

Package ‘specklestar’

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Version 0.0.1.7

Title Reduction of Speckle Data from BTA 6-m Telescope

Description A set of functions for obtaining positional parameters and magnitude difference between components of binary and multiple stellar systems from series of speckle images.

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URL https://drastega.github.io/docs/specklestar_vignette.html

BugReports <https://github.com/drastega/specklestar/issues>

Depends R (>= 3.0.0)

Imports Rcpp

Suggests imager, tidyverse, rgl, fftw, mrbsizeR, knitr, rmarkdown

License GPL-2

NeedsCompilation yes

SystemRequirements fftw3 (>= 3.1.2)

Encoding UTF-8

LazyData true

LinkingTo Rcpp

RoxygenNote 6.0.1

VignetteBuilder knitr

Repository CRAN

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middle_frame	<i>Middle frame</i>
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Description

Average image of the series of 512 x 512 px images

Usage

```
middle_frame(filename, subtrahend, threshold = 50000L)
```

Arguments

- filename A string.
- subtrahend 512 x 512 matrix to subtract.
- threshold An integer (default 50000).

Value

The 512 x 512 matrix of middle speckle image.

Examples

```
obj_filename <- system.file("extdata", "ads15182_550_2_frames.dat", package = "specklestar")
zero_matrix <- matrix(0, 512, 512)
mf <- middle_frame(obj_filename, subtrahend = zero_matrix)
```

specklestar	<i>specklestar: A package for reduction of speckle data.</i>
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Description

The specklestar package provides functions for obtaining power spectrum and autocorrelation function from speckle data.

speckle_acf	<i>Autocorrelation function calculation</i>
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Description

Autocorrelation function of power spectrum

Usage

```
speckle_acf(ps)
```

Arguments

ps 513 x 1024 power spectrum double matrix.

Value

The 513 x 1024 double matrix of ACF.

Examples

```
obj_filename <- system.file("extdata", "ads15182_550_2_frames.dat", package = "specklestar")
pow_spec_diff <- speckle_ps_diff(obj_filename)
acf <- speckle_acf(pow_spec_diff)
```

speckle_frame	<i>Get selected speckle frame Get specified speckle frame as matrix from file</i>
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Description

Get selected speckle frame Get specified speckle frame as matrix from file

Usage

```
speckle_frame(data_file = file.choose(), frame = 1)
```

Arguments

data_file a character string with the path name to a file.
frame an integer.

Value

512 x 512 matrix with given frame.

Examples

```
## Not run:
# On Unix-like operating systems only
# Read frame number 2 from file to matrix
obj_filename <- system.file("extdata", "ads15182_550_2_frames.dat", package = "specklestar")
frame2 <- speckle_frame(obj_filename, 2)

## End(Not run)
```

speckle_generator	<i>Speckle Generator</i>
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Description

Generate model 512 x 512 x 2 (bytes) speckle image of binary star

Usage

```
speckle_generator(rho, theta, dm, seeing, speckle_sigma, wind)
```

Arguments

rho	a separation (an arcsec).
theta	a positional angle.
dm	a magnitude difference.
seeing	a number.
speckle_sigma	a number.
wind	a wind speed.

Value

The vector of model speckle image.

Examples

```
speckle_vector <- speckle_generator(rho = 0.5, theta = 70,
dm = 0.3, seeing = 20, speckle_sigma = 1, wind = 0)
speckle_matrix <- matrix(speckle_vector, nrow = 512, ncol = 512)
```

speckle_ps	<i>Power spectrum calculation</i>
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Description

Power spectrum of the series of 512 x 512 speckle images

Usage

```
speckle_ps(filename, dark, flat, threshold = 50000L)
```

Arguments

filename	a character string with the path name to a file.
dark	512 x 512 middle frame matrix.
flat	512 x 512 middle flat field matrix.
threshold	an integer (default is 50000).

Value

The 513 x 1024 double matrix of power spectrum.

Examples

```
obj_filename <- system.file("extdata", "ads15182_550_2_frames.dat", package = "specklestar")
midd_dark <- matrix(0, 512, 512)
midd_flat <- matrix(1, 512, 512)
pow_spec <- speckle_ps(obj_filename, dark = midd_dark, flat = midd_flat)
```

speckle_ps_diff	<i>Power spectrum calculation</i>
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Description

Power spectrum of the difference of neighboring frames in the series of speckle images

Usage

```
speckle_ps_diff(filename, threshold = 50000L)
```

Arguments

filename	a character string with the path name to a file.
threshold	an integer (default is 50000).

Value

The 513 x 1024 double matrix of power spectrum.

Examples

```
obj_filename <- system.file("extdata", "ads15182_550_2_frames.dat", package = "specklestar")
pow_spec_diff <- speckle_ps_diff(obj_filename)
```

speckle_stat	<i>Statistics of speckles</i>
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Description

Calculate statistics of speckles in the series of 512 x 512 speckle images and filter "bad" frames

Usage

```
speckle_stat(filename, threshold = 50000L)
```

Arguments

filename	a character string with the path name to a file.
threshold	an integer (default is 50000).

Value

The list with 2 elements 'badFrames' and 'hist':
 1 number of bad frames,
 2 double vector of speckle statistics.

Examples

```
obj_filename <- system.file("extdata", "ads15182_550_2_frames.dat", package = "specklestar")
spec_stat <- speckle_stat(obj_filename)
```

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