

Package: foto (via r-universe)

October 16, 2024

Version 1.2

Title Fourier Transform Textural Ordination

Description A tool to use a principal component analysis on radially averaged two dimensional Fourier spectra to characterize image texture. The method within the context of ecology was first described by Couteron et al. (2005) [doi:10.1111/j.1365-2664.2005.01097.x](https://doi.org/10.1111/j.1365-2664.2005.01097.x) and expanded upon by Solorzano et al. (2018) [doi:10.1117/1.JRS.12.036006](https://doi.org/10.1117/1.JRS.12.036006) using a moving window approach.

URL <https://github.com/bluegreen-labs/foto>,
<https://bluegreen-labs.github.io/foto/>

BugReports <https://github.com/bluegreen-labs/foto/issues>

Depends R (>= 3.6)

Imports terra, stats, parallel, grDevices

Suggests knitr, tidy, ggplot2, rmarkdown, covr, testthat

License AGPL-3

LazyData true

ByteCompile true

RoxygenNote 7.2.3

VignetteBuilder knitr

Repository <https://bluegreen-labs.r-universe.dev>

RemoteUrl <https://github.com/bluegreen-labs/foto>

RemoteRef HEAD

RemoteSha 456d871d232a88d7990b2b76898b64b0060dd2ff

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foto	<i>Calculates FOTO classification of texture</i>
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Description

Note that the input matrix should be square or results will be discarded

Usage

```
foto(  
  x,  
  window_size = 61,  
  harmonics = 29,  
  method = "zones",  
  norm_spec = FALSE,  
  high_pass = TRUE,  
  pca = TRUE,  
  plot = FALSE  
)
```

Arguments

x	an image file, or single or multi-layer SpatRaster (RGB or otherwise), multi-layer data are averaged to a single layer
window_size	a moving window size in pixels (default = 61 pixels)
harmonics	number of harmonics to consider (29 by default)
method	zones (for discrete zones) or mw for a moving window approach
norm_spec	normalize radial spectrum, boolean TRUE or FALSE
high_pass	apply high pass filter to radial spectra, boolean TRUE or FALSE
pca	execute PCA, TRUE or FALSE. If FALSE only the radial spectra are returned for additional manipulation. Plotting is ignored if set to FALSE.
plot	plot output, boolean TRUE or FALSE

Value

returns a radial spectrum for a moving window across a raster layer

See Also

[rspectrum](#)

Examples

```
## Not run:
# load demo data
r <- terra::rast(system.file("extdata",
  "yangambi.png",
  package = "foto",
  mustWork = TRUE
))

# classify pixels using zones (discrete steps)
output <- foto(r,
  plot = FALSE,
  window_size = 25,
  method = "zones"
)

# print data structure
print(names(output))

## End(Not run)
```

foto_batch

Calculates FOTO classification of texture for an image batch

Description

This routine process images as a batch, normalizing the PCA analysis across images. This global normalization makes it possible to compare the resulting PCA scores across images and infer trends over different remote sensing tiles or across time.

Usage

```
foto_batch(path, window_size = 61, method = "zones", cores = 1)
```

Arguments

path	directory containing (only) image files to process
window_size	a moving window size in pixels (default = 61 pixels)
method	zones (for discrete zones) or mw for a moving window approach
cores	number of cores to use in parallel calculations

Value

returns a radial spectrum for a moving window across a raster layer

See Also

[rspectrum foto](#)

Examples

```
## Not run:
# load demo data path
path <- system.file("extdata", package = "foto")

# classify pixels using zones (discrete steps)
output <- foto_batch(
  path = path,
  window_size = 25,
  method = "zones"
)

## End(Not run)
```

normalize	<i>Normalize a matrix or vector</i>
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Description

Normalize values between 0 and 1, internal function only.

Usage

```
normalize(x)
```

Arguments

x a matrix or vector

Value

returns a normalized matrix or vector

rspectrum	<i>Calculates a radial spectrum</i>
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Description

This is an internal function and not to be used stand-alone.

Usage

```
rspectrum(x, w, hm, n = TRUE, h = TRUE, env, ...)
```

Arguments

x	a square matrix
w	a moving window size
hm	harmonics to consider as features
n	normalize, boolean TRUE or FALSE
h	high pass filter on the two first spectra values set to 0, limits the influence of low frequency components boolean TRUE or FALSE
env	local environment to evaluate
...	additional parameters to forward

Value

Returns a radial spectrum values for the image used in order to classify texture using a PCA (or other) analysis.

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