Package ‘imbibe’

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Title A Pipe-Friendly Image Calculator
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LinkingTo Rcpp, RNifti
Suggests mmand, tinytest, covr
Description Provides a set of fast, chainable image-processing operations
    which are applicable to images of two, three or four dimensions,
    particularly medical images.
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add

Basic binary operations

Usage

add(image, arg)
subtract(image, arg)
multiply(image, arg)
divide(image, arg)
remainder(image, arg)
mask(image, arg)
maximum(image, arg)
minimum(image, arg)

Arguments

image An image object or pipeline.
arg Numeric or image argument.

Value

An updated pipeline.
dilate

Mathematical morphology and filtering operations

Description

Mathematical morphology and filtering operations

Usage

dilate(image, kernel = NULL, ..., max = FALSE, nonzero = TRUE)
dilateall(image, kernel = NULL, ...)
erode(image, kernel = NULL, ..., min = FALSE)
filter_median(image, kernel = NULL, ...)
filter_mean(image, kernel = NULL, ..., norm = TRUE)
smooth_gauss(image, sigma)
subsamp(image, offset = FALSE)

Arguments

image An image object or pipeline.
kernel A suitable kernel function (see kernels). If NULL, the most recently set kernel
in the pipeline is used, if any, otherwise the default kernel (kernel_3d).
... Additional arguments to the kernel function, if any.
max Logical value: if TRUE, maximum filtering is used for dilation; otherwise mean
filtering is used. Mean filtering is always used by dilateall.
nonzero Logical value: if TRUE, the default, dilation is only applied to nonzero pix-
els/voxels. Otherwise it is applied everywhere (and maximum filtering is always
used).
min Logical value: if TRUE, minimum filtering is used for erosion; otherwise nonzero
voxels overlapping with the kernel are simply zeroed.
norm Logical value indicating whether the mean filter will be normalised or not.
sigma Numeric value giving the standard deviation of the Gaussian smoothing kernel.
offset Logical value indicating whether subsampled pixels should be offset from the
original locations or not.

Value

An updated pipeline.
Dimensionality reduction operations

Description

Dimensionality reduction operations

Usage

```r
dim_mean(image, dim = 4L)
dim_sd(image, dim = 4L)
dim_max(image, dim = 4L)
dim_whichmax(image, dim = 4L)
dim_min(image, dim = 4L)
dim_median(image, dim = 4L)
dim_quantile(image, dim = 4L, prob)
dim_AR1(image, dim = 4L)
```

Arguments

- `image`: An image object or pipeline.
- `dim`: Integer value between 1 and 4, giving the dimension to apply the reduction along.
- `prob`: For `drt_quantile`, the quantile probability to extract (analogously to `quantile`).

Value

An updated pipeline.

Description

This function provides an expectation for use with the "tinytest" package, which runs the pipeline specified in its first argument and compares the result to its second.
### exponent

#### Usage

```r
expect_pipeline_result(current, target, precision = "double", ...)
```

#### Arguments

- **current**: The pipeline to run, which should have class "imbibe".
- **target**: The target value to compare against, a numeric array of some kind, which will be converted to a "niftiImage" object.
- **precision**: A string specifying the working precision. Passed to `run`.
- **...**: Further arguments to `expect_equal`.

#### Value

A "tinytest" object.

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### Description

Basic unary operations

#### Usage

- `exponent(image)`
- `logarithm(image)`
- `sine(image)`
- `cosine(image)`
- `tangent(image)`
- `arcsine(image)`
- `arccosine(image)`
- `arctangent(image)`
- `square(image)`
- `squareroot(image)`
- `reciprocal(image)`
imbibe

Arguments

image An image object or pipeline.
invert Logical value: if TRUE, binarising will also perform logical inversion so that only zeroes in the original image will be nonzero; if FALSE, the default, the usual sense is used, in which zeroes remain as they are, and everything else is converted to 1.

Value

An updated pipeline.

Description

Create an operation pipeline

Usage

imbibe(image)

## S3 method for class 'imbibe'
as.Nifti(x, ...)

## S3 method for class 'imbibe'
as.array(x, ...)

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

Arguments

image An image object or existing pipeline.
x An "imbibe" object.
... Additional arguments to methods.
Mathematical morphology kernels

Usage

kernel_3d(image)
kernel_2d(image)
kernel_box(image, width, voxels = FALSE)
kernel_gauss(image, sigma)
kernel_sphere(image, radius)
kernel_file(image, file)

Arguments

- **image**: An image object or pipeline.
- **width**: The width of the kernel in appropriate units. If voxels is FALSE a value can be specified for each of the three dimensions; otherwise only a single value should be given and the kernel will be isotropic.
- **voxels**: Logical value: if TRUE, the width is given in pixels/voxels and must be an odd integer; otherwise, the units are millimetres and can take any value.
- **sigma**: Numeric value giving the standard deviation of a Gaussian kernel, in millimetres.
- **radius**: Numeric value giving the radius of a sphere kernel, in millimetres.
- **file**: Name of a NIfTI file containing the kernel.

Value

An updated pipeline.
**run**

*Run a pipeline and return an image result*

**Description**

Run a pipeline and return an image result

**Usage**

```r
run(pipe, precision = getOption("imbibe.precision", "double"))
```

**Arguments**

- `pipe`  
  An operation pipeline.
- `precision`  
  The internal precision used for calculations. May be "double", "float" or "single"; the latter two are equivalent.

**Value**

An image

**Examples**

```r
im <- RNifti::readNifti(system.file("extdata", "example.nii.gz", package="RNifti"))
pipe <- im %>% threshold_below(500) %>% binarise()
run(pipe)
```

---

**threshold**

*Image thresholding*

**Description**

Image thresholding

**Usage**

```r
threshold(
  image,
  value,
  reference = c("none", "image", "nonzero"),
  above = FALSE
)
```

```r
threshold_below(image, value, reference = c("none", "image", "nonzero"))
```

```r
threshold_above(image, value, reference = c("none", "image", "nonzero"))
```
### Arguments

- **image**: An image object or pipeline.
- **value**: Numeric threshold value.
- **reference**: String indicating what the value should be referenced against, if anything. If "none", the default, the value is taken literally. If "image", it is interpreted as a proportion of the "robust range" of the current image’s intensities. If "nonzero" it is interpreted as a proportion of the "robust range" of the nonzero pixel intensities.
- **above**: Logical value: if TRUE the operation zeroes values above the threshold; otherwise it zeroes values below it. The `threshold_below` and `threshold_above` function variants set argument implicitly.

### Value

An updated pipeline.
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