Package ‘magick’
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Type Package
Title Advanced Graphics and Image-Processing in R
Version 2.0
Description Bindings to 'ImageMagick': the most comprehensive open-source image processing library available. Supports many common formats (png, jpeg, tiff, pdf, etc) and manipulations (rotate, scale, crop, trim, flip, blur, etc). All operations are vectorized via the Magick++ STL meaning they operate either on a single frame or a series of frames for working with layers, collages, or animation. In RStudio images are automatically previewed when printed to the console, resulting in an interactive editing environment. The latest version of the package includes a native graphics device for creating in-memory graphics or drawing onto images using pixel coordinates.

License MIT + file LICENSE
URL https://github.com/ropensci/magick#readme
BugReports https://github.com/ropensci/magick/issues
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LinkingTo Rcpp
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```
R topics documented:

analysis ................................................................. 2
animation ................................................................. 3
as_EBIImage ............................................................ 5
attributes ................................................................. 6
autoviewer ................................................................. 7
coder_info ............................................................... 7
color ...................................................................... 8
composite ................................................................. 11
device ..................................................................... 12
edges ...................................................................... 14
editing .................................................................... 15
effects ..................................................................... 17
fx .......................................................................... 18
geometry ................................................................. 19
image_ggplot ............................................................ 21
morphology ............................................................... 21
ocr ....................................................................... 22
options ................................................................. 23
painting ................................................................. 24
segmentation ........................................................... 25
thresholding ............................................................. 27
transform ............................................................... 28
video ................................................................. 30
wizard ................................................................. 31
_index_ ................................................................. 31
```

Index 33

<table>
<thead>
<tr>
<th>analysis</th>
<th>Image Analysis</th>
</tr>
</thead>
</table>

Description

Functions for image calculations and analysis. This part of the package needs more work.

Usage

```
image_compare(image, reference_image, metric = "", fuzz = 0)

image_compare_dist(image, reference_image, metric = "", fuzz = 0)

image_fft(image)
```
animation

Arguments

image  magick image object returned by image_read() or image_graph()
reference_image  another image to compare to
metric  string with a metric from metric_types() such as "AE" or "phash"
fuzz  Fuzz percentage: value between 0 and 100. Relative distance between colors to be considered similar in the filling algorithm.

Details

For details see Image++ documentation. Short descriptions:

- image_compare calculates a metric by comparing image with a reference image.
- image_fft returns Discrete Fourier Transform (DFT) of the image as a magnitude / phase image pair. I wish I knew what this means.

Here image_compare() is vectorized over the first argument and returns the diff image with the calculated distortion value as an attribute.

See Also

Other image: _index_, animation, attributes, color, composite, device, edges, editing, effects, fx, geometry, morphology, ocr, options, painting, segmentation, transform, video

Examples

out1 <- image_blur(logo, 3)
out2 <- image_oilpaint(logo, 3)
input <- c(logo, out1, out2, logo)
if(magick_config$version >= "6.8.7"){
diff_img <- image_compare(input, logo, metric = "AE")
attributes(diff_img)
}

Description

Operations to manipulate or combine multiple frames of an image. Details below.
Usage

```c
image_animate(image, fps = 10, loop = 0, dispose = c("background", "previous", "none"))
```

```c
image_morph(image, frames = 8)
```

```c
image_mosaic(image, operator = NULL)
```

```c
image_montage(image)
```

```c
image_flatten(image, operator = NULL)
```

```c
image_average(image)
```

```c
image_append(image, stack = FALSE)
```

```c
image_apply(image, FUN, ...)
```

Arguments

- **image**: magick image object returned by `image_read()` or `image_graph()`
- **fps**: frames per second
- **loop**: how many times to repeat the animation. Default is infinite.
- **dispose**: a frame disposal method from `dispose_types()`
- **frames**: number of frames to use in output animation
- **operator**: string with a composite operator from `compose_types()`
- **stack**: place images top-to-bottom (TRUE) or left-to-right (FALSE)
- **FUN**: a function to be called on each frame in the image
- **...**: additional parameters for **FUN**

Details

For details see Magick++ STL documentation. Short descriptions:

- **image_animate** coalesces frames by playing the sequence and converting to gif format.
- **image_morph** expands number of frames by interpolating intermediate frames to blend into each other when played as an animation.
- **image_mosaic** inlays images to form a single coherent picture.
- **image_montage** creates a composite image by combining frames.
- **image_flatten** merges frames as layers into a single frame using a given operator.
- **image_average** averages frames into single frame.
- **image_append** stack images left-to-right (default) or top-to-bottom.
- **image_apply** applies a function to each frame
The `image_apply` function calls an image function to each frame and joins results back into a single image. Because most operations are already vectorized this is often not needed. Note that `FUN()` should return an image. To apply other kinds of functions to image frames simply use `lapply`, `vapply`, etc.

See Also

Other image: `_index_`, `analysis`, `attributes`, `color`, `composite`, `device`, `edges`, `editing`, `effects`, `fx`, `geometry`, `morphology`, `ocr`, `options`, `painting`, `segmentation`, `transform`, `video`

Examples

```r
# Combine images
logo <- image_read("https://jeroen.github.io/images/Rlogo.png")
oldlogo <- image_read("https://developer.r-project.org/Logo/Rlogo-3.png")

# Create morphing animation
both <- image_scale(c(oldlogo, logo), "400")
image_average(image_crop(both))
image_animate(image_morph(both, 10))

# Create thumbnails from GIF
banana <- image_read("https://jeroen.github.io/images/banana.gif")
length(banana)
image_average(banana)
image_flatten(banana)
image_append(banana)
image_append(banana, stack = TRUE)

# Append images together
wizard <- image_read("wizard:"
image_append(image_scale(c(image_append(banana[c(1,3)], stack = TRUE), wizard)))

image_composite(banana, image_scale(logo, "300"))

# Break down and combine frames
front <- image_scale(banana, "300")
background <- image_background(image_scale(logo, "400"), 'white')
frames <- image_apply(front, function(x){image_composite(background, x, offset = "+70+30")})
image_animate(fps = 10)
```

---

### as_EBImage

Convert to EBImage

Description

Convert a Magck image to EBImage class. Note that EBImage only supports multi-frame images in greyscale.
Usage

as_EBImage(image)

Arguments

image magick image object returned by image_read() or image_graph()

Attributes

Attributes are properties of the image that might be present on some images and might affect image manipulation methods.

Usage

image_comment(image, comment = NULL)

image_info(image)

Arguments

image magick image object returned by image_read() or image_graph()

comment string to set an image comment

Details

Each attribute can be get and set with the same function. The image_info() function returns a data frame with some commonly used attributes.

See Also

Other image: _index_, analysis, animation, color, composite, device, edges, editing, effects, fx, geometry, morphology, ocr, options, painting, segmentation, transform, video
**autoviewer**

**RStudio AutoViewer**

**Description**

This enables a `addTaskCallback` that automatically updates the viewer after the state of a magick graphics device has changed. This is enabled by default in RStudio.

**Usage**

```r
autoviewer_enable()

autoviewer_disable()
```

**Examples**

```r
# Only has effect in RStudio (or other GUI with a viewer):
autoviewer_enable()

img <- magick::image_graph()
plot()
abline(0, 1, col = "blue", lwd = 2, lty = "solid")
abline(0.1, 1, col = "red", lwd = 3, lty = "dotted")

autoviewer_disable()
abline(0.2, 1, col = "green", lwd = 4, lty = "twodash")
abline(0.3, 1, col = "black", lwd = 5, lty = "dotted")

autoviewer_enable()
abline(0.4, 1, col = "purple", lwd = 6, lty = "dashed")
abline(0.5, 1, col = "yellow", lwd = 7, lty = "longdash")
```

---

**coder_info**

**Magick Configuration**

**Description**

ImageMagick can be configured to support various additional tool and formats via external libraries. These functions show which features ImageMagick supports on your system.

**Usage**

```r
coder_info(format)

magick_config()
```
Arguments

format  image format such as png, tiff or pdf.

Details

Note that coder_info raises an error for unsupported formats.

References

https://www.imagemagick.org/Magick++/CoderInfo.html

Examples

coder_info("png")
coder_info("jpg")
coder_info("pdf")
coder_info("tiff")
coder_info("gif")

color  Image Color

Description

Functions to adjust contrast, brightness, colors of the image. Details below.

Usage

image_modulate(image, brightness = 100, saturation = 100, hue = 100)

image_quantize(image, max = 256, colorspace = "rgb", dither = NULL, treedepth = NULL)

image_map(image, map, dither = FALSE)

image_channel(image, channel = "lightness")

image_transparent(image, color, fuzz = 0)

image_background(image, color, flatten = TRUE)

image_colorize(image, opacity, color)

image_contrast(image, sharpen = 1)

image_normalize(image)
color

image_enhance(image)
image_equalize(image)
image_median(image, radius = 1)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>image</td>
<td>magick image object returned by image_read() or image_graph()</td>
</tr>
<tr>
<td>brightness</td>
<td>modulation of brightness as percentage of the current value (100 for no change)</td>
</tr>
<tr>
<td>saturation</td>
<td>modulation of saturation as percentage of the current value (100 for no change)</td>
</tr>
<tr>
<td>hue</td>
<td>modulation of hue is an absolute rotation of -180 degrees to +180 degrees from the current position corresponding to an argument range of 0 to 200 (100 for no change)</td>
</tr>
<tr>
<td>max</td>
<td>preferred number of colors in the image. The actual number of colors in the image may be less than your request, but never more.</td>
</tr>
<tr>
<td>colorspace</td>
<td>string with a colorspace from colorspace_types for example &quot;gray&quot;, &quot;rgb&quot; or &quot;cmyk&quot;</td>
</tr>
<tr>
<td>dither</td>
<td>apply Floyd/Steinberg error diffusion to the image: averages intensities of several neighboring pixels</td>
</tr>
<tr>
<td>treedepth</td>
<td>depth of the quantization color classification tree. Values of 0 or 1 allow selection of the optimal tree depth for the color reduction algorithm. Values between 2 and 8 may be used to manually adjust the tree depth.</td>
</tr>
<tr>
<td>map</td>
<td>reference image to map colors from</td>
</tr>
<tr>
<td>channel</td>
<td>a string with a channel from channel_types for example &quot;alpha&quot; or &quot;hue&quot; or &quot;cyan&quot;</td>
</tr>
<tr>
<td>color</td>
<td>a valid color string such as &quot;navyblue&quot; or &quot;#000080&quot;</td>
</tr>
<tr>
<td>fuzz</td>
<td>Fuzz percentage: value between 0 and 100. Relative distance between colors to be considered similar in the filling algorithm.</td>
</tr>
<tr>
<td>flatten</td>
<td>should image be flattened before writing? This also replaces transparency with background color.</td>
</tr>
<tr>
<td>opacity</td>
<td>percentage of opacity used for coloring</td>
</tr>
<tr>
<td>sharpen</td>
<td>enhance intensity differences in image</td>
</tr>
<tr>
<td>radius</td>
<td>replace each pixel with the median color in a circular neighborhood</td>
</tr>
</tbody>
</table>

Details

For details see Magick++ STL documentation. Short descriptions:

- image_modulate adjusts brightness, saturation and hue of image relative to current.
- image_quantize reduces number of unique colors in the image.
- image_map replaces colors of image with the closest color from a reference image.
- image_channel extracts a single channel from an image and returns as grayscale.
• `image_transparent` sets pixels approximately matching given color to transparent.
• `image_background` sets background color. When image is flattened, transparent pixels get background color.
• `image_colorize` overlays a solid color frame using specified opacity.
• `image_contrast` enhances intensity differences in image
• `image_normalize` increases contrast by normalizing the pixel values to span the full range of colors
• `image_enhance` tries to minimize noise
• `image_equalize` equalizes using histogram equalization
• `image_median` replaces each pixel with the median color in a circular neighborhood

Note that colors are also determined by image properties `imagetype` and `colorspace` which can be modified via `image_convert()`.

**See Also**

Other image: `_index_`, `analysis`, `animation`, `attributes`, `composite`, `device`, `edges`, `editing`, `effects`, `fx`, `geometry`, `morphology`, `ocr`, `options`, `painting`, `segmentation`, `transform`, `video`

**Examples**

```r
# manually adjust colors
logo <- image_read("logo:")
image_modulate(logo, brightness = 200)
image_modulate(logo, saturation = 150)
image_modulate(logo, hue = 200)

# Reduce image to 10 different colors using various spaces
image_quantize(logo, max = 10, colorspace = 'gray')
image_quantize(logo, max = 10, colorspace = 'rgb')
image_quantize(logo, max = 10, colorspace = 'cmyk')

# Change background color
translogo <- image_transparent(logo, 'white')
image_background(translogo, "pink", flatten = TRUE)

# Compare to flood-fill method:
image_fill(logo, "pink", fuzz = 20)

# Other color tweaks
image_colorize(logo, 50, "red")
image_contrast(logo)
image_normalize(logo)
image_enhance(logo)
image_equalize(logo)
image_median(logo)

# Alternate way to convert into black-white
image_convert(logo, type = 'grayscale')
```
### Image Composite

**Description**

Similar to the ImageMagick composite utility: compose an image on top of another one using a `CompositeOperator`.

**Usage**

```plaintext
image_composite(image, composite_image, operator = "atop", offset = "+0+0", compose_args = "")

image_border(image, color = "lightgray", geometry = "10x10", operator = "copy")

image_frame(image, color = "lightgray", geometry = "25x25+6+6")
```

**Arguments**

- `image`: magick image object returned by `image_read()` or `image_graph()`
- `composite_image`: composition image
- `operator`: string with a `composite operator` from `compose_types()`
- `offset`: a `geometry_point` string to set x/y offset of top image
- `compose_args`: additional arguments needed for some composite operations
- `color`: a valid `color string` such as "navyblue" or "#000000"
- `geometry`: a `geometry string` to set height and width of the border, e.g. "10x8". In addition `image_frame` allows for adding shadow by setting an offset e.g. "20x10+7+2".

**Details**

The `image_compose` function is vectorized over both image arguments: if the first image has \( n \) frames and the second \( m \) frames, the output image will contain \( n \times m \) frames.

The `image_border` function creates a slightly larger solid color frame and then composes the original frame on top. The `image_frame` function is similar but has an additional feature to create a shadow effect on the border (which is really ugly).

**See Also**

Other image: `_index_`, `analysis`, `animation`, `attributes`, `color`, `device`, `edges`, `editing`, `effects`, `fx`, `geometry`, `morphology`, `ocr`, `options`, `painting`, `segmentation`, `transform`, `video`
Examples

# Compose images using one of many operators
imlogo <- image_scale(image_read("logo:"), "x275")
rlogo <- image_read("https://developer.r-project.org/Logo/Rlogo-3.png")

# Standard is atop
image_composite(imlogo, rlogo)

# Same as 'blend 50' in the command line
image_composite(imlogo, rlogo, operator = "blend", compose_args="50")

# Add a border frame around the image
image_border(imlogo, "red", "10x10")
image_frame(imlogo)

---

device  

*Magick Graphics Device*

Description

Graphics device that produces a Magick image. Can either be used like a regular device for making plots, or alternatively via `image_draw` to open a device which draws onto an existing image using pixel coordinates. The latter is vectorized, i.e. drawing operations are applied to each frame in the image.

Usage

```r
image_graph(width = 800, height = 600, bg = "white",
            pointsize = 12, res = 72, clip = TRUE, antialias = TRUE)

image_draw(image, pointsize = 12, res = 72, antialias = TRUE, ...)

image_capture()
```

Arguments

- `width` in pixels
- `height` in pixels
- `bg` background color
- `pointsize` size of fonts
- `res` resolution in pixels
- `clip` enable clipping in the device. Because clipping can slow things down a lot, you can disable it if you don’t need it.
- `antialias` TRUE/FALSE: enables anti-aliasing for text and strokes
- `image` an existing image on which to start drawing
- `...` additional device parameters passed to `plot.window` such as `xlim`, `ylim`, or `mar`.
Details

The device is a relatively recent feature of the package. It should support all operations but there might still be small inaccuracies. Also it is a bit slower than some of the other devices, in particular for rendering text and clipping. Hopefully this can be optimized in the next version.

By default image_draw sets all margins to 0 and uses graphics coordinates to match image size in pixels (width x height) where (0, 0) is the top left corner. Note that this means the y axis increases from top to bottom which is the opposite of typical graphics coordinates. You can override all this by passing custom xlim, ylim or mar values to image_draw.

The image_capture function returns the current device as an image. This only works if the current device is a magick device or supports dev.capture.

See Also

Other image: _index_, analysis, animation, attributes, color, composite, edges, editing, effects, fx, geometry, morphology, ocr, options, painting, segmentation, transform, video

Examples

# Regular image
frink <- image_read("https://jeroen.github.io/images/frink.png")

# Produce image using graphics device
fig <- image_graph(res = 96)
ggplot2::qplot(mpg, wt, data = mtcars, colour = cyl)
dev.off()

# Combine
out <- image_composite(fig, frink, offset = "+70+30")
print(out)

# Or paint over an existing image
img <- image_draw(frink)
rect(20, 20, 200, 100, border = "red", lty = "dashed", lwd = 5)
abline(h = 300, col = 'blue', lwd = '10', lty = "dotted")
text(10, 250, "Hoiven-Graven", family = "monospace", cex = 4, srt = 90)
palette(rainbow(11, end = 0.9))
symbols(rep(200, 11), seq(0, 400, 40), circles = runif(11, 5, 35),
    bg = 1:11, inches = FALSE, add = TRUE)
dev.off()
print(img)

# Vectorized example with custom coordinates
earth <- image_read("https://jeroen.github.io/images/earth.gif")
img <- image_draw(earth, xlim = c(0,1), ylim = c(0,1))
rect(.1, .1, .9, .9, border = "red", lty = "dashed", lwd = 5)
text(.5, .9, "Our planet", cex = 3, col = "white")
dev.off()
print(img)
**edges**

*Edge / Line Detection*

**Description**

Best results are obtained by finding edges with `image_canny()` and then performing Hough-line detection on the edge image.

**Usage**

```plaintext
image_edge(image, radius = 1)

image_canny(image, geometry = "0x1+10%+30%")

image_hough_draw(image, geometry = NULL, color = "red", 
    bg = "transparent", size = 3, overlay = FALSE)

image_hough_txt(image, geometry = NULL, format = c("mvg", "svg"))
```

**Arguments**

- `image`: magick image object returned by `image_read()` or `image_graph()`
- `radius`: edge size in pixels
- `geometry`: geometry string, see details.
- `color`: a valid color string such as "navyblue" or "#000080"
- `bg`: background color
- `size`: size in points to draw the line
- `overlay`: composite the drawing atop the input image. Only for `bg = 'transparent'`
- `format`: output format of the text, either svg or mvg

**Details**

For Hough-line detection, the geometry format is `{W}x(H)+{threshold}` defining the size and threshold of the filter used to find 'peaks' in the intermediate search image. For canny edge detection the format is `{radius}x{sigma}+{lower%}+{upper%}`. More details and examples are available at the imagemagick website.

**See Also**

Other image: _index_, analysis, animation, attributes, color, composite, device, editing, effects, fx, geometry, morphology, ocr, options, painting, segmentation, transform, video
Examples

```
if(magick_config()$version > "6.8.9"){
  shape <- demo_image("shape_rectangle.gif")
  rectangle <- image_canny(shape)
  rectangle %= image_hough_draw(’5x5+20’)
  rectangle %= image_hough_txt(format = ’svg’) %= cat()
}
```

Image Editing

Description

Read, write and join or combine images. All image functions are vectorized, meaning they operate either on a single frame or a series of frames (e.g. a collage, video, or animation). Besides paths and URLs, `image_read()` supports commonly used bitmap and raster object types.

Usage

```
image_read(path, density = NULL, depth = NULL, strip = FALSE)
image_read_svg(path, width = NULL, height = NULL)
image_read_pdf(path, pages = NULL, density = 300, password = ””)
image_write(image, path = NULL, format = NULL, quality = NULL,
  depth = NULL, density = NULL, comment = NULL, flatten = FALSE)
image_convert(image, format = NULL, type = NULL, colorspace = NULL,
  depth = NULL, antialias = NULL)
image_data(image, channels = NULL, frame = 1)
image_raster(image, frame = 1, tidy = TRUE)
image_display(image, animate = TRUE)
image_browse(image, browser = getOption("browser"))
image_strip(image)
image_blank(width, height, color = "none", pseudo_image = ””)
image_join(...) 
image_attributes(image)
demo_image(path)
```
Arguments

- **path**: a file, url, or raster object or bitmap array
- **density**: resolution to render pdf or svg
- **depth**: color depth (either 8 or 16)
- **strip**: drop image comments and metadata
- **width**: in pixels
- **height**: in pixels
- **pages**: integer vector with page numbers. Defaults to all pages.
- **password**: user password to open protected pdf files
- **image**: magick image object returned by `image_read()` or `image_graph()`
- **format**: output format such as "png", "jpeg", "gif", "rgb" or "rgba".
- **quality**: number between 0 and 100 for jpeg quality. Defaults to 75.
- **comment**: text string added to the image metadata for supported formats
- **flatten**: should image be flattened before writing? This also replaces transparency with background color.
- **type**: string with `imagetype` value from `image_types` for example grayscale to convert into black/white
- **colorspace**: string with a `colorspace` from `colorspace_types` for example "gray", "rgb" or "cmyk"
- **antialias**: enable anti-aliasing for text and strokes
- **channels**: string with image channel(s) for example "rgb", "rgba", "cmyk","gray", or "ycbcr". Default is either "gray", "rgb" or "rgba" depending on the image
- **frame**: integer setting which frame to extract from the image
- **tidy**: converts raster data to long form for use with `geom_raster`. If FALSE output is the same as `as.raster()`.
- **animate**: support animations in the X11 display
- **browser**: argument passed to `browseURL`
- **color**: a valid color string such as "navyblue" or "#000080"
- **pseudo_image**: string with pseudo image specification for example "radial-gradient:purple-yellow"
  
  ...  
  
  several images or lists of images to be combined

Details

All standard base vector methods such as `[,]`, `c()`, `as.list()`, `as.raster()`, `rev()`, `length()`, and `print()` can be used to work with magick image objects. Use the standard img[i] syntax to extract a subset of the frames from an image. The img[i] method is an alias for `image_data()` which extracts a single frame as a raw bitmap matrix with pixel values.

For reading svg or pdf it is recommended to use `image_read_svg()` and `image_read_pdf()` if the `rsvg` and `pdftools` R packages are available. These functions provide more rendering options and better quality than built-in svg/pdf rendering delegates from imagemagick itself.

X11 is required for `image_display()` which is only works on some platforms. A more portable method is `image_browse()` which opens the image in a browser. RStudio has an embedded viewer that does this automatically which is quite nice.
See Also

Other image: _index_, analysis, animation, attributes, color, composite, device, edges, effects, fx, geometry, morphology, ocr, options, painting, segmentation, transform, video

Examples

```r
# Download image from the web
frink <- image_read("https://jeroen.github.io/images/frink.png")
worldcup_frink <- image_fill(frink, "orange", "+100+200", 20)
image_write(worldcup_frink, "output.png")

# extract raw bitmap array
bitmap <- frink[[1]]

# replace pixels with #FF69B4 ('hot pink') and convert back to image
bitmap[,50:100, 50:100] <- as.raw(c(0xff, 0x69, 0xb4, 0xff))
image_read(bitmap)

# Plot to graphics device via legacy raster format
raster <- as.raster(frink)
par(ask=FALSE)
plot(raster)

# Read bitmap arrays from from other image packages
curl::curl_download("https://jeroen.github.io/images/example.webp", "example.webp")
if(require(webp)) image_read(webp::read_webp("example.webp"))
if(require(rsvg))
tiger <- image_read_rsvg("http://jeroen.github.io/images/tiger.svg")
if(require(pdftools))
image_read_pdf(file.path(R.home('doc'), 'NEWS.pdf'), pages = 1, density = 100)
# create a solid canvas
image_blank(600, 400, "green")
image_blank(600, 400, pseudo_image = "radial-gradient:purple-yellow")
```

---

**Image Effects**

Description

High level effects applied to an entire image. These are mostly just for fun.

Usage

```r
image_despeckle(image, times = 1L)

image_reducenoise(image, radius = 1L)

image_noise(image, noisetype = "gaussian")
```
image_blur(image, radius = 1, sigma = 0.5)
image_charcoal(image, radius = 1, sigma = 0.5)
image_oilpaint(image, radius = 1)
image_emboss(image, radius = 1, sigma = 0.5)
image_implode(image, factor = 0.5)
image_negate(image)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>image</td>
<td>magick image object returned by <code>image_read()</code> or <code>image_graph()</code></td>
</tr>
<tr>
<td>times</td>
<td>number of times to repeat the despeckle operation</td>
</tr>
<tr>
<td>radius</td>
<td>radius, in pixels, for various transformations</td>
</tr>
<tr>
<td>noisetype</td>
<td>string with a noisetype value from <code>noise_types</code>.</td>
</tr>
<tr>
<td>sigma</td>
<td>the standard deviation of the Laplacian, in pixels.</td>
</tr>
<tr>
<td>factor</td>
<td>image implode factor (special effect)</td>
</tr>
</tbody>
</table>

See Also

Other image: `_index_`, `analysis`, `animation`, `attributes`, `color`, `composite`, `device`, `edges`, `editing`, `fx`, `geometry`, `morphology`, `ocr`, `options`, `painting`, `segmentation`, `transform`, `video`

Examples

```r
logo <- image_read("logo:"
image_despeckle(logo)
image_reducenoise(logo)
image_noise(logo)
image_blur(logo, 10, 10)
image_charcoal(logo)
image_oilpaint(logo, radius = 3)
image_emboss(logo)
image_implode(logo)
image_negate(logo)
```

Description

Apply a custom an `fx expression` to the image.
Usage

image_fx(image, expression = "p", channel = NULL)

Arguments

image magick image object returned by image_read() or image_graph()
expression string with an fx expression
cchannel a value of channel_types() specifying which channel(s) to set

See Also

Other image: _index_, analysis, animation, attributes, color, composite, device, edges, editing, effects, geometry, morphology, ocr, options, painting, segmentation, transform, video

Examples

# Show image_fx() expression
img <- image_convert(logo, colorspace = "Gray")
image_fx(img, expression = "pow(p, 0.5)"
image_fx(img, expression = "random()"

gradient_x <- image_convolve(img, kernel = "Prewitt")
gradient_y <- image_convolve(img, kernel = "Prewitt:90")
gradient <- c(image_fx(gradient_x, expression = "p^2"),
              image_fx(gradient_y, expression = "p^2")
gradient <- image_flatten(gradient, operator = "Plus")
gradient <- image_fx(gradient, expression = "sqrt(p)")
gradient

geometry Geometry Helpers

Description

ImageMagick uses a handy geometry syntax to specify coordinates and shapes for use in image transformations. You can either specify these manually as strings or use the helper functions below.

Usage

geometry_point(x, y)

geometry_area(width = NULL, height = NULL, x_off = 0, y_off = 0)

geometry_size_pixels(width = NULL, height = NULL,
preserve_aspect = TRUE)

geometry_size_percent(width = 100, height = NULL)
Arguments

- **x**: left offset in pixels
- **y**: top offset in pixels
- **width**: in pixels
- **height**: in pixels
- **x_off**: offset in pixels on x axis
- **y_off**: offset in pixels on y axis
- **preserve_aspect**: if FALSE, resize to width and height exactly, loosing original aspect ratio. Only one of percent and preserve_aspect may be TRUE.

Details

See ImageMagick Manual for details about the syntax specification. Examples of geometry strings:

- "500x300" – Resize image keeping aspect ratio, such that width does not exceed 500 and the height does not exceed 300.
- "500x300!" – Resize image to 500 by 300, ignoring aspect ratio
- "500x" – Resize width to 500 keep aspect ratio
- "x300" – Resize height to 300 keep aspect ratio
- "50%x20%" – Resize width to 50 percent and height to 20 percent of original
- "500x300+10+20" – Crop image to 500 by 300 at position 10,20

See Also

Other image: _index_, analysis, animation, attributes, color, composite, device, edges, editing, effects, fx, morphology, ocr, options, painting, segmentation, transform, video

Examples

```r
# Specify a point
logo <- image_read("logo:"
image_annotate(logo, "Some text", location = geometry_point(100, 200), size = 24)

# Specify image area
image_crop(logo, geometry_area(300, 300), repage = FALSE)
image_crop(logo, geometry_area(300, 300, 100, 100), repage = FALSE)

# Specify image size
image_resize(logo, geometry_size_pixels(300))
image_resize(logo, geometry_size_pixels(height = 300))
image_resize(logo, geometry_size_pixels(300, 300, preserve_aspect = FALSE))

# resize relative to current size
image_resize(logo, geometry_size_percent(50))
image_resize(logo, geometry_size_percent(50, 20))
```
image_ggplot

**Image to ggplot**

**Description**

Converts image to raster using `image_raster()` and then plots it with `ggplot2 geom_raster`. See examples for other ways to use magick images in `ggplot2`.

**Usage**

```
image_ggplot(image)
```

**Arguments**

- `image` magick image object returned by `image_read()` or `image_graph()`

**Examples**

```r
# Plot with base R
plot(logo)

# Plot image with ggplot2
library(ggplot2)
myplot <- image_ggplot(logo)
myplot + ggtitle("Test plot")

# Or add to plot as annotation
image <- image_fill(logo, 'none')
raster <- as.raster(image)
myplot <- qplot(mpg, wt, data = mtcars)
myplot + annotation_raster(raster, 25, 35, 3, 5)

# Or overplot image using grid
library(grid)
quplot(speed, dist, data = cars, geom = c("point", "smooth"))
grid.raster(image)
```

**morphology**

**Morphology**

**Description**

Apply a morphology method. This is a very flexible function which can be used to apply any morphology method with custom parameters. See `imagemagick website` for examples.
Usage

```r
image_morphology(image, method = "convolve", kernel = "Gaussian",
iterations = 1, opts = list())

image_convolve(image, kernel = "Gaussian", iterations = 1,
scaling = NULL, bias = NULL)
```

Arguments

- **image**: magick image object returned by `image_read()` or `image_graph()`
- **method**: a string with a valid method from `morphology_types()`
- **kernel**: either a square matrix or a string. The string can either be a parameterized *kerneltype* such as: "DoG:0,0,2" or "Diamond" or it can contain a custom matrix (see examples)
- **iterations**: number of iterations
- **opts**: a named list or character vector with custom attributes
- **scaling**: string with kernel scaling. The special flag "!" automatically scales to full dynamic range, for example: "50%!
- **bias**: output bias string, for example "50%"

See Also

Other image: `_index_`, `analysis`, `animation`, `attributes`, `color`, `composite`, `device`, `edges`, `editing`, `effects`, `fx`, `geometry`, `ocr`, `options`, `painting`, `segmentation`, `transform`, `video`

---

**Description**

Extract text from an image using the `tesseract` package.

**Usage**

```r
image_ocr(image, language = "eng", HOCR = FALSE, ...)

image_ocr_data(image, language = "eng", ...)
```

**Arguments**

- **image**: magick image object returned by `image_read()` or `image_graph()`
- **language**: passed to `tesseract`. To install additional languages see instructions in `tesseract_download()`.
- **HOCR**: if TRUE return results as HOCR xml instead of plain text
- **...**: additional parameters passed to `tesseract`
Details

To use this function you need to tesseract first:

```r
install.packages("tesseract")
```

Best results are obtained if you set the correct language in `tesseract`. To install additional languages see instructions in `tesseract_download()`.

See Also

Other image: `_index_`, `analysis`, `animation`, `attributes`, `color`, `composite`, `device`, `edges`, `editing`, `effects`, `fx`, `geometry`, `morphology`, `options`, `painting`, `segmentation`, `transform`, `video`

Examples

```r
if(require("tesseract")){
  img <- image_read("http://jeroen.github.io/images/testocr.png")
  image_ocr(img)
  image_ocr_data(img)
}
```

<table>
<thead>
<tr>
<th>options</th>
<th>Magick Options</th>
</tr>
</thead>
</table>

Description

List option types and values supported in your version of ImageMagick. For descriptions see ImageMagick Enumerations.

Usage

```r
magick_options()
option_types()
filter_types()
metric_types()
dispose_types()
compose_types()
colorspace_types()
channel_types()
```
image_types()
kernel_types()
noise_types()
gravity_types()
orientation_types()
morphology_types()

References
ImageMagick Manual: Enumerations

See Also
Other image: _index_, analysis, animation, attributes, color, composite, device, edges, editing, effects, fx, geometry, morphology, ocr, painting, segmentation, transform, video

---

**painting**

**Image Painting**

**Description**

The `image_fill()` function performs flood-fill by painting starting point and all neighboring pixels of approximately the same color. Annotate simply prints some text on the image.

**Usage**

```plaintext
image_fill(image, color, point = "1x1", fuzz = 0)
image_annotate(image, text, gravity = "northwest", location = "+0+0",
degrees = 0, size = 10, font = "", color = NULL,
strokecolor = NULL, boxcolor = NULL)
```

**Arguments**

- **image**: magick image object returned by `image_read()` or `image_graph()`
- **color**: a valid color string such as "navyblue" or "#000080"
- **point**: a geometry_point string indicating the starting point of the flood-fill
- **fuzz**: Fuzz percentage: value between 0 and 100. Relative distance between colors to be considered similar in the filling algorithm.
- **text**: annotation text
gravity string with gravity value from gravity_types.
location geometry string with location relative to gravity
degrees rotates text around center point
size font-size in pixels
font string with font family such as "sans", "mono", "serif", "Times", "Helvetica", "Trebuchet", "Georgia", "Palatino" or "Comic Sans".
strokecolor a color string adds a stroke (border around the text)
boxcolor a color string for background color that annotation text is rendered on.

Details

Note that more sophisticated drawing mechanisms are available via the graphics device using image_draw.

See Also

Other image: _index_, analysis, animation, attributes, color, composite, device, edges, editing, effects, fx, geometry, morphology, ocr, options, segmentation, transform, video

Examples

```r
logo <- image_read("logo:")
logo <- image_background(logo, 'white')
image_fill(logo, "pink", point = "+450+400")
image_fill(logo, "pink", point = "+450+400", fuzz = 25)
# Add some text to an image
image_annotate(logo, "This is a test")
image_annotate(logo, "CONFIDENTIAL", size = 50, color = "red", boxcolor = "pink",
              degrees = 30, location = "+100+100")

# Setting fonts requires fontconfig support (and that you have the font)
image_annotate(logo, "The quick brown fox", font = "monospace", size = 50)
```

Image Segmentation

Description

Basic image segmentation like connected components labelling, blob extraction and fuzzy c-means

Usage

```r
image_connect(image, connectivity = 4)

image_split(image, keep_color = TRUE)

image_fuzzycmeans(image, min_pixels = 1, smoothing = 1.5)
```
Arguments

- `image` magick image object returned by `image_read()` or `image_graph()`
- `connectivity` number neighbor colors which are considered part of a unique object
- `keep_color` if TRUE the output images retain the color of the input pixel. If FALSE all matching pixels are set black to retain only the image mask.
- `min_pixels` the minimum number of pixels contained in a hexahedra before it can be considered valid (expressed as a percentage)
- `smoothing` the smoothing threshold which eliminates noise in the second derivative of the histogram (higher values gives smoother second derivative)

Details

- `image_connect` Connect adjacent pixels with the same pixel intensities to do blob extraction
- `image_split` Splits the image according to pixel intensities
- `image_fuzycmeans` Fuzzy c-means segmentation of the histogram of color components

`image_connect` performs blob extraction by scanning the image, pixel-by-pixel from top-left to bottom-right where regions of adjacent pixels which share the same set of intensity values get combined.

See Also

Other image: `_index_`, `analysis`, `animation`, `attributes`, `color`, `composite`, `device`, `edges`, `editing`, `effects`, `fx`, `geometry`, `morphology`, `ocr`, `options`, `painting`, `transform`, `video`

Examples

```r
# Split an image by color
img <- image_quantize(logo, 4)
layers <- image_split(img)
layers

# This returns the original image
image_flatten(layers)

# From the IM website
objects <- image_convert(demo_image("objects.gif"), colorspace = "Gray")
objects

# Split image in blobs of connected pixel levels
if(magick_config()$version > "6.9.0"){
  objects %>%
    image_connect(connectivity = 4) %>%
    image_split()
}

# Fuzzy c-means
image_fuzycmeans(logo)
```

`logo` %>`
Image thresholding

Description

Thresholding an image can be used for simple and straightforward image segmentation. The function \texttt{image\_threshold()} allows to do black and white thresholding whereas \texttt{image\_lat()} performs local adaptive thresholding.

Usage

\begin{verbatim}
image\_threshold(image, type = c("black", "white"), threshold = "50\%",
channel = NULL)
\end{verbatim}

\begin{verbatim}
image\_lat(image, geometry = "10x10+5\%")
\end{verbatim}

Arguments

- \texttt{image} \hspace{1cm} magick image object returned by \texttt{image\_read()} or \texttt{image\_graph()}
- \texttt{type} \hspace{1cm} type of thresholding, either one of lat, black or white (see details below)
- \texttt{threshold} \hspace{1cm} pixel intensity threshold percentage for black or white thresholding
- \texttt{channel} \hspace{1cm} a value of \texttt{channel\_types()} specifying which channel(s) to set
- \texttt{geometry} \hspace{1cm} pixel window plus offset for LAT algorithm

Details

- \texttt{image\_threshold(type = "black"): Forces all pixels below the threshold into black while leaving all pixels at or above the threshold unchanged
- \texttt{image\_threshold(type = "white"): Forces all pixels above the threshold into white while leaving all pixels at or below the threshold unchanged
- \texttt{image\_lat(): Local Adaptive Thresholding. Looks in a box (width x height) around the pixel neighborhood if the pixel value is bigger than the average minus an offset.

Examples

\begin{verbatim}
test <- image\_convert(logo, colorspace = "Gray")
image\_threshold(test, type = "black", threshold = "50\%")
image\_threshold(test, type = "white", threshold = "50\%")
\end{verbatim}

\begin{verbatim}
# Turn image into BW

test %>%
  image\_threshold(type = "white", threshold = "50\%") %>%
  image\_threshold(type = "black", threshold = "50\%")
\end{verbatim}
# adaptive thresholding
image_lat(test, geometry = '10x10+5%')

---

<table>
<thead>
<tr>
<th>transform</th>
<th>Image Transform</th>
</tr>
</thead>
</table>

**Description**

Basic transformations like rotate, resize, crop and flip. The `geometry` syntax is used to specify sizes and areas.

**Usage**

- `image_trim(image, fuzz = 0)`
- `image_chop(image, geometry)`
- `image_rotate(image, degrees)`
- `image_resize(image, geometry = NULL, filter = NULL)`
- `image_scale(image, geometry = NULL)`
- `image_sample(image, geometry = NULL)`
- `image_crop(image, geometry = NULL, repage = TRUE)`
- `image_flip(image)`
- `image_flop(image)`
- `image_deskew(image, threshold = 40)`
- `image_page(image, pagesize = NULL, density = NULL)`
- `image_repage(image)`
- `image_orient(image, orientation = NULL)`

**Arguments**

- **image**: magick image object returned by `image_read()` or `image_graph()`.
- **fuzz**: Fuzz percentage: value between 0 and 100. Relative distance between colors to be considered similar in the filling algorithm.
- **geometry**: a `geometry` string specifying area (for cropping) or size (for resizing).
transform

degrees value between 0 and 360 for how many degrees to rotate
filter string with filter type from: filter_types
repage resize the canvas to the cropped area
threshold straightens an image. A threshold of 40 works for most images.
pagesize geometry string with preferred size and location of an image canvas
density geometry string with vertical and horizontal resolution in pixels of the image. Specifies an image density when decoding a Postscript or PDF.
orientation string to set image orientation one of the orientation_types. If NULL it applies auto-orientation which tries to infer the correct orientation from the Exif data.

Details

For details see Magick++ STL documentation. Short descriptions:

- **image_trim** removes edges that are the background color from the image.
- **image_chop** removes vertical or horizontal subregion of image.
- **image_crop** cuts out a subregion of original image
- **image_rotate** rotates and increases size of canvas to fit rotated image.
- **image_deskew** auto rotate to correct skewed images
- **image_resize** resizes using custom filterType
- **image_scale** and **image_sample** resize using simple ratio and pixel sampling algorithm.
- **image_flip** and **image_flop** invert image vertically and horizontally

The most powerful resize function is **image_resize** which allows for setting a custom resize filter. Output of **image_scale** is similar to **image_resize(img, filter = "point")**.

For resize operations it holds that if no geometry is specified, all frames are rescaled to match the top frame.

See Also

Other image: _index_, analysis, animation, attributes, color, composite, device, edges, editing, effects, fx, geometry, morphology, ocr, options, painting, segmentation, video

Examples

```r
logo <- image_read("logo:"
logo <- image_scale(logo, "400")
image_trim(logo)
image_chop(logo, "100x20")
image_rotate(logo, 45)
# Small image
rose <- image_convert(image_read("rose:"), "png")

# Resize to 400 width or height:
image_resize(rose, "400x")
image_resize(rose, "x400")
```
# Resize keeping ratio
image_resize(rose, "400x400")

# Resize, force size losing ratio
image_resize(rose, "400x400!")

# Different filters
image_resize(rose, "400x", filter = "Triangle")
image_resize(rose, "400x", filter = "Point")
# simple pixel resize
image_scale(rose, "400x")
image_sample(rose, "400x")
image_crop(logo, "400x400+200+200")
image_flip(logo)
image_flop(logo)

if(magick_config()$version > "6.8.6")
    image_orient(logo)

---

**video**

### Write Video

**Description**

High quality video / gif exporter based on external packages `gifski` and `av`.

**Usage**

```c
image_write_video(image, path = NULL, framerate = 1, ...)
```

```c
image_write_gif(image, path = NULL, ...)```

**Arguments**

<table>
<thead>
<tr>
<th>image</th>
<th>magick image object returned by <code>image_read()</code> or <code>image_graph()</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>path</td>
<td>filename of the output gif or video. This is also the return value.</td>
</tr>
<tr>
<td>framerate</td>
<td>frames per second, passed to <code>av_encode_video</code></td>
</tr>
<tr>
<td>...</td>
<td>additional parameters passed to <code>av_encode_video</code> and <code>gifski</code>.</td>
</tr>
</tbody>
</table>

**Details**

This requires an image with multiple frames. The GIF exporter accomplishes the same thing as `image_animate` but much faster and with better quality.

**See Also**

Other image: `_index_`, `analysis`, `animation`, `attributes`, `color`, `composite`, `device`, `edges`, `editing`, `effects`, `fx`, `geometry`, `morphology`, `ocr`, `options`, `painting`, `segmentation`, `transform`
Example Images

Description

Example images included with ImageMagick:

Details

- logo: ImageMagick Logo, 640x480
- wizard: ImageMagick Wizard, 480x640
- rose: Picture of a rose, 70x46
- granite: Granite texture pattern, 128x128

Magick Image Processing

Description

The magick package for graphics and image processing in R. Important resources:

- R introduction vignette: getting started
- Magick++ API and Magick++ STL detailed descriptions of methods and parameters

Details

Documentation is split into the following pages:

- analysis - metrics and calculations: compare, fft
- animation - manipulate or combine multiple frames: animate, morph, mosaic, montage, average, append, apply
- attributes - image properties: comment, info
- color - contrast, brightness, colors: modulate, quantize, map, transparent, background, colorize, contrast, normalize, enhance, equalize, median
- composite - advanced joining: composite, border, frame
- device - creating graphics and drawing on images
- editing - basic image IO: read, write, convert, join, display, brose
- effects - fun effects: despecle, reducenoise, noise, blur, charcoal, edge, oilpaint, emboss, implode, negate
- geometry - specify points, areas and sizes using geometry syntax
- ocr - extract text from image using tesseract package
- options - list option types and values supported in your version of ImageMagick
- painting - flood fill and annotating text
- transform - shape operations: trim, chop, rotate, resize, scale, sample crop, flip, flop, deskew, page
See Also

Other image: analysis, animation, attributes, color, composite, device, edges, editing, effects, fx, geometry, morphology, ocr, options, painting, segmentation, transform, video
Index

[]., 16
[[], 16
_index_, 3, 5, 6, 10, 11, 13, 14, 17–20, 22–26, 29, 30, 31
addTaskCallback, 7
analysis, 2, 5, 6, 10, 11, 13, 14, 17–20, 22–26, 29–32
animation, 3, 3, 6, 10, 11, 13, 14, 17–20, 22–26, 29–32
as.list(), 16
as.raster(), 16
as_EBiImage, 5
attributes, 3, 5, 6, 10, 11, 13, 14, 17–20, 22–26, 29–32
autoviewer, 7
autoviewer_disable (autoviewer), 7
autoviewer_enable (autoviewer), 7
av, 30
av_encode_video, 30
browseURL, 16

c(), 16
channel_types, 9
channel_types (options), 23
channel_types(), 19, 27
coder_info, 7
color, 3, 5, 6, 8, 11, 13, 14, 17–20, 22–26, 29–32
colorspace_types, 9, 16
colorspace_types (options), 23
compose_types (options), 23
compose_types(), 4, 11
composite, 3, 5, 6, 10, 11, 13, 14, 17–20, 22–26, 29–32
demo_image (editing), 15
dev.capture, 13
device, 3, 5, 6, 10, 11, 12, 14, 17–20, 22–26, 29–32
disposable_types (options), 23
disposable_types(), 4
edges, 3, 5, 6, 10, 11, 13, 14, 17–20, 22–26, 29, 30, 31
editing, 3, 5, 6, 10, 11, 13, 14, 15, 18–20, 22–26, 29–32
effects, 3, 5, 6, 10, 11, 13, 14, 17, 17, 19, 20, 22–26, 29–32
filter_types, 29
filter_types (options), 23
fx, 3, 5, 6, 10, 11, 13, 14, 17, 18, 18, 20, 22–26, 29, 30, 32
gem_raster, 16, 21
gem_raster, 16, 21
gem_area (geometry), 19
gem_point, 11, 24
gem_point (geometry), 19
gem_size_percent (geometry), 19
gem_size_pixels (geometry), 19
gifski, 30
granite (wizard), 31
gravity_types, 25
gravity_types (options), 23
image_animate, 4, 30
image_animate (animation), 3
image_animate (animation), 3
image_animate (animation), 3
image_append, 4
image_append (animation), 3
image_apply, 4, 5
image_apply (animation), 3
image_attributes (editing), 15
image_average, 4
image_average (animation), 3
image_background, 10
image_background (color), 8
image_blank (editing), 15
image_blur (effects), 17
image_border, 11
image_border (composite), 11
image_browse (editing), 15
image_canny (edges), 14
image_canny(), 14
image_capture (device), 12
image_channel, 9
image_channel (color), 8
image_charcoal (effects), 17
image_chop, 29
image_chop (transform), 28
image_coalesce (animation), 3
image_colorize, 10
image_colorize (color), 8
image_comment (attributes), 6
image_compare, 3
image_compare (analysis), 2
image_compare_dist (analysis), 2
image_composite (composite), 11
image_connect, 26
image_connect (segmentation), 25
image_contrast, 10
image_contrast (color), 8
image_convert (editing), 15
image_convert(), 10
image_convolve (morphology), 21
image_crop, 29
image_crop (transform), 28
image_data (editing), 15
image_data(), 16
image_deskew, 29
image_deskew (transform), 28
image_despeckle (effects), 17
image_device (device), 12
image_display (editing), 15
image_draw, 25
image_draw (device), 12
image_edge (edges), 14
image_emboss (effects), 17
image_enhance, 10
image_enhance (color), 8
image_equalize, 10
image_equalize (color), 8
image_fft, 3
image_fft (analysis), 2
image_fill (painting), 24
image_fill(), 24
image_flatten, 4
image_flatten (animation), 3
image_flip, 29
image_flip (transform), 28
image_flop, 29
image_flop (transform), 28
image_frame, 11
image_frame (composite), 11
image_fuzzycmeans, 26
image_fuzzycmeans (segmentation), 25
image_fx (fx), 18
image_ggplot, 21
image_graph (device), 12
image_graph(), 3, 4, 6, 9, 11, 14, 16, 18, 19, 21, 22, 24, 26–28, 30
image_hough_draw (edges), 14
image_hough_txt (edges), 14
image_implode (effects), 17
image_info (attributes), 6
image_info(), 6
image_join (editing), 15
image_lat (thresholding), 27
image_lat(), 27
image_map, 9
image_map (color), 8
image_median, 10
image_median (color), 8
image_modulate, 9
image_modulate (color), 8
image_montage, 4
image_montage (animation), 3
image_morph, 4
image_morph (animation), 3
image_morphology (morphology), 21
image_mosaic, 4
image_mosaic (animation), 3
image_negate (effects), 17
image_noise (effects), 17
image_normalize, 10
image_normalize (color), 8
image_ocr (ocr), 22
image_ocr_data (ocr), 22
image_oilpaint (effects), 17
image_orient (transform), 28
image_page (transform), 28
image_quantize, 9
image_quantize (color), 8
INDEX

image_raster (editing), 15
image_raster(), 21
image_read (editing), 15
image_read(), 3, 4, 6, 9, 11, 14–16, 18, 19, 21, 22, 24, 26–28, 30
image_read_pdf (editing), 15
image_read_svg (editing), 15
image_reducenoise (effects), 17
image_repage (transform), 28
image_resize, 29
image_resize (transform), 28
image_rotate, 29
image_rotate (transform), 28
image_sample, 29
image_sample (transform), 28
image_scale, 29
image_scale (transform), 28
image_split, 26
image_split (segmentation), 25
image_strip (editing), 15
image_threshold (thresholding), 27
image_threshold(), 27
image_transparent, 10
image_transparent (color), 8
image_trim, 29
image_trim (transform), 28
image_types, 16
image_types (options), 23
image_write (editing), 15
image_write_gif (video), 30
image_write_video (video), 30
imagemagick (_index_), 31
kernel_types (options), 23
kerneltype, 22
lapply, 5
length(), 16
logo (wizard), 31
magick (_index_), 31
magick-package (_index_), 31
magick_config (coder_info), 7
magick_options (options), 23
metric_types (options), 23
metric_types(), 3
morphology, 3, 5, 6, 10, 11, 13, 14, 17–20, 21, 23–26, 29, 30, 32
morphology_types (options), 23

noise_types, 18
noise_types (options), 23
ocr, 3, 5, 6, 10, 11, 13, 14, 17–20, 22, 22, 24–26, 29–32
option_types (options), 23
options, 3, 5, 6, 10, 11, 13, 14, 17–20, 22, 23, 23, 25, 26, 29–32
orientation_types, 29
orientation_types (options), 23
painting, 3, 5, 6, 10, 11, 13, 14, 17–20, 22–24, 24, 26, 29–32
password, 16
pdf tools, 16
plotNwindow, 12
print(), 16
rev(), 16
rose (wizard), 31
rsvg, 16

segmentation, 3, 5, 6, 10, 11, 13, 14, 17–20, 22–25, 25, 29, 30, 32
tesseract, 22, 23, 31
tesseract_download(), 22, 23
thresholding, 27
transform, 3, 5, 6, 10, 11, 13, 14, 17–20, 22–26, 28, 30–32
vapply, 5
video, 3, 5, 6, 10, 11, 13, 14, 17–20, 22–26, 29, 30, 32

wizard, 31