ref.mpg -lavfi vmafmotion -f null -
```

10.193 vstack# TOC

Stack input videos vertically.

All streams must be of same pixel format and of same width.

Note that this filter is faster than using overlay and pad filter to create same output.

The filter accept the following option:

`inputs`

Set number of input streams. Default is 2.

`shortest`

If set to 1, force the output to terminate when the shortest input terminates. Default value is 0.

10.194 w3fdif# TOC

Deinterlace the input video ("`w3fdif`" stands for "Weston 3 Field Deinterlacing Filter").

Based on the process described by Martin Weston for BBC R&D, and implemented based on the de-interlace algorithm written by Jim Easterbrook for BBC R&D, the Weston 3 field deinterlacing filter uses filter coefficients calculated by BBC R&D.

There are two sets of filter coefficients, so called "simple": and "complex". Which set of filter coefficients is used can be set by passing an optional parameter:

`filter`

Set the interlacing filter coefficients. Accepts one of the following values:

`'simple'`

Simple filter coefficient set.

`'complex'`

More-complex filter coefficient set.

Default value is `'complex'`.

`deint`

Specify which frames to deinterlace. Accept one of the following values:

`'all'`

Deinterlace all frames,

`'interlaced'`

Only deinterlace frames marked as interlaced.

Default value is `'all'`.

10.195 waveform# TOC

Video waveform monitor.

The waveform monitor plots color component intensity. By default luminance only. Each column of the waveform corresponds to a column of pixels in the source video.

It accepts the following options:

`mode, m`

Can be either `row`, or `column`. Default is `column`. In row mode, the graph on the left side represents color component value 0 and the right side represents value = 255. In column mode, the top side represents color component value = 0 and bottom side represents value = 255.

`intensity, i`

Set intensity. Smaller values are useful to find out how many values of the same luminance are distributed across input rows/columns. Default value is 0.04. Allowed range is [0, 1].

`mirror, r`

Set mirroring mode. 0 means unmirrored, 1 means mirrored. In mirrored mode, higher values will be represented on the left side for `row` mode and at the top for `column` mode. Default is 1 (mirrored).

`display, d`

Set display mode. It accepts the following values:

`'overlay'`

Presents information identical to that in the `parade`, except that the graphs representing color components are superimposed directly over one another.

This display mode makes it easier to spot relative differences or similarities in overlapping areas of the color components that are supposed to be identical, such as neutral whites, grays, or blacks.

`'stack'`

Display separate graph for the color components side by side in `row` mode or one below the other in `column` mode.

`'parade'`

Display separate graph for the color components side by side in `column` mode or one below the other in `row` mode.

Using this display mode makes it easy to spot color casts in the highlights and shadows of an image, by comparing the contours of the top and the bottom graphs of each waveform. Since whites, grays, and blacks are characterized by exactly equal amounts of red, green, and blue, neutral areas of the picture should display three waveforms of roughly equal width/height. If not, the correction is easy to perform by making level adjustments the three waveforms.

Default is `stack`.

`components, c`

Set which color components to display. Default is 1, which means only luminance or red color component if input is in RGB colorspace. If is set for example to 7 it will display all 3 (if) available color components.

`envelope, e`

`'none'`

No envelope, this is default.

`'instant'`

Instant envelope, minimum and maximum values presented in graph will be easily visible even with small `step` value.

`'peak'`

Hold minimum and maximum values presented in graph across time. This way you can still spot out of range values without constantly looking at waveforms.

`'peak+instant'`

Peak and instant envelope combined together.

`filter, f`

`'lowpass'`

No filtering, this is default.

`'flat'`

Luma and chroma combined together.

`'aflat'`

Similar as above, but shows difference between blue and red chroma.

`'xflat'`

Similar as above, but use different colors.

`'chroma'`

Displays only chroma.

`'color'`

Displays actual color value on waveform.

`'acolor'`

Similar as above, but with luma showing frequency of chroma values.

`graticule, g`

Set which graticule to display.

`'none'`

Do not display graticule.

`'green'`

Display green graticule showing legal broadcast ranges.

`'orange'`

Display orange graticule showing legal broadcast ranges.

`opacity, o`

Set graticule opacity.

`flags, fl`

Set graticule flags.

`'numbers'`

Draw numbers above lines. By default enabled.

`'dots'`

Draw dots instead of lines.

`scale, s`

Set scale used for displaying graticule.

`'digital'`
`'millivolts'`
`'ire'`

Default is digital.

`bgopacity, b`

Set background opacity.

10.196 weave, doubleweave# TOC

The `weave` takes a field-based video input and join each two sequential fields into single frame, producing a new double height clip with half the frame rate and half the frame count.

The `doubleweave` works same as `weave` but without halving frame rate and frame count.

It accepts the following option:

`first_field`

Set first field. Available values are:

`'top, t'`

Set the frame as top-field-first.

`'bottom, b'`

Set the frame as bottom-field-first.

10.196.1 Examples# TOC

- Interlace video using `select` and `separatefields` filter:

```
separatefields, select=eq(mod(n,4),0)+eq(mod(n,4),3), weave
```

10.197 xbr# TOC

Apply the xBR high-quality magnification filter which is designed for pixel art. It follows a set of edge-detection rules, see <http://www.libretro.com/forums/viewtopic.php?f=6&t=134>.

It accepts the following option:

n

Set the scaling dimension: 2 for 2xBR, 3 for 3xBR and 4 for 4xBR. Default is 3.

10.198 yadif# TOC

Deinterlace the input video ("yadif" means "yet another deinterlacing filter").

It accepts the following parameters:

mode

The interlacing mode to adopt. It accepts one of the following values:

0, send_frame

Output one frame for each frame.

1, send_field

Output one frame for each field.

2, send_frame_nospatial

Like send_frame, but it skips the spatial interlacing check.

3, send_field_nospatial

Like send_field, but it skips the spatial interlacing check.

The default value is send_frame.

parity

The picture field parity assumed for the input interlaced video. It accepts one of the following values:

0, tff

Assume the top field is first.

1, bff

Assume the bottom field is first.

-1, `auto`

Enable automatic detection of field parity.

The default value is `auto`. If the interlacing is unknown or the decoder does not export this information, top field first will be assumed.

`deint`

Specify which frames to deinterlace. Accept one of the following values:

0, `all`

Deinterlace all frames.

1, `interlaced`

Only deinterlace frames marked as interlaced.

The default value is `all`.

10.199 zoompan# TOC

Apply Zoom & Pan effect.

This filter accepts the following options:

`zoom`, `z`

Set the zoom expression. Default is 1.

`x`

`y`

Set the x and y expression. Default is 0.

`d`

Set the duration expression in number of frames. This sets for how many number of frames effect will last for single input image.

`s`

Set the output image size, default is 'hd720'.

`fps`

Set the output frame rate, default is '25'.

Each expression can contain the following constants:

`in_w, iw`

Input width.

`in_h, ih`

Input height.

`out_w, ow`

Output width.

`out_h, oh`

Output height.

`in`

Input frame count.

`on`

Output frame count.

`x`

`y`

Last calculated 'x' and 'y' position from 'x' and 'y' expression for current input frame.

`px`

`py`

'x' and 'y' of last output frame of previous input frame or 0 when there was not yet such frame (first input frame).

`zoom`

Last calculated zoom from 'z' expression for current input frame.

`pzoom`

Last calculated zoom of last output frame of previous input frame.

`duration`

Number of output frames for current input frame. Calculated from 'd' expression for each input frame.

pduration

number of output frames created for previous input frame

a

Rational number: input width / input height

sar

sample aspect ratio

dar

display aspect ratio

10.199.1 Examples# TOC

- Zoom-in up to 1.5 and pan at same time to some spot near center of picture:

```
zoompan=z='min(zoom+0.0015,1.5)':d=700:x='if(gte(zoom,1.5),x,x+1/a)':y='if(gte(zoom,1.5),y,y+1)':s=640x360
```

- Zoom-in up to 1.5 and pan always at center of picture:

```
zoompan=z='min(zoom+0.0015,1.5)':d=700:x='iw/2-(iw/zoom/2)':y='ih/2-(ih/zoom/2)'
```

- Same as above but without pausing:

```
zoompan=z='min(max(zoom,pzoom)+0.0015,1.5)':d=1:x='iw/2-(iw/zoom/2)':y='ih/2-(ih/zoom/2)'
```

10.200 zscale# TOC

Scale (resize) the input video, using the z.lib library: <https://github.com/sekrit-twc/zimg>. To enable compilation of this filter, you need to configure FFmpeg with `--enable-libzimg`.

The zscale filter forces the output display aspect ratio to be the same as the input, by changing the output sample aspect ratio.

If the input image format is different from the format requested by the next filter, the zscale filter will convert the input to the requested format.

10.200.1 Options# TOC

The filter accepts the following options.

width, w
height, h

Set the output video dimension expression. Default value is the input dimension.

If the *width* or *w* value is 0, the input width is used for the output. If the *height* or *h* value is 0, the input height is used for the output.

If one and only one of the values is -n with $n \geq 1$, the zscale filter will use a value that maintains the aspect ratio of the input image, calculated from the other specified dimension. After that it will, however, make sure that the calculated dimension is divisible by n and adjust the value if necessary.

If both values are -n with $n \geq 1$, the behavior will be identical to both values being set to 0 as previously detailed.

See below for the list of accepted constants for use in the dimension expression.

size, s

Set the video size. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual.

dither, d

Set the dither type.

Possible values are:

none
ordered
random
error_diffusion

Default is none.

filter, f

Set the resize filter type.

Possible values are:

point
bilinear
bicubic
spline16
spline36
lanczos

Default is bilinear.

range, r

Set the color range.

Possible values are:

input
limited
full

Default is same as input.

primaries, p

Set the color primaries.

Possible values are:

input
709
unspecified
170m
240m
2020

Default is same as input.

transfer, t

Set the transfer characteristics.

Possible values are:

input
709
unspecified
601
linear
2020_10
2020_12
smp2084
iec61966-2-1
arib-std-b67

Default is same as input.

`matrix, m`

Set the colorspace matrix.

Possible value are:

input
709
unspecified
470bg
170m
2020_ncl
2020_cl

Default is same as input.

`rangein, rin`

Set the input color range.

Possible values are:

input
limited
full

Default is same as input.

`primariesin, pin`

Set the input color primaries.

Possible values are:

input
709
unspecified
170m
240m
2020

Default is same as input.

`transferin, tin`

Set the input transfer characteristics.

Possible values are:

input
709
unspecified
601
linear
2020_10
2020_12

Default is same as input.

`matrixin, min`

Set the input colorspace matrix.

Possible value are:

input
709
unspecified
470bg
170m
2020_ncl
2020_cl

`chromal, c`

Set the output chroma location.

Possible values are:

input
left
center
topleft
top
bottomleft
bottom

`chromalin, cin`

Set the input chroma location.

Possible values are:

input
left
center

opleft
top
bottomleft
bottom

np1

Set the nominal peak luminance.

The values of the *w* and *h* options are expressions containing the following constants:

in_w
in_h

The input width and height

iw
ih

These are the same as *in_w* and *in_h*.

out_w
out_h

The output (scaled) width and height

ow
oh

These are the same as *out_w* and *out_h*

a

The same as *iw* / *ih*

sar

input sample aspect ratio

dar

The input display aspect ratio. Calculated from $(iw / ih) * sar$.

hsub
vsub

horizontal and vertical input chroma subsample values. For example for the pixel format "yuv422p" *hsub* is 2 and *vsub* is 1.

ohsub
ovsub

horizontal and vertical output chroma subsample values. For example for the pixel format "yuv422p" *hsub* is 2 and *vsub* is 1.

11 Video Sources# TOC

Below is a description of the currently available video sources.

11.1 buffer# TOC

Buffer video frames, and make them available to the filter chain.

This source is mainly intended for a programmatic use, in particular through the interface defined in `libavfilter/vsrc_buffer.h`.

It accepts the following parameters:

`video_size`

Specify the size (width and height) of the buffered video frames. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual.

`width`

The input video width.

`height`

The input video height.

`pix_fmt`

A string representing the pixel format of the buffered video frames. It may be a number corresponding to a pixel format, or a pixel format name.

`time_base`

Specify the timebase assumed by the timestamps of the buffered frames.

`frame_rate`

Specify the frame rate expected for the video stream.

`pixel_aspect, sar`

The sample (pixel) aspect ratio of the input video.

`sws_param`

Specify the optional parameters to be used for the scale filter which is automatically inserted when an input change is detected in the input size or format.

`hw_frames_ctx`

When using a hardware pixel format, this should be a reference to an AVHWFramesContext describing input frames.

For example:

```
buffer=width=320:height=240:pix_fmt=yuv410p:time_base=1/24:sar=1
```

will instruct the source to accept video frames with size 320x240 and with format "yuv410p", assuming 1/24 as the timestamps timebase and square pixels (1:1 sample aspect ratio). Since the pixel format with name "yuv410p" corresponds to the number 6 (check the enum AVPixelFormat definition in `libavutil/pixfmt.h`), this example corresponds to:

```
buffer=size=320x240:pixfmt=6:time_base=1/24:pixel_aspect=1/1
```

Alternatively, the options can be specified as a flat string, but this syntax is deprecated:

```
width:height:pix_fmt:time_base.num:time_base.den:pixel_aspect.num:pixel_aspect.den[:sws_param]
```

11.2 cellauto# TOC

Create a pattern generated by an elementary cellular automaton.

The initial state of the cellular automaton can be defined through the `filename` and `pattern` options. If such options are not specified an initial state is created randomly.

At each new frame a new row in the video is filled with the result of the cellular automaton next generation. The behavior when the whole frame is filled is defined by the `scroll` option.

This source accepts the following options:

`filename, f`

Read the initial cellular automaton state, i.e. the starting row, from the specified file. In the file, each non-whitespace character is considered an alive cell, a newline will terminate the row, and further characters in the file will be ignored.

`pattern, p`

Read the initial cellular automaton state, i.e. the starting row, from the specified string.

Each non-whitespace character in the string is considered an alive cell, a newline will terminate the row, and further characters in the string will be ignored.

`rate, r`

Set the video rate, that is the number of frames generated per second. Default is 25.

`random_fill_ratio, ratio`

Set the random fill ratio for the initial cellular automaton row. It is a floating point number value ranging from 0 to 1, defaults to 1/PHI.

This option is ignored when a file or a pattern is specified.

`random_seed, seed`

Set the seed for filling randomly the initial row, must be an integer included between 0 and `UINT32_MAX`. If not specified, or if explicitly set to -1, the filter will try to use a good random seed on a best effort basis.

`rule`

Set the cellular automaton rule, it is a number ranging from 0 to 255. Default value is 110.

`size, s`

Set the size of the output video. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual.

If `filename` or `pattern` is specified, the size is set by default to the width of the specified initial state row, and the height is set to *width* * PHI.

If `size` is set, it must contain the width of the specified pattern string, and the specified pattern will be centered in the larger row.

If a filename or a pattern string is not specified, the size value defaults to "320x518" (used for a randomly generated initial state).

`scroll`

If set to 1, scroll the output upward when all the rows in the output have been already filled. If set to 0, the new generated row will be written over the top row just after the bottom row is filled. Defaults to 1.

`start_full, full`

If set to 1, completely fill the output with generated rows before outputting the first frame. This is the default behavior, for disabling set the value to 0.

`stitch`

If set to 1, stitch the left and right row edges together. This is the default behavior, for disabling set the value to 0.

11.2.1 Examples# TOC

- Read the initial state from `pattern`, and specify an output of size 200x400.

```
cellauto=f=pattern:s=200x400
```

- Generate a random initial row with a width of 200 cells, with a fill ratio of 2/3:

```
cellauto=ratio=2/3:s=200x200
```

- Create a pattern generated by rule 18 starting by a single alive cell centered on an initial row with width 100:

```
cellauto=p=@:s=100x400:full=0:rule=18
```

- Specify a more elaborated initial pattern:

```
cellauto=p='@@ @ @':s=100x400:full=0:rule=18
```

11.3 coreimagesrc# TOC

Video source generated on GPU using Apple's CoreImage API on OSX.

This video source is a specialized version of the `coreimage` video filter. Use a core image generator at the beginning of the applied filterchain to generate the content.

The `coreimagesrc` video source accepts the following options:

`list_generators`

List all available generators along with all their respective options as well as possible minimum and maximum values along with the default values.

```
list_generators=true
```

`size, s`

Specify the size of the sourced video. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the `ffmpeg-utils` manual. The default value is 320x240.

`rate, r`

Specify the frame rate of the sourced video, as the number of frames generated per second. It has to be a string in the format *frame_rate_num/frame_rate_den*, an integer number, a floating point number or a valid video frame rate abbreviation. The default value is "25".

`sar`

Set the sample aspect ratio of the sourced video.

`duration, d`

Set the duration of the sourced video. See (ffmpeg-utils)the Time duration section in the ffmpeg-utils(1) manual for the accepted syntax.

If not specified, or the expressed duration is negative, the video is supposed to be generated forever.

Additionally, all options of the coreimage video filter are accepted. A complete filterchain can be used for further processing of the generated input without CPU-HOST transfer. See coreimage documentation and examples for details.

11.3.1 Examples# TOC

- Use CIQRCodeGenerator to create a QR code for the FFmpeg homepage, given as complete and escaped command-line for Apple's standard bash shell:

```
ffmpeg -f lavfi -i coreimagesrc=s=100x100:filter=CIQRCodeGenerator@inputMessage=https\\\\\\\\://FFmpeg.org/@inputCorrectionLevel=H -frames:v 1 QRCode.png
```

This example is equivalent to the QRCode example of coreimage without the need for a nullsrc video source.

11.4 mandelbrot# TOC

Generate a Mandelbrot set fractal, and progressively zoom towards the point specified with *start_x* and *start_y*.

This source accepts the following options:

`end_pts`

Set the terminal pts value. Default value is 400.

`end_scale`

Set the terminal scale value. Must be a floating point value. Default value is 0.3.

`inner`

Set the inner coloring mode, that is the algorithm used to draw the Mandelbrot fractal internal region.

It shall assume one of the following values:

black

Set black mode.

convergence

Show time until convergence.

mincol

Set color based on point closest to the origin of the iterations.

period

Set period mode.

Default value is *mincol*.

bailout

Set the bailout value. Default value is 10.0.

maxiter

Set the maximum of iterations performed by the rendering algorithm. Default value is 7189.

outer

Set outer coloring mode. It shall assume one of following values:

iteration_count

Set iteration count mode.

normalized_iteration_count

set normalized iteration count mode.

Default value is *normalized_iteration_count*.

rate, r

Set frame rate, expressed as number of frames per second. Default value is "25".

size, s

Set frame size. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual. Default value is "640x480".

start_scale

Set the initial scale value. Default value is 3.0.

start_x

Set the initial x position. Must be a floating point value between -100 and 100. Default value is -0.743643887037158704752191506114774.

start_y

Set the initial y position. Must be a floating point value between -100 and 100. Default value is -0.131825904205311970493132056385139.

11.5 mptestsrc# TOC

Generate various test patterns, as generated by the MPlayer test filter.

The size of the generated video is fixed, and is 256x256. This source is useful in particular for testing encoding features.

This source accepts the following options:

rate, r

Specify the frame rate of the sourced video, as the number of frames generated per second. It has to be a string in the format *frame_rate_num/frame_rate_den*, an integer number, a floating point number or a valid video frame rate abbreviation. The default value is "25".

duration, d

Set the duration of the sourced video. See (ffmpeg-utils)the Time duration section in the ffmpeg-utils(1) manual for the accepted syntax.

If not specified, or the expressed duration is negative, the video is supposed to be generated forever.

test, t

Set the number or the name of the test to perform. Supported tests are:

dc_luma
dc_chroma
freq_luma
freq_chroma

```
amp_luma
amp_chroma
cbp
mv
ring1
ring2
all
```

Default value is "all", which will cycle through the list of all tests.

Some examples:

```
mptestsrc=t=dc_luma
```

will generate a "dc_luma" test pattern.

11.6 frei0r_src# TOC

Provide a frei0r source.

To enable compilation of this filter you need to install the frei0r header and configure FFmpeg with `--enable-frei0r`.

This source accepts the following parameters:

`size`

The size of the video to generate. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual.

`framerate`

The framerate of the generated video. It may be a string of the form *num/den* or a frame rate abbreviation.

`filter_name`

The name to the frei0r source to load. For more information regarding frei0r and how to set the parameters, read the frei0r section in the video filters documentation.

`filter_params`

A `'`'-separated list of parameters to pass to the frei0r source.

For example, to generate a frei0r partik0l source with size 200x200 and frame rate 10 which is overlaid on the overlay filter main input:

```
freiOr_src=size=200x200:framerate=10:filter_name=partik01:filter_params=1234 [overlay]; [in][overlay] overlay
```

11.7 life# TOC

Generate a life pattern.

This source is based on a generalization of John Conway's life game.

The sourced input represents a life grid, each pixel represents a cell which can be in one of two possible states, alive or dead. Every cell interacts with its eight neighbours, which are the cells that are horizontally, vertically, or diagonally adjacent.

At each interaction the grid evolves according to the adopted rule, which specifies the number of neighbor alive cells which will make a cell stay alive or born. The `rule` option allows one to specify the rule to adopt.

This source accepts the following options:

`filename, f`

Set the file from which to read the initial grid state. In the file, each non-whitespace character is considered an alive cell, and newline is used to delimit the end of each row.

If this option is not specified, the initial grid is generated randomly.

`rate, r`

Set the video rate, that is the number of frames generated per second. Default is 25.

`random_fill_ratio, ratio`

Set the random fill ratio for the initial random grid. It is a floating point number value ranging from 0 to 1, defaults to 1/PHI. It is ignored when a file is specified.

`random_seed, seed`

Set the seed for filling the initial random grid, must be an integer included between 0 and `UINT32_MAX`. If not specified, or if explicitly set to -1, the filter will try to use a good random seed on a best effort basis.

`rule`

Set the life rule.

A rule can be specified with a code of the kind "`SNS/BNB`", where *NS* and *NB* are sequences of numbers in the range 0-8, *NS* specifies the number of alive neighbor cells which make a live cell stay alive, and *NB* the number of alive neighbor cells which make a dead cell to become alive (i.e. to "born"). "s" and "b" can be used in place of "S" and "B", respectively.

Alternatively a rule can be specified by an 18-bits integer. The 9 high order bits are used to encode the next cell state if it is alive for each number of neighbor alive cells, the low order bits specify the rule for "borning" new cells. Higher order bits encode for an higher number of neighbor cells. For example the number $6153 = (12 \ll 9) + 9$ specifies a stay alive rule of 12 and a born rule of 9, which corresponds to "S23/B03".

Default value is "S23/B3", which is the original Conway's game of life rule, and will keep a cell alive if it has 2 or 3 neighbor alive cells, and will born a new cell if there are three alive cells around a dead cell.

`size, s`

Set the size of the output video. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual.

If `filename` is specified, the size is set by default to the same size of the input file. If `size` is set, it must contain the size specified in the input file, and the initial grid defined in that file is centered in the larger resulting area.

If a filename is not specified, the size value defaults to "320x240" (used for a randomly generated initial grid).

`stitch`

If set to 1, stitch the left and right grid edges together, and the top and bottom edges also. Defaults to 1.

`mold`

Set cell mold speed. If set, a dead cell will go from `death_color` to `mold_color` with a step of `mold`. `mold` can have a value from 0 to 255.

`life_color`

Set the color of living (or new born) cells.

`death_color`

Set the color of dead cells. If `mold` is set, this is the first color used to represent a dead cell.

`mold_color`

Set mold color, for definitely dead and moldy cells.

For the syntax of these 3 color options, check the (ffmpeg-utils)"Color" section in the ffmpeg-utils manual.

11.7.1 Examples# TOC

- Read a grid from `pattern`, and center it on a grid of size 300x300 pixels:

```
life=f=pattern:s=300x300
```

- Generate a random grid of size 200x200, with a fill ratio of 2/3:

```
life=ratio=2/3:s=200x200
```

- Specify a custom rule for evolving a randomly generated grid:

```
life=rule=S14/B34
```

- Full example with slow death effect (mold) using `ffplay`:

```
ffplay -f lavfi life=s=300x200:mold=10:r=60:ratio=0.1:death_color=#C83232:life_color=#00ff00,scale=1200:800:flags=16
```

11.8 allrgb, allyuv, color, haldclutsrc, nullsrc, pal75bars, pal100bars, rgbtestsrc, smptebars, smptehdbars, testsrc, testsrc2, yuvtestsrc# TOC

The `allrgb` source returns frames of size 4096x4096 of all rgb colors.

The `allyuv` source returns frames of size 4096x4096 of all yuv colors.

The `color` source provides an uniformly colored input.

The `haldclutsrc` source provides an identity Hald CLUT. See also `haldclut` filter.

The `nullsrc` source returns unprocessed video frames. It is mainly useful to be employed in analysis / debugging tools, or as the source for filters which ignore the input data.

The `pal75bars` source generates a color bars pattern, based on EBU PAL recommendations with 75% color levels.

The `pal100bars` source generates a color bars pattern, based on EBU PAL recommendations with 100% color levels.

The `rgbtestsrc` source generates an RGB test pattern useful for detecting RGB vs BGR issues. You should see a red, green and blue stripe from top to bottom.

The `smptebars` source generates a color bars pattern, based on the SMPTE Engineering Guideline EG 1-1990.

The `smptehdbars` source generates a color bars pattern, based on the SMPTE RP 219-2002.

The `testsrc` source generates a test video pattern, showing a color pattern, a scrolling gradient and a timestamp. This is mainly intended for testing purposes.

The `testsrc2` source is similar to `testsrc`, but supports more pixel formats instead of just `rgb24`. This allows using it as an input for other tests without requiring a format conversion.

The `yuvtestsrc` source generates an YUV test pattern. You should see a y, cb and cr stripe from top to bottom.

The sources accept the following parameters:

`level`

Specify the level of the Hald CLUT, only available in the `haldclutsrc` source. A level of N generates a picture of $N*N*N$ by $N*N*N$ pixels to be used as identity matrix for 3D lookup tables. Each component is coded on a $1/(N*N)$ scale.

`color, c`

Specify the color of the source, only available in the `color` source. For the syntax of this option, check the (ffmpeg-utils)"Color" section in the ffmpeg-utils manual.

`size, s`

Specify the size of the sourced video. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual. The default value is `320x240`.

This option is not available with the `allrgb`, `allyuv`, and `haldclutsrc` filters.

`rate, r`

Specify the frame rate of the sourced video, as the number of frames generated per second. It has to be a string in the format *frame_rate_num/frame_rate_den*, an integer number, a floating point number or a valid video frame rate abbreviation. The default value is "25".

`duration, d`

Set the duration of the sourced video. See (ffmpeg-utils)the Time duration section in the ffmpeg-utils(1) manual for the accepted syntax.

If not specified, or the expressed duration is negative, the video is supposed to be generated forever.

`sar`

Set the sample aspect ratio of the sourced video.

`alpha`

Specify the alpha (opacity) of the background, only available in the `testsrc2` source. The value must be between 0 (fully transparent) and 255 (fully opaque, the default).

`decimals, n`

Set the number of decimals to show in the timestamp, only available in the `testsrc` source.

The displayed timestamp value will correspond to the original timestamp value multiplied by the power of 10 of the specified value. Default value is 0.

11.8.1 Examples# TOC

- Generate a video with a duration of 5.3 seconds, with size 176x144 and a frame rate of 10 frames per second:

```
testsrc=duration=5.3:size=qcif:rate=10
```

- The following graph description will generate a red source with an opacity of 0.2, with size "qcif" and a frame rate of 10 frames per second:

```
color=c:red@0.2:s=qcif:r=10
```

- If the input content is to be ignored, `nullsrc` can be used. The following command generates noise in the luminance plane by employing the `geq` filter:

```
nullsrc=s=256x256, geq=random(1)*255:128:128
```

11.8.2 Commands# TOC

The `color` source supports the following commands:

`c, color`

Set the color of the created image. Accepts the same syntax of the corresponding `color` option.

11.9 openclsrc# TOC

Generate video using an OpenCL program.

`source`

OpenCL program source file.

`kernel`

Kernel name in program.

`size, s`

Size of frames to generate. This must be set.

format

Pixel format to use for the generated frames. This must be set.

rate, r

Number of frames generated every second. Default value is '25'.

For details of how the program loading works, see the `program_opengl` filter.

Example programs:

- Generate a colour ramp by setting pixel values from the position of the pixel in the output image. (Note that this will work with all pixel formats, but the generated output will not be the same.)

```
__kernel void ramp(__write_only image2d_t dst,
                  unsigned int index)
{
    int2 loc = (int2)(get_global_id(0), get_global_id(1));

    float4 val;
    val.xy = val.zw = convert_float2(loc) / convert_float2(get_image_dim(dst));

    write_imagef(dst, loc, val);
}
```

- Generate a Sierpinski carpet pattern, panning by a single pixel each frame.

```
__kernel void sierpinski_carpet(__write_only image2d_t dst,
                                unsigned int index)
{
    int2 loc = (int2)(get_global_id(0), get_global_id(1));

    float4 value = 0.0f;
    int x = loc.x + index;
    int y = loc.y + index;
    while (x > 0 || y > 0) {
        if (x % 3 == 1 && y % 3 == 1) {
            value = 1.0f;
            break;
        }
        x /= 3;
        y /= 3;
    }

    write_imagef(dst, loc, value);
}
```

12 Video Sinks# TOC

Below is a description of the currently available video sinks.

12.1 buffersink# TOC

Buffer video frames, and make them available to the end of the filter graph.

This sink is mainly intended for programmatic use, in particular through the interface defined in `libavfilter/buffersink.h` or the options system.

It accepts a pointer to an `AVBufferSinkContext` structure, which defines the incoming buffers' formats, to be passed as the opaque parameter to `avfilter_init_filter` for initialization.

12.2 nullsink# TOC

Null video sink: do absolutely nothing with the input video. It is mainly useful as a template and for use in analysis / debugging tools.

13 Multimedia Filters# TOC

Below is a description of the currently available multimedia filters.

13.1 abitscope# TOC

Convert input audio to a video output, displaying the audio bit scope.

The filter accepts the following options:

`rate, r`

Set frame rate, expressed as number of frames per second. Default value is "25".

`size, s`

Specify the video size for the output. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual. Default value is 1024x256.

`colors`

Specify list of colors separated by space or by '|' which will be used to draw channels. Unrecognized or missing colors will be replaced by white color.

13.2 ahistogram# TOC

Convert input audio to a video output, displaying the volume histogram.

The filter accepts the following options:

dmode

Specify how histogram is calculated.

It accepts the following values:

‘single’

Use single histogram for all channels.

‘separate’

Use separate histogram for each channel.

Default is single.

rate, r

Set frame rate, expressed as number of frames per second. Default value is "25".

size, s

Specify the video size for the output. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual. Default value is hd720.

scale

Set display scale.

It accepts the following values:

‘log’

logarithmic

‘sqrt’

square root

‘cbrt’

cubic root

‘lin’

linear

‘rlog’

reverse logarithmic

Default is log.

ascale

Set amplitude scale.

It accepts the following values:

‘log’

logarithmic

‘lin’

linear

Default is log.

account

Set how much frames to accumulate in histogram. Defaults is 1. Setting this to -1 accumulates all frames.

rheight

Set histogram ratio of window height.

slide

Set sonogram sliding.

It accepts the following values:

‘replace’

replace old rows with new ones.

‘scroll’

scroll from top to bottom.

Default is replace.

13.3 aphasemeter# TOC

Convert input audio to a video output, displaying the audio phase.

The filter accepts the following options:

`rate, r`

Set the output frame rate. Default value is 25.

`size, s`

Set the video size for the output. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual. Default value is 800x400.

`rc`

`gc`

`bc`

Specify the red, green, blue contrast. Default values are 2, 7 and 1. Allowed range is [0, 255].

`mpc`

Set color which will be used for drawing median phase. If color is none which is default, no median phase value will be drawn.

`video`

Enable video output. Default is enabled.

The filter also exports the frame metadata `lavfi.aphasemeter.phase` which represents mean phase of current audio frame. Value is in range [-1, 1]. The -1 means left and right channels are completely out of phase and 1 means channels are in phase.

13.4 avectorscope# TOC

Convert input audio to a video output, representing the audio vector scope.

The filter is used to measure the difference between channels of stereo audio stream. A monoaural signal, consisting of identical left and right signal, results in straight vertical line. Any stereo separation is visible as a deviation from this line, creating a Lissajous figure. If the straight (or deviation from it) but horizontal line appears this indicates that the left and right channels are out of phase.

The filter accepts the following options:

`mode, m`

Set the vectorscope mode.

Available values are:

`'lissajous'`

Lissajous rotated by 45 degrees.

`'lissajous_xy'`

Same as above but not rotated.

`'polar'`

Shape resembling half of circle.

Default value is `'lissajous'`.

`size, s`

Set the video size for the output. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual. Default value is 400x400.

`rate, r`

Set the output frame rate. Default value is 25.

`rc`

`gc`

`bc`

`ac`

Specify the red, green, blue and alpha contrast. Default values are 40, 160, 80 and 255. Allowed range is [0, 255].

`rf`

`gf`

`bf`

`af`

Specify the red, green, blue and alpha fade. Default values are 15, 10, 5 and 5. Allowed range is [0, 255].

`zoom`

Set the zoom factor. Default value is 1. Allowed range is [0, 10]. Values lower than 1 will auto adjust zoom factor to maximal possible value.

draw

Set the vectorscope drawing mode.

Available values are:

‘dot’

Draw dot for each sample.

‘line’

Draw line between previous and current sample.

Default value is ‘dot’.

scale

Specify amplitude scale of audio samples.

Available values are:

‘lin’

Linear.

‘sqrt’

Square root.

‘cbrt’

Cubic root.

‘log’

Logarithmic.

swap

Swap left channel axis with right channel axis.

mirror

Mirror axis.

‘none’

No mirror.

‘x’

Mirror only x axis.

‘y’

Mirror only y axis.

‘xy’

Mirror both axis.

13.4.1 Examples# TOC

- Complete example using `ffplay`:

```
ffplay -f lavfi 'amovie=input.mp3, asplit [a][out1];  
[a] avectorscope=zoom=1.3:rc=2:gc=200:bc=10:rf=1:gf=8:bf=7 [out0]'
```

13.5 bench, abench# TOC

Benchmark part of a filtergraph.

The filter accepts the following options:

action

Start or stop a timer.

Available values are:

‘start’

Get the current time, set it as frame metadata (using the key `lavfi.bench.start_time`), and forward the frame to the next filter.

‘stop’

Get the current time and fetch the `lavfi.bench.start_time` metadata from the input frame metadata to get the time difference. Time difference, average, maximum and minimum time (respectively `t`, `avg`, `max` and `min`) are then printed. The timestamps are expressed in seconds.

13.5.1 Examples# TOC

- Benchmark selectivecolor filter:

```
bench=start,selectivecolor=reds=-.2 .12 -.49,bench=stop
```

13.6 concat# TOC

Concatenate audio and video streams, joining them together one after the other.

The filter works on segments of synchronized video and audio streams. All segments must have the same number of streams of each type, and that will also be the number of streams at output.

The filter accepts the following options:

`n`

Set the number of segments. Default is 2.

`v`

Set the number of output video streams, that is also the number of video streams in each segment. Default is 1.

`a`

Set the number of output audio streams, that is also the number of audio streams in each segment. Default is 0.

`unsafe`

Activate unsafe mode: do not fail if segments have a different format.

The filter has $v+a$ outputs: first v video outputs, then a audio outputs.

There are $nx(v+a)$ inputs: first the inputs for the first segment, in the same order as the outputs, then the inputs for the second segment, etc.

Related streams do not always have exactly the same duration, for various reasons including codec frame size or sloppy authoring. For that reason, related synchronized streams (e.g. a video and its audio track) should be concatenated at once. The concat filter will use the duration of the longest stream in each segment (except the last one), and if necessary pad shorter audio streams with silence.

For this filter to work correctly, all segments must start at timestamp 0.

All corresponding streams must have the same parameters in all segments; the filtering system will automatically select a common pixel format for video streams, and a common sample format, sample rate and channel layout for audio streams, but other settings, such as resolution, must be converted explicitly by the user.

Different frame rates are acceptable but will result in variable frame rate at output; be sure to configure the output file to handle it.

13.6.1 Examples# TOC

- Concatenate an opening, an episode and an ending, all in bilingual version (video in stream 0, audio in streams 1 and 2):

```
ffmpeg -i opening.mkv -i episode.mkv -i ending.mkv -filter_complex \
'[0:0] [0:1] [0:2] [1:0] [1:1] [1:2] [2:0] [2:1] [2:2]
concat=n=3:v=1:a=2 [v] [a1] [a2]' \
-map '[v]' -map '[a1]' -map '[a2]' output.mkv
```

- Concatenate two parts, handling audio and video separately, using the (a)movie sources, and adjusting the resolution:

```
movie=part1.mp4, scale=512:288 [v1] ; amovie=part1.mp4 [a1] ;
movie=part2.mp4, scale=512:288 [v2] ; amovie=part2.mp4 [a2] ;
[v1] [v2] concat [outv] ; [a1] [a2] concat=v=0:a=1 [outa]
```

Note that a desync will happen at the stitch if the audio and video streams do not have exactly the same duration in the first file.

13.6.2 Commands# TOC

This filter supports the following commands:

next

Close the current segment and step to the next one

13.7 drawgraph, adrawgraph# TOC

Draw a graph using input video or audio metadata.

It accepts the following parameters:

m1

Set 1st frame metadata key from which metadata values will be used to draw a graph.

fg1

Set 1st foreground color expression.

m2

Set 2nd frame metadata key from which metadata values will be used to draw a graph.

fg2

Set 2nd foreground color expression.

m3

Set 3rd frame metadata key from which metadata values will be used to draw a graph.

fg3

Set 3rd foreground color expression.

m4

Set 4th frame metadata key from which metadata values will be used to draw a graph.

fg4

Set 4th foreground color expression.

min

Set minimal value of metadata value.

max

Set maximal value of metadata value.

bg

Set graph background color. Default is white.

mode

Set graph mode.

Available values for mode is:

‘bar’

‘dot’

‘line’

Default is line.

slide

Set slide mode.

Available values for slide is:

`'frame'`

Draw new frame when right border is reached.

`'replace'`

Replace old columns with new ones.

`'scroll'`

Scroll from right to left.

`'rscroll'`

Scroll from left to right.

`'picture'`

Draw single picture.

Default is `frame`.

`size`

Set size of graph video. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual. The default value is 900x256.

The foreground color expressions can use the following variables:

`MIN`

Minimal value of metadata value.

`MAX`

Maximal value of metadata value.

`VAL`

Current metadata key value.

The color is defined as 0xAABBGGRR.

Example using metadata from signalstats filter:

```
signalstats,drawgraph=lavfi.signalstats.YAVG:min=0:max=255
```

Example using metadata from ebur128 filter:

```
ebur128=metadata=1,adrawgraph=lavfi.r128.M:min=-120:max=5
```

13.8 ebur128# TOC

EBU R128 scanner filter. This filter takes an audio stream as input and outputs it unchanged. By default, it logs a message at a frequency of 10Hz with the Momentary loudness (identified by M), Short-term loudness (S), Integrated loudness (I) and Loudness Range (LRA).

The filter also has a video output (see the *video* option) with a real time graph to observe the loudness evolution. The graphic contains the logged message mentioned above, so it is not printed anymore when this option is set, unless the verbose logging is set. The main graphing area contains the short-term loudness (3 seconds of analysis), and the gauge on the right is for the momentary loudness (400 milliseconds).

More information about the Loudness Recommendation EBU R128 on <http://tech.ebu.ch/loudness>.

The filter accepts the following options:

`video`

Activate the video output. The audio stream is passed unchanged whether this option is set or no. The video stream will be the first output stream if activated. Default is 0.

`size`

Set the video size. This option is for video only. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual. Default and minimum resolution is 640x480.

`meter`

Set the EBU scale meter. Default is 9. Common values are 9 and 18, respectively for EBU scale meter +9 and EBU scale meter +18. Any other integer value between this range is allowed.

`metadata`

Set metadata injection. If set to 1, the audio input will be segmented into 100ms output frames, each of them containing various loudness information in metadata. All the metadata keys are prefixed with `lavfi.r128..`

Default is 0.

`framelog`

Force the frame logging level.

Available values are:

`'info'`

information logging level

`'verbose'`

verbose logging level

By default, the logging level is set to *info*. If the `video` or the `metadata` options are set, it switches to *verbose*.

peak

Set peak mode(s).

Available modes can be cumulated (the option is a `flag` type). Possible values are:

`'none'`

Disable any peak mode (default).

`'sample'`

Enable sample-peak mode.

Simple peak mode looking for the higher sample value. It logs a message for sample-peak (identified by `SPK`).

`'true'`

Enable true-peak mode.

If enabled, the peak lookup is done on an over-sampled version of the input stream for better peak accuracy. It logs a message for true-peak. (identified by `TPK`) and true-peak per frame (identified by `FTPK`). This mode requires a build with `libswresample`.

dualmono

Treat mono input files as "dual mono". If a mono file is intended for playback on a stereo system, its EBU R128 measurement will be perceptually incorrect. If set to `true`, this option will compensate for this effect. Multi-channel input files are not affected by this option.

panlaw

Set a specific pan law to be used for the measurement of dual mono files. This parameter is optional, and has a default value of `-3.01dB`.

13.8.1 Examples# TOC

- Real-time graph using `ffplay`, with a EBU scale meter +18:

```
ffplay -f lavfi -i "amovie=input.mp3,ebur128=video=1:meter=18 [out0][out1]"
```

- Run an analysis with `ffmpeg`:

```
ffmpeg -nostats -i input.mp3 -filter_complex ebur128 -f null -
```

13.9 interleave, ainterleave# TOC

Temporally interleave frames from several inputs.

`interleave` works with video inputs, `ainterleave` with audio.

These filters read frames from several inputs and send the oldest queued frame to the output.

Input streams must have well defined, monotonically increasing frame timestamp values.

In order to submit one frame to output, these filters need to enqueue at least one frame for each input, so they cannot work in case one input is not yet terminated and will not receive incoming frames.

For example consider the case when one input is a `select` filter which always drops input frames. The `interleave` filter will keep reading from that input, but it will never be able to send new frames to output until the input sends an end-of-stream signal.

Also, depending on inputs synchronization, the filters will drop frames in case one input receives more frames than the other ones, and the queue is already filled.

These filters accept the following options:

`nb_inputs, n`

Set the number of different inputs, it is 2 by default.

13.9.1 Examples# TOC

- Interleave frames belonging to different streams using `ffmpeg`:

```
ffmpeg -i bambi.avi -i pr0n.mkv -filter_complex "[0:v][1:v] interleave" out.avi
```

- Add flickering blur effect:

```
select='if(gt(random(0), 0.2), 1, 2)':n=2 [tmp], boxblur=2:2, [tmp] interleave
```

13.10 metadata, ametadata# TOC

Manipulate frame metadata.

This filter accepts the following options:

`mode`

Set mode of operation of the filter.

Can be one of the following:

`'select'`

If both `value` and `key` is set, select frames which have such metadata. If only `key` is set, select every frame that has such key in metadata.

`'add'`

Add new metadata `key` and `value`. If `key` is already available do nothing.

`'modify'`

Modify value of already present key.

`'delete'`

If `value` is set, delete only keys that have such value. Otherwise, delete key. If `key` is not set, delete all metadata values in the frame.

`'print'`

Print key and its value if metadata was found. If `key` is not set print all metadata values available in frame.

`key`

Set key used with all modes. Must be set for all modes except `print` and `delete`.

`value`

Set metadata value which will be used. This option is mandatory for `modify` and `add` mode.

`function`

Which function to use when comparing metadata value and `value`.

Can be one of following:

`'same_str'`

Values are interpreted as strings, returns true if metadata value is same as `value`.

`'starts_with'`

Values are interpreted as strings, returns true if metadata value starts with the `value` option string.

`'less'`

Values are interpreted as floats, returns true if metadata value is less than `value`.

`'equal'`

Values are interpreted as floats, returns true if `value` is equal with metadata value.

`'greater'`

Values are interpreted as floats, returns true if metadata value is greater than `value`.

`'expr'`

Values are interpreted as floats, returns true if expression from option `expr` evaluates to true.

`expr`

Set expression which is used when `function` is set to `expr`. The expression is evaluated through the eval API and can contain the following constants:

`VALUE1`

Float representation of `value` from metadata key.

`VALUE2`

Float representation of `value` as supplied by user in `value` option.

`file`

If specified in `print` mode, output is written to the named file. Instead of plain filename any writable url can be specified. Filename `"-"` is a shorthand for standard output. If `file` option is not set, output is written to the log with `AV_LOG_INFO` loglevel.

13.10.1 Examples# TOC

- Print all metadata values for frames with key `lavfi.signalstats.YDIF` with values between 0 and 1.

```
signalstats,metadata=print:key=lavfi.signalstats.YDIF:value=0:function=expr:expr='between(VALUE1,0,1)'
```

- Print silencedetect output to file `metadata.txt`.

```
silencedetect,ametadata=mode=print:file=metadata.txt
```

- Direct all metadata to a pipe with file descriptor 4.

```
metadata=mode=print:file='pipe\4'
```

13.11 perms, aperms# TOC

Set read/write permissions for the output frames.

These filters are mainly aimed at developers to test direct path in the following filter in the filtergraph.

The filters accept the following options:

`mode`

Select the permissions mode.

It accepts the following values:

`'none'`

Do nothing. This is the default.

`'ro'`

Set all the output frames read-only.

`'rw'`

Set all the output frames directly writable.

`'toggle'`

Make the frame read-only if writable, and writable if read-only.

`'random'`

Set each output frame read-only or writable randomly.

`seed`

Set the seed for the *random* mode, must be an integer included between 0 and `UINT32_MAX`. If not specified, or if explicitly set to `-1`, the filter will try to use a good random seed on a best effort basis.

Note: in case of auto-inserted filter between the permission filter and the following one, the permission might not be received as expected in that following filter. Inserting a format or aformat filter before the perms/aprms filter can avoid this problem.

13.12 realtime, arealtime# TOC

Slow down filtering to match real time approximately.

These filters will pause the filtering for a variable amount of time to match the output rate with the input timestamps. They are similar to the `re` option to `ffmpeg`.

They accept the following options:

`limit`

Time limit for the pauses. Any pause longer than that will be considered a timestamp discontinuity and reset the timer. Default is 2 seconds.

13.13 select, aselect# TOC

Select frames to pass in output.

This filter accepts the following options:

`expr, e`

Set expression, which is evaluated for each input frame.

If the expression is evaluated to zero, the frame is discarded.

If the evaluation result is negative or NaN, the frame is sent to the first output; otherwise it is sent to the output with index `ceil(val) - 1`, assuming that the input index starts from 0.

For example a value of `1.2` corresponds to the output with index `ceil(1.2) - 1 = 2 - 1 = 1`, that is the second output.

`outputs, n`

Set the number of outputs. The output to which to send the selected frame is based on the result of the evaluation. Default value is 1.

The expression can contain the following constants:

`n`

The (sequential) number of the filtered frame, starting from 0.

`selected_n`

The (sequential) number of the selected frame, starting from 0.

`prev_selected_n`

The sequential number of the last selected frame. It's NAN if undefined.

`TB`

The timebase of the input timestamps.

`pts`

The PTS (Presentation TimeStamp) of the filtered video frame, expressed in *TB* units. It's NAN if undefined.

`t`

The PTS of the filtered video frame, expressed in seconds. It's NAN if undefined.

`prev_pts`

The PTS of the previously filtered video frame. It's NAN if undefined.

`prev_selected_pts`

The PTS of the last previously filtered video frame. It's NAN if undefined.

`prev_selected_t`

The PTS of the last previously selected video frame, expressed in seconds. It's NAN if undefined.

`start_pts`

The PTS of the first video frame in the video. It's NAN if undefined.

`start_t`

The time of the first video frame in the video. It's NAN if undefined.

`pict_type` (*video only*)

The type of the filtered frame. It can assume one of the following values:

I

P

B

S
SI
SP
BI

`interlace_type` (*video only*)

The frame interlace type. It can assume one of the following values:

PROGRESSIVE

The frame is progressive (not interlaced).

TOPFIRST

The frame is top-field-first.

BOTTOMFIRST

The frame is bottom-field-first.

`consumed_sample_n` (*audio only*)

the number of selected samples before the current frame

`samples_n` (*audio only*)

the number of samples in the current frame

`sample_rate` (*audio only*)

the input sample rate

`key`

This is 1 if the filtered frame is a key-frame, 0 otherwise.

`pos`

the position in the file of the filtered frame, -1 if the information is not available (e.g. for synthetic video)

`scene` (*video only*)

value between 0 and 1 to indicate a new scene; a low value reflects a low probability for the current frame to introduce a new scene, while a higher value means the current frame is more likely to be one (see the example below)

`concatdec_select`

The concat demuxer can select only part of a concat input file by setting an inpoint and an outpoint, but the output packets may not be entirely contained in the selected interval. By using this variable, it is possible to skip frames generated by the concat demuxer which are not exactly contained in the selected interval.

This works by comparing the frame pts against the *lavf.concat.start_time* and the *lavf.concat.duration* packet metadata values which are also present in the decoded frames.

The *concatdec_select* variable is -1 if the frame pts is at least start_time and either the duration metadata is missing or the frame pts is less than start_time + duration, 0 otherwise, and NaN if the start_time metadata is missing.

That basically means that an input frame is selected if its pts is within the interval set by the concat demuxer.

The default value of the select expression is "1".

13.13.1 Examples# TOC

- Select all frames in input:

```
select
```

The example above is the same as:

```
select=1
```

- Skip all frames:

```
select=0
```

- Select only I-frames:

```
select='eq(pict_type\,I)'
```

- Select one frame every 100:

```
select='not(mod(n\,100))'
```

- Select only frames contained in the 10-20 time interval:

```
select=between(t\,10\,20)
```

- Select only I-frames contained in the 10-20 time interval:

```
select=between(t\,10\,20)*eq(pict_type\,I)
```

- Select frames with a minimum distance of 10 seconds:

```
select='isnan(prev_selected_t)+gte(t-prev_selected_t\,10)'
```

- Use *aselect* to select only audio frames with samples number > 100:

```
aselect='gt(samples_n\,100)'
```

- Create a mosaic of the first scenes:

```
ffmpeg -i video.avi -vf select='gt(scene\,0.4)',scale=160:120,tile -frames:v 1 preview.png
```

Comparing *scene* against a value between 0.3 and 0.5 is generally a sane choice.

- Send even and odd frames to separate outputs, and compose them:

```
select=n=2:e='mod(n, 2)+1' [odd][even]; [odd] pad=h=2*ih [tmp]; [tmp][even] overlay=y=h
```

- Select useful frames from an `ffconcat` file which is using inpoints and outpoints but where the source files are not intra frame only.

```
ffmpeg -copyts -vsync 0 -segment_time_metadata 1 -i input.ffconcat -vf select=concatdec_select -af aselect=concatdec_select output.avi
```

13.14 sendcmd, asendcmd# TOC

Send commands to filters in the filtergraph.

These filters read commands to be sent to other filters in the filtergraph.

`sendcmd` must be inserted between two video filters, `asendcmd` must be inserted between two audio filters, but apart from that they act the same way.

The specification of commands can be provided in the filter arguments with the *commands* option, or in a file specified by the *filename* option.

These filters accept the following options:

`commands, c`

Set the commands to be read and sent to the other filters.

`filename, f`

Set the filename of the commands to be read and sent to the other filters.

13.14.1 Commands syntax# TOC

A commands description consists of a sequence of interval specifications, comprising a list of commands to be executed when a particular event related to that interval occurs. The occurring event is typically the current frame time entering or leaving a given time interval.

An interval is specified by the following syntax:

```
START[-END] COMMANDS;
```

The time interval is specified by the *START* and *END* times. *END* is optional and defaults to the maximum time.

The current frame time is considered within the specified interval if it is included in the interval [*START*, *END*), that is when the time is greater or equal to *START* and is lesser than *END*.

COMMANDS consists of a sequence of one or more command specifications, separated by ",", relating to that interval. The syntax of a command specification is given by:

```
[FLAGS] TARGET COMMAND ARG
```

FLAGS is optional and specifies the type of events relating to the time interval which enable sending the specified command, and must be a non-null sequence of identifier flags separated by "+" or "|" and enclosed between "[" and "]".

The following flags are recognized:

`enter`

The command is sent when the current frame timestamp enters the specified interval. In other words, the command is sent when the previous frame timestamp was not in the given interval, and the current is.

`leave`

The command is sent when the current frame timestamp leaves the specified interval. In other words, the command is sent when the previous frame timestamp was in the given interval, and the current is not.

If *FLAGS* is not specified, a default value of [`enter`] is assumed.

TARGET specifies the target of the command, usually the name of the filter class or a specific filter instance name.

COMMAND specifies the name of the command for the target filter.

ARG is optional and specifies the optional list of argument for the given *COMMAND*.

Between one interval specification and another, whitespaces, or sequences of characters starting with # until the end of line, are ignored and can be used to annotate comments.

A simplified BNF description of the commands specification syntax follows:

```
COMMAND_FLAG ::= "enter" | "leave"  
COMMAND_FLAGS ::= COMMAND_FLAG [ (+ | " | ") COMMAND_FLAG ]  
COMMAND ::= [ "[" COMMAND_FLAGS "]" ] TARGET COMMAND [ARG]  
COMMANDS ::= COMMAND [ , COMMANDS ]  
INTERVAL ::= START [ - END ] COMMANDS  
INTERVALS ::= INTERVAL [ ; INTERVALS ]
```


13.14.2 Examples# TOC

- Specify audio tempo change at second 4:

```
asendcmd=c='4.0 atempo tempo 1.5',atempo
```

- Target a specific filter instance:

```
asendcmd=c='4.0 atempo@my tempo 1.5',atempo@my
```

- Specify a list of drawtext and hue commands in a file.

```
# show text in the interval 5-10
5.0-10.0 [enter] drawtext reinit 'fontfile=FreeSerif.ttf:text=hello world',
[leave] drawtext reinit 'fontfile=FreeSerif.ttf:text=';

# desaturate the image in the interval 15-20
15.0-20.0 [enter] hue s 0,
[enter] drawtext reinit 'fontfile=FreeSerif.ttf:text=nocolor',
[leave] hue s 1,
[leave] drawtext reinit 'fontfile=FreeSerif.ttf:text=color';

# apply an exponential saturation fade-out effect, starting from time 25
25 [enter] hue s exp(25-t)
```

A filtergraph allowing to read and process the above command list stored in a file `test.cmd`, can be specified with:

```
sendcmd=f=test.cmd,drawtext=fontfile=FreeSerif.ttf:text='',hue
```

13.15 setpts, asetpts# TOC

Change the PTS (presentation timestamp) of the input frames.

`setpts` works on video frames, `asetpts` on audio frames.

This filter accepts the following options:

`expr`

The expression which is evaluated for each frame to construct its timestamp.

The expression is evaluated through the eval API and can contain the following constants:

`FRAME_RATE`

frame rate, only defined for constant frame-rate video

`PTS`

The presentation timestamp in input

N

The count of the input frame for video or the number of consumed samples, not including the current frame for audio, starting from 0.

NB_CONSUMED_SAMPLES

The number of consumed samples, not including the current frame (only audio)

NB_SAMPLES, S

The number of samples in the current frame (only audio)

SAMPLE_RATE, SR

The audio sample rate.

STARTPTS

The PTS of the first frame.

STARTT

the time in seconds of the first frame

INTERLACED

State whether the current frame is interlaced.

T

the time in seconds of the current frame

POS

original position in the file of the frame, or undefined if undefined for the current frame

PREV_INPTS

The previous input PTS.

PREV_INT

previous input time in seconds

PREV_OUTPTS

The previous output PTS.

PREV_OUTT

previous output time in seconds

RTCTIME

The wallclock (RTC) time in microseconds. This is deprecated, use time(0) instead.

RTCSTART

The wallclock (RTC) time at the start of the movie in microseconds.

TB

The timebase of the input timestamps.

13.15.1 Examples# TOC

- Start counting PTS from zero

```
setpts=PTS-STARTPTS
```

- Apply fast motion effect:

```
setpts=0.5*PTS
```

- Apply slow motion effect:

```
setpts=2.0*PTS
```

- Set fixed rate of 25 frames per second:

```
setpts=N/(25*Tb)
```

- Set fixed rate 25 fps with some jitter:

```
setpts='1/(25*Tb) * (N + 0.05 * sin(N*2*PI/25))'
```

- Apply an offset of 10 seconds to the input PTS:

```
setpts=PTS+10/Tb
```

- Generate timestamps from a "live source" and rebase onto the current timebase:

```
setpts='(RTCTIME - RTCSTART) / (Tb * 1000000)'
```

- Generate timestamps by counting samples:

```
asetpts=N/SR/Tb
```

13.16 setrange# TOC

Force color range for the output video frame.

The `setrange` filter marks the color range property for the output frames. It does not change the input frame, but only sets the corresponding property, which affects how the frame is treated by following filters.

The filter accepts the following options:

`range`

Available values are:

`'auto'`

Keep the same color range property.

`'unspecified, unknown'`

Set the color range as unspecified.

`'limited, tv, mpeg'`

Set the color range as limited.

`'full, pc, jpeg'`

Set the color range as full.

13.17 settb, asettb# TOC

Set the timebase to use for the output frames timestamps. It is mainly useful for testing timebase configuration.

It accepts the following parameters:

`expr, tb`

The expression which is evaluated into the output timebase.

The value for `tb` is an arithmetic expression representing a rational. The expression can contain the constants "AVTB" (the default timebase), "intb" (the input timebase) and "sr" (the sample rate, audio only). Default value is "intb".

13.17.1 Examples# TOC

- Set the timebase to 1/25:

```
settb=expr=1/25
```

- Set the timebase to 1/10:

```
settb=expr=0.1
```

- Set the timebase to 1001/1000:

```
settb=1+0.001
```

- Set the timebase to 2*intb:

```
settb=2*intb
```

- Set the default timebase value:

```
settb=AVTB
```

13.18 showcqt# TOC

Convert input audio to a video output representing frequency spectrum logarithmically using Brown-Puckette constant Q transform algorithm with direct frequency domain coefficient calculation (but the transform itself is not really constant Q, instead the Q factor is actually variable/clamped), with musical tone scale, from E0 to D#10.

The filter accepts the following options:

`size, s`

Specify the video size for the output. It must be even. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual. Default value is 1920x1080.

`fps, rate, r`

Set the output frame rate. Default value is 25.

`bar_h`

Set the bargraph height. It must be even. Default value is -1 which computes the bargraph height automatically.

`axis_h`

Set the axis height. It must be even. Default value is -1 which computes the axis height automatically.

sono_h

Set the sonogram height. It must be even. Default value is -1 which computes the sonogram height automatically.

fullhd

Set the fullhd resolution. This option is deprecated, use *size*, *s* instead. Default value is 1.

sono_v, volume

Specify the sonogram volume expression. It can contain variables:

bar_v

the *bar_v* evaluated expression

frequency, freq, f

the frequency where it is evaluated

timeclamp, tc

the value of *timeclamp* option

and functions:

a_weighting(f)

A-weighting of equal loudness

b_weighting(f)

B-weighting of equal loudness

c_weighting(f)

C-weighting of equal loudness.

Default value is 16.

bar_v, volume2

Specify the bargraph volume expression. It can contain variables:

sono_v

the *sono_v* evaluated expression

frequency, freq, f

the frequency where it is evaluated

timeclamp, tc

the value of *timeclamp* option

and functions:

a_weighting(f)

A-weighting of equal loudness

b_weighting(f)

B-weighting of equal loudness

c_weighting(f)

C-weighting of equal loudness.

Default value is `sono_v`.

sono_g, gamma

Specify the sonogram gamma. Lower gamma makes the spectrum more contrast, higher gamma makes the spectrum having more range. Default value is 3. Acceptable range is [1, 7].

bar_g, gamma2

Specify the bargraph gamma. Default value is 1. Acceptable range is [1, 7].

bar_t

Specify the bargraph transparency level. Lower value makes the bargraph sharper. Default value is 1. Acceptable range is [0, 1].

timeclamp, tc

Specify the transform timeclamp. At low frequency, there is trade-off between accuracy in time domain and frequency domain. If timeclamp is lower, event in time domain is represented more accurately (such as fast bass drum), otherwise event in frequency domain is represented more accurately (such as bass guitar). Acceptable range is [0.002, 1]. Default value is 0.17.

attack

Set attack time in seconds. The default is 0 (disabled). Otherwise, it limits future samples by applying asymmetric windowing in time domain, useful when low latency is required. Accepted range is [0, 1].

`basefreq`

Specify the transform base frequency. Default value is 20.01523126408007475 , which is frequency 50 cents below E0. Acceptable range is $[10, 100000]$.

`endfreq`

Specify the transform end frequency. Default value is 20495.59681441799654 , which is frequency 50 cents above D#10. Acceptable range is $[10, 100000]$.

`coeffclamp`

This option is deprecated and ignored.

`tlength`

Specify the transform length in time domain. Use this option to control accuracy trade-off between time domain and frequency domain at every frequency sample. It can contain variables:

`frequency, freq, f`

the frequency where it is evaluated

`timeclamp, tc`

the value of *timeclamp* option.

Default value is $384 * tc / (384 + tc * f)$.

`count`

Specify the transform count for every video frame. Default value is 6. Acceptable range is $[1, 30]$.

`fcount`

Specify the transform count for every single pixel. Default value is 0, which makes it computed automatically. Acceptable range is $[0, 10]$.

`fontfile`

Specify font file for use with freetype to draw the axis. If not specified, use embedded font. Note that drawing with font file or embedded font is not implemented with custom *basefreq* and *endfreq*, use *axisfile* option instead.

`font`

Specify fontconfig pattern. This has lower priority than *fontfile*. The `:` in the pattern may be replaced by `|` to avoid unnecessary escaping.

fontcolor

Specify font color expression. This is arithmetic expression that should return integer value 0xRRGGBB. It can contain variables:

frequency, freq, f

the frequency where it is evaluated

timeclamp, tc

the value of *timeclamp* option

and functions:

midi(f)

midi number of frequency f, some midi numbers: E0(16), C1(24), C2(36), A4(69)

r(x), g(x), b(x)

red, green, and blue value of intensity x.

Default value is `st(0, (midi(f)-59.5)/12); st(1, if(between(ld(0), 0, 1), 0.5-0.5*cos(2*PI*ld(0)), 0)); r(1-lld(1)) + b(lld(1)).`

axisfile

Specify image file to draw the axis. This option override *fontfile* and *fontcolor* option.

axis, text

Enable/disable drawing text to the axis. If it is set to 0, drawing to the axis is disabled, ignoring *fontfile* and *axisfile* option. Default value is 1.

csp

Set colorspace. The accepted values are:

'unspecified'

Unspecified (default)

'bt709'

BT.709

'fcc'

FCC

'bt470bg'

BT.470BG or BT.601-6 625

'smpte170m'

SMPTE-170M or BT.601-6 525

'smpte240m'

SMPTE-240M

'bt2020ncl'

BT.2020 with non-constant luminance

cscheme

Set spectrogram color scheme. This is list of floating point values with format left_r|left_g|left_b|right_r|right_g|right_b. The default is 1|0.5|0|0|0.5|1.

13.18.1 Examples# TOC

- Playing audio while showing the spectrum:

```
ffplay -f lavfi 'amovie=a.mp3, asplit [a][out1]; [a] showcqt [out0]'
```

- Same as above, but with frame rate 30 fps:

```
ffplay -f lavfi 'amovie=a.mp3, asplit [a][out1]; [a] showcqt=fps=30:count=5 [out0]'
```

- Playing at 1280x720:

```
ffplay -f lavfi 'amovie=a.mp3, asplit [a][out1]; [a] showcqt=s=1280x720:count=4 [out0]'
```

- Disable sonogram display:

```
sono_h=0
```

- A1 and its harmonics: A1, A2, (near)E3, A3:

```
ffplay -f lavfi 'aevalsrc=0.1*sin(2*PI*55*t)+0.1*sin(4*PI*55*t)+0.1*sin(6*PI*55*t)+0.1*sin(8*PI*55*t), asplit[a][out1]; [a] showcqt [out0]'
```

- Same as above, but with more accuracy in frequency domain:

```
ffplay -f lavfi 'aevalsrc=0.1*sin(2*PI*55*t)+0.1*sin(4*PI*55*t)+0.1*sin(6*PI*55*t)+0.1*sin(8*PI*55*t), asplit[a][out1]; [a] showcqt=timeclamp=0.5 [out0]'
```

- Custom volume:

```
bar_v=10:sono_v=bar_v*a_weighting(f)
```

- Custom gamma, now spectrum is linear to the amplitude.

```
bar_g=2:sono_g=2
```

- Custom tlength equation:

```
tc=0.33:tlength='st(0,0.17); 384*tc / (384 / ld(0) + tc*f / (1-ld(0))) + 384*tc / (tc*f / ld(0) + 384 / (1-ld(0)))'
```

- Custom fontcolor and fontfile, C-note is colored green, others are colored blue:

```
fontcolor='if(mod(floor(midi(f)+0.5),12), 0x0000FF, g(1))':fontfile=myfont.ttf
```

- Custom font using fontconfig:

```
font='Courier New,Monospace,mono|bold'
```

- Custom frequency range with custom axis using image file:

```
axisfile=myaxis.png:basefreq=40:endfreq=10000
```

13.19 showfreqs# TOC

Convert input audio to video output representing the audio power spectrum. Audio amplitude is on Y-axis while frequency is on X-axis.

The filter accepts the following options:

size, s

Specify size of video. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual. Default is 1024x512.

mode

Set display mode. This set how each frequency bin will be represented.

It accepts the following values:

```
'line'  
'bar'  
'dot'
```

Default is bar.

ascale

Set amplitude scale.

It accepts the following values:

`'lin'`

Linear scale.

`'sqrt'`

Square root scale.

`'cbrt'`

Cubic root scale.

`'log'`

Logarithmic scale.

Default is `log`.

`fscale`

Set frequency scale.

It accepts the following values:

`'lin'`

Linear scale.

`'log'`

Logarithmic scale.

`'rlog'`

Reverse logarithmic scale.

Default is `lin`.

`win_size`

Set window size.

It accepts the following values:

`'w16'`

`'w32'`

`'w64'`
`'w128'`
`'w256'`
`'w512'`
`'w1024'`
`'w2048'`
`'w4096'`
`'w8192'`
`'w16384'`
`'w32768'`
`'w65536'`

Default is `w2048`

`win_func`

Set windowing function.

It accepts the following values:

`'rect'`
`'bartlett'`
`'hanning'`
`'hamming'`
`'blackman'`
`'welch'`
`'flattop'`
`'bharris'`
`'bnuuttall'`
`'bhann'`
`'sine'`
`'nutall'`
`'lanczos'`
`'gauss'`
`'tukey'`
`'dolph'`
`'cauchy'`
`'parzen'`
`'poisson'`

Default is `hanning`.

`overlap`

Set window overlap. In range `[0, 1]`. Default is 1, which means optimal overlap for selected window function will be picked.

averaging

Set time averaging. Setting this to 0 will display current maximal peaks. Default is 1, which means time averaging is disabled.

colors

Specify list of colors separated by space or by '|' which will be used to draw channel frequencies. Unrecognized or missing colors will be replaced by white color.

cmode

Set channel display mode.

It accepts the following values:

'combined'

'separate'

Default is combined.

minamp

Set minimum amplitude used in log amplitude scaler.

13.20 showspectrum# TOC

Convert input audio to a video output, representing the audio frequency spectrum.

The filter accepts the following options:

size, s

Specify the video size for the output. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual. Default value is 640x512.

slide

Specify how the spectrum should slide along the window.

It accepts the following values:

'replace'

the samples start again on the left when they reach the right

'scroll'

the samples scroll from right to left

`'fullframe'`

frames are only produced when the samples reach the right

`'rscroll'`

the samples scroll from left to right

Default value is `replace`.

`mode`

Specify display mode.

It accepts the following values:

`'combined'`

all channels are displayed in the same row

`'separate'`

all channels are displayed in separate rows

Default value is `'combined'`.

`color`

Specify display color mode.

It accepts the following values:

`'channel'`

each channel is displayed in a separate color

`'intensity'`

each channel is displayed using the same color scheme

`'rainbow'`

each channel is displayed using the rainbow color scheme

`'moreland'`

each channel is displayed using the moreland color scheme

`'nebulae'`

each channel is displayed using the nebulae color scheme

`'fire'`

each channel is displayed using the fire color scheme

`'fiery'`

each channel is displayed using the fiery color scheme

`'fruit'`

each channel is displayed using the fruit color scheme

`'cool'`

each channel is displayed using the cool color scheme

Default value is `'channel'`.

`scale`

Specify scale used for calculating intensity color values.

It accepts the following values:

`'lin'`

linear

`'sqrt'`

square root, default

`'cbrt'`

cubic root

`'log'`

logarithmic

`'4thrt'`

4th root

`'5thrt'`

5th root

Default value is `'sqrt'`.

saturation

Set saturation modifier for displayed colors. Negative values provide alternative color scheme. 0 is no saturation at all. Saturation must be in `[-10.0, 10.0]` range. Default value is 1.

win_func

Set window function.

It accepts the following values:

`'rect'`
`'bartlett'`
`'hann'`
`'hanning'`
`'hamming'`
`'blackman'`
`'welch'`
`'flattop'`
`'bharris'`
`'bnuuttall'`
`'bhann'`
`'sine'`
`'nutttall'`
`'lanczos'`
`'gauss'`
`'tukey'`
`'dolph'`
`'cauchy'`
`'parzen'`
`'poisson'`

Default value is `hann`.

orientation

Set orientation of time vs frequency axis. Can be `vertical` or `horizontal`. Default is `vertical`.

overlap

Set ratio of overlap window. Default value is 0. When value is 1 overlap is set to recommended size for specific window function currently used.

gain

Set scale gain for calculating intensity color values. Default value is 1.

data

Set which data to display. Can be magnitude, default or phase.

rotation

Set color rotation, must be in [-1.0, 1.0] range. Default value is 0.

The usage is very similar to the showwaves filter; see the examples in that section.

13.20.1 Examples# TOC

- Large window with logarithmic color scaling:

```
showspectrum=s=1280x480:scale=log
```

- Complete example for a colored and sliding spectrum per channel using `ffplay`:

```
ffplay -f lavfi 'amovie=input.mp3, asplit [a][out1];  
[a] showspectrum=mode=separate:color=intensity:slide=1:scale=cbrt [out0]'
```

13.21 showspectrum# TOC

Convert input audio to a single video frame, representing the audio frequency spectrum.

The filter accepts the following options:

size, s

Specify the video size for the output. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual. Default value is 4096x2048.

mode

Specify display mode.

It accepts the following values:

'combined'

all channels are displayed in the same row

‘separate’

all channels are displayed in separate rows

Default value is ‘combined’.

color

Specify display color mode.

It accepts the following values:

‘channel’

each channel is displayed in a separate color

‘intensity’

each channel is displayed using the same color scheme

‘rainbow’

each channel is displayed using the rainbow color scheme

‘moreland’

each channel is displayed using the moreland color scheme

‘nebulae’

each channel is displayed using the nebulae color scheme

‘fire’

each channel is displayed using the fire color scheme

‘fiery’

each channel is displayed using the fiery color scheme

‘fruit’

each channel is displayed using the fruit color scheme

‘cool’

each channel is displayed using the cool color scheme

Default value is 'intensity'.

scale

Specify scale used for calculating intensity color values.

It accepts the following values:

'lin'

linear

'sqrt'

square root, default

'cbrt'

cubic root

'log'

logarithmic

'4thrt'

4th root

'5thrt'

5th root

Default value is 'log'.

saturation

Set saturation modifier for displayed colors. Negative values provide alternative color scheme. 0 is no saturation at all. Saturation must be in [-10.0, 10.0] range. Default value is 1.

win_func

Set window function.

It accepts the following values:

'rect'

`'bartlett'`
`'hann'`
`'hanning'`
`'hamming'`
`'blackman'`
`'welch'`
`'flattop'`
`'bharris'`
`'bnuttall'`
`'bhann'`
`'sine'`
`'nutall'`
`'lanczos'`
`'gauss'`
`'tukey'`
`'dolph'`
`'cauchy'`
`'parzen'`
`'poisson'`

Default value is hann.

orientation

Set orientation of time vs frequency axis. Can be vertical or horizontal. Default is vertical.

gain

Set scale gain for calculating intensity color values. Default value is 1.

legend

Draw time and frequency axes and legends. Default is enabled.

rotation

Set color rotation, must be in [-1.0, 1.0] range. Default value is 0.

13.21.1 Examples# TOC

- Extract an audio spectrogram of a whole audio track in a 1024x1024 picture using ffmpeg:

```
ffmpeg -i audio.flac -lavfi showspectrum:s=1024x1024 spectrogram.png
```

13.22 showvolume# TOC

Convert input audio volume to a video output.

The filter accepts the following options:

rate, r

Set video rate.

b

Set border width, allowed range is [0, 5]. Default is 1.

w

Set channel width, allowed range is [80, 8192]. Default is 400.

h

Set channel height, allowed range is [1, 900]. Default is 20.

f

Set fade, allowed range is [0, 1]. Default is 0.95.

c

Set volume color expression.

The expression can use the following variables:

VOLUME

Current max volume of channel in dB.

PEAK

Current peak.

CHANNEL

Current channel number, starting from 0.

t

If set, displays channel names. Default is enabled.

v

If set, displays volume values. Default is enabled.

o

Set orientation, can be horizontal: h or vertical: v, default is h.

s

Set step size, allowed range is [0, 5]. Default is 0, which means step is disabled.

p

Set background opacity, allowed range is [0, 1]. Default is 0.

m

Set metering mode, can be peak: p or rms: r, default is p.

ds

Set display scale, can be linear: lin or log: log, default is lin.

dm

In second. If set to > 0., display a line for the max level in the previous seconds. default is disabled: 0.

dmc

The color of the max line. Use when dm option is set to > 0. default is: orange

13.23 showwaves# TOC

Convert input audio to a video output, representing the samples waves.

The filter accepts the following options:

size, s

Specify the video size for the output. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual. Default value is 600x240.

mode

Set display mode.

Available values are:

`'point'`

Draw a point for each sample.

`'line'`

Draw a vertical line for each sample.

`'p2p'`

Draw a point for each sample and a line between them.

`'cline'`

Draw a centered vertical line for each sample.

Default value is `point`.

`n`

Set the number of samples which are printed on the same column. A larger value will decrease the frame rate. Must be a positive integer. This option can be set only if the value for *rate* is not explicitly specified.

`rate, r`

Set the (approximate) output frame rate. This is done by setting the option *n*. Default value is "25".

`split_channels`

Set if channels should be drawn separately or overlap. Default value is 0.

`colors`

Set colors separated by '|' which are going to be used for drawing of each channel.

`scale`

Set amplitude scale.

Available values are:

`'lin'`

Linear.

`'log'`

Logarithmic.

`'sqrt'`

Square root.

`'cbrt'`

Cubic root.

Default is linear.

`draw`

Set the draw mode. This is mostly useful to set for high n .

Available values are:

`'scale'`

Scale pixel values for each drawn sample.

`'full'`

Draw every sample directly.

Default value is `scale`.

13.23.1 Examples# TOC

- Output the input file audio and the corresponding video representation at the same time:

```
amovie=a.mp3,asplit[out0],showwaves[out1]
```

- Create a synthetic signal and show it with `showwaves`, forcing a frame rate of 30 frames per second:

```
aevalsrc=sin(1*2*PI*t)*sin(880*2*PI*t):cos(2*PI*200*t),asplit[out0],showwaves=r=30[out1]
```

13.24 showwavespic# TOC

Convert input audio to a single video frame, representing the samples waves.

The filter accepts the following options:

`size, s`

Specify the video size for the output. For the syntax of this option, check the (ffmpeg-utils)"Video size" section in the ffmpeg-utils manual. Default value is 600x240.

`split_channels`

Set if channels should be drawn separately or overlap. Default value is 0.

`colors`

Set colors separated by '|' which are going to be used for drawing of each channel.

`scale`

Set amplitude scale.

Available values are:

`'lin'`

Linear.

`'log'`

Logarithmic.

`'sqrt'`

Square root.

`'cbrt'`

Cubic root.

Default is linear.

13.24.1 Examples# TOC

- Extract a channel split representation of the wave form of a whole audio track in a 1024x800 picture using ffmpeg:

```
ffmpeg -i audio.flac -lavfi showwavespic=split_channels=1:s=1024x800 waveform.png
```

13.25 sidedata, asidedata# TOC

Delete frame side data, or select frames based on it.

This filter accepts the following options:

mode

Set mode of operation of the filter.

Can be one of the following:

`'select'`

Select every frame with side data of `type`.

`'delete'`

Delete side data of `type`. If `type` is not set, delete all side data in the frame.

type

Set side data type used with all modes. Must be set for `select` mode. For the list of frame side data types, refer to the `AVFrameSideDataType` enum in `libavutil/frame.h`. For example, to choose `AV_FRAME_DATA_PANSCAN` side data, you must specify `PANSCAN`.

13.26 spectrumsynth# TOC

Synthesize audio from 2 input video spectrums, first input stream represents magnitude across time and second represents phase across time. The filter will transform from frequency domain as displayed in videos back to time domain as presented in audio output.

This filter is primarily created for reversing processed `showspectrum` filter outputs, but can synthesize sound from other spectrograms too. But in such case results are going to be poor if the phase data is not available, because in such cases phase data need to be recreated, usually its just recreated from random noise. For best results use gray only output (`channel` color mode in `showspectrum` filter) and `log` scale for magnitude video and `lin` scale for phase video. To produce phase, for 2nd video, use `data` option. Inputs videos should generally use `fullframe` slide mode as that saves resources needed for decoding video.

The filter accepts the following options:

`sample_rate`

Specify sample rate of output audio, the sample rate of audio from which spectrum was generated may differ.

`channels`

Set number of channels represented in input video spectrums.

`scale`

Set scale which was used when generating magnitude input spectrum. Can be `lin` or `log`. Default is `log`.

`slide`

Set slide which was used when generating inputs spectrums. Can be `replace`, `scroll`, `fullframe` or `rscroll`. Default is `fullframe`.

`win_func`

Set window function used for resynthesis.

`overlap`

Set window overlap. In range `[0, 1]`. Default is `1`, which means optimal overlap for selected window function will be picked.

`orientation`

Set orientation of input videos. Can be `vertical` or `horizontal`. Default is `vertical`.

13.26.1 Examples# TOC

- First create magnitude and phase videos from audio, assuming audio is stereo with 44100 sample rate, then resynthesize videos back to audio with `spectrumsynth`:

```
ffmpeg -i input.flac -lavfi showspectrum=mode=separate:scale=log:overlap=0.875:color=channel:slide=fullframe:data=magnitude -an -c:v rawvideo magnitude.nut
ffmpeg -i input.flac -lavfi showspectrum=mode=separate:scale=lin:overlap=0.875:color=channel:slide=fullframe:data=phase -an -c:v rawvideo phase.nut
ffmpeg -i magnitude.nut -i phase.nut -lavfi spectrumsynth=channels=2:sample_rate=44100:win_func=hann:overlap=0.875:slide=fullframe output.flac
```

13.27 split, asplit# TOC

Split input into several identical outputs.

`asplit` works with audio input, `split` with video.

The filter accepts a single parameter which specifies the number of outputs. If unspecified, it defaults to `2`.

13.27.1 Examples# TOC

- Create two separate outputs from the same input:

```
[in] split [out0][out1]
```

- To create 3 or more outputs, you need to specify the number of outputs, like in:

```
[in] asplit=3 [out0][out1][out2]
```

- Create two separate outputs from the same input, one cropped and one padded:

```
[in] split [splitout1][splitout2];
[splitout1] crop=100:100:0:0 [cropout];
[splitout2] pad=200:200:100:100 [padout];
```

- Create 5 copies of the input audio with `ffmpeg`:

```
ffmpeg -i INPUT -filter_complex asplit=5 OUTPUT
```

13.28 zmq, azmq# TOC

Receive commands sent through a libzmq client, and forward them to filters in the filtergraph.

`zmq` and `azmq` work as a pass-through filters. `zmq` must be inserted between two video filters, `azmq` between two audio filters. Both are capable to send messages to any filter type.

To enable these filters you need to install the libzmq library and headers and configure FFmpeg with `--enable-libzmq`.

For more information about libzmq see: <http://www.zeromq.org/>

The `zmq` and `azmq` filters work as a libzmq server, which receives messages sent through a network interface defined by the `bind_address` (or the abbreviation "b") option. Default value of this option is `tcp://localhost:5555`. You may want to alter this value to your needs, but do not forget to escape any `'` signs (see filtergraph escaping).

The received message must be in the form:

```
TARGET COMMAND [ARG]
```

TARGET specifies the target of the command, usually the name of the filter class or a specific filter instance name. The default filter instance name uses the pattern `'Parsed_<filter_name>_<index>'`, but you can override this by using the `'filter_name@id'` syntax (see Filtergraph syntax).

COMMAND specifies the name of the command for the target filter.

ARG is optional and specifies the optional argument list for the given *COMMAND*.

Upon reception, the message is processed and the corresponding command is injected into the filtergraph. Depending on the result, the filter will send a reply to the client, adopting the format:

```
ERROR_CODE ERROR_REASON  
MESSAGE
```

MESSAGE is optional.

13.28.1 Examples# TOC

Look at `tools/zmqsend` for an example of a zmq client which can be used to send commands processed by these filters.

Consider the following filtergraph generated by `ffplay`. In this example the last overlay filter has an instance name. All other filters will have default instance names.

```
ffplay -dumpgraph 1 -f lavfi "  
color=s=100x100:c=red [l];  
color=s=100x100:c=blue [r];  
nullsrc=s=200x100, zmq [bg];  
[bg][l] overlay [bg+l];  
[bg+l][r] overlay@my=x=100 "
```

To change the color of the left side of the video, the following command can be used:

```
echo Parsed_color_0 c yellow | tools/zmqsend
```

To change the right side:

```
echo Parsed_color_1 c pink | tools/zmqsend
```

To change the position of the right side:

```
echo overlay@my x 150 | tools/zmqsend
```

14 Multimedia Sources# TOC

Below is a description of the currently available multimedia sources.

14.1 amovie# TOC

This is the same as movie source, except it selects an audio stream by default.

14.2 movie# TOC

Read audio and/or video stream(s) from a movie container.

It accepts the following parameters:

filename

The name of the resource to read (not necessarily a file; it can also be a device or a stream accessed through some protocol).

format_name, f

Specifies the format assumed for the movie to read, and can be either the name of a container or an input device. If not specified, the format is guessed from *movie_name* or by probing.

`seek_point, sp`

Specifies the seek point in seconds. The frames will be output starting from this seek point. The parameter is evaluated with `av_strtod`, so the numerical value may be suffixed by an IS postfix. The default value is "0".

`streams, s`

Specifies the streams to read. Several streams can be specified, separated by "+". The source will then have as many outputs, in the same order. The syntax is explained in the (ffmpeg)"Stream specifiers" section in the ffmpeg manual. Two special names, "dv" and "da" specify respectively the default (best suited) video and audio stream. Default is "dv", or "da" if the filter is called as "amovie".

`stream_index, si`

Specifies the index of the video stream to read. If the value is -1, the most suitable video stream will be automatically selected. The default value is "-1". Deprecated. If the filter is called "amovie", it will select audio instead of video.

`loop`

Specifies how many times to read the stream in sequence. If the value is 0, the stream will be looped infinitely. Default value is "1".

Note that when the movie is looped the source timestamps are not changed, so it will generate non monotonically increasing timestamps.

`discontinuity`

Specifies the time difference between frames above which the point is considered a timestamp discontinuity which is removed by adjusting the later timestamps.

It allows overlaying a second video on top of the main input of a filtergraph, as shown in this graph:

```
input -----> deltapt0 --> overlay --> output
                        ^
                        |
movie --> scale--> deltapt1 -----+
```

14.2.1 Examples# TOC

- Skip 3.2 seconds from the start of the AVI file `in.avi`, and overlay it on top of the input labelled "in":

```
movie=in.avi:seek_point=3.2, scale=180:-1, setpts=PTS-STARTPTS [over];
[in] setpts=PTS-STARTPTS [main];
[main][over] overlay=16:16 [out]
```

- Read from a `video4linux2` device, and overlay it on top of the input labelled "in":

```
movie=/dev/video0:f=video4linux2, scale=180:-1, setpts=PTS-STARTPTS [over];  
[in] setpts=PTS-STARTPTS [main];  
[main][over] overlay=16:16 [out]
```

- Read the first video stream and the audio stream with id 0x81 from dvd.vob; the video is connected to the pad named "video" and the audio is connected to the pad named "audio":

```
movie=dvd.vob:s=v:0+#0x81 [video] [audio]
```

14.2.2 Commands# TOC

Both movie and amovie support the following commands:

`seek`

Perform seek using "av_seek_frame". The syntax is: seek *stream_index|timestamp|flags*

- *stream_index*: If *stream_index* is -1, a default stream is selected, and *timestamp* is automatically converted from AV_TIME_BASE units to the stream specific time_base.
- *timestamp*: Timestamp in AVStream.time_base units or, if no stream is specified, in AV_TIME_BASE units.
- *flags*: Flags which select direction and seeking mode.

`get_duration`

Get movie duration in AV_TIME_BASE units.

15 See Also# TOC

ffmpeg, ffplay, ffprobe, libavfilter

16 Authors# TOC

The FFmpeg developers.

For details about the authorship, see the Git history of the project ([git://source.ffmpeg.org/ffmpeg](http://source.ffmpeg.org/ffmpeg)), e.g. by typing the command `git log` in the FFmpeg source directory, or browsing the online repository at <http://source.ffmpeg.org>.

Maintainers for the specific components are listed in the file MAINTAINERS in the source code tree.

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