Package 'Julia'

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Type Package

Title Fractal Image Data Generator

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Description Generates image data for fractals (Julia and Mandelbrot sets) on the complex plane in the given region and resolution.

License GPL-3

LazyLoad yes

Repository CRAN

NeedsCompilation no

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`Julia-package` *Julia*

Description

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Details

Package:	Julia
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License:	GPL-3
LazyLoad:	yes

Author(s)

Mehmet Suzen Maintainer: Mehmet Suzen <mehmet.suzen@physics.org>

References

The Fractal Geometry of Nature, Benoit B. Mandelbrot, W.H.Freeman & Co Ltd (18 Nov 1982)

See Also

JuliaIterate and MandelIterate

Examples

```
# Julia Set
  imageN <- 5;
  centre <- -1.0
  L <- 2.0
  file <- "julia1a.png"
  C <- 1-1.6180339887;# Golden Ration
  image <- JuliaImage(imageN,centre,L,C);
 # writePNG(image,file);# possible visulisation
# Mandelbrot Set
  imageN <- 5;
  centre <- 0.0
  L <- 4.0
  file <- "mandelbrot1.png"
  image<-MandelImage(imageN,centre,L);
 # writePNG(image,file);# possible visulisation
```

JuliaImage *Julia Set Generator in a Square Region*

Description

'JuliaImage' returns two dimensional array representing escape values from on the square region in complex plane. Escape values (which measures the number of iteration before the lenght of the complex value reaches to 2).

Usage

```
JuliaImage(imageN, centre, L, C)
```

Arguments

imageN	Number of pixels to equally space division of one side if the square region.
centre	A complex number that determines the centre of the square region
L	A side length of the square region on the complex plane.
C	Complex coefficient

Details

Julia Set is defined as the set of initial complex values where the z = z^2 +C does not diverge to infinity. C is an arbitrary complex constant that does not change during the iteration by definition.

Value

It returns a 2D array of real values from 0 to 1. The array correspods to image on the complex plane.

Note

Post processing to plot/color mapping of the Julia set for visualisation can be done by using the array generated. See examples to get a png output.

Author(s)

Mehmet Suzen <mehmet.suzen@physics.org>

References

Gaston Julia (1918) "Memoire sur l'iteration des fonctions rationnelles," Journal de Mathematiques Pures et Appliquees, vol. 8, pages 47-245.

See Also

MandelImage

Examples

```
#
# Generating png of the Julia set
# C is 1 minus the golden ratio
#
  imageN <- 5;
  centre <- 0.0
  L <- 4.0
  C <- 1-1.6180339887;# Golden Ratio
  image <- JuliaImage(imageN,centre,L,C);
  #library(png)
  #file <- "julia1.png"
```

```
  #writePNG(image,file); # possible visulation
#
#  Generating png of the Julia set
# different coefficient.
#
  imageN <- 5;
  centre <- 0.0
  L <- 4.0
  C <- -0.70176-0.3842i
  image <- JuliaImage(imageN,centre,L,C);
  #library(png)
  #file <- "julia2.png"
  #writePNG(image,file); # possible visulation
```

JuliaIterate *JuliaIterate*

Description

'JuliaIterate' returns the number of iteration until a complex value diverges for the Julia map for a give complex number.

Usage

```
JuliaIterate(z, C)
```

Arguments

z	A complex coordinate (initial value for the map).
C	A complex constant.

Details

'JuliaIterate' returns the number of iteration until a complex value diverges for the Julia map for a give complex number.

Value

Number of iterations.

Note

Iterative function.

Author(s)

Mehmet Suzen <mehmet.suzen@physics.org>

References

The Fractal Geometry of Nature, Benoit B. Mandelbrot, W.H.Freeman & Co Ltd (18 Nov 1982)

See Also

JuliaIterate and MandelIterate

Examples

```
z<-0+0i
C <- 1-1.6180339887;# Golden Ratio
it<- JuliaIterate(z,C)
```

MandelImage *Mandelbrot Set Generator in a Square Domain*

Description

'MandelImage' returns two dimensional array representing escape values from on the square region in complex plane. Escape values (which measures the number of iteration before the lenght of the complex value reaches to 2.)

Usage

```
MandelImage(imageN, centre, L)
```

Arguments

imageN	Number of pixels to equally space division of one side if the square region.
centre	A complex number that determines the centre of the square region.
L	A side length of the square region on the complex plane.

Details

Mandelbrot set is defined as the set of initial complex values where the z = z^2 +z_0 does not diverge to infinity. Initial value for the map is taken to be zero and z_0 is the complex coordinate.

Value

Returns a matrix.

Note

Returns a matrix

Author(s)

Mehmet Suzen <mehmet.suzen@physics.org>

References

The Fractal Geometry of Nature, Benoit B. Mandelbrot, W.H.Freeman & Co Ltd (18 Nov 1982)

See Also

JuliaImage

Examples

```
# png image
  imageN <- 5;
  centre <- 0.0
  L <- 4.0
  image<-MandelImage(imageN,centre,L);
  #file <- "mandelbrot1.png"
  # writePNG(image,file); # possible visualisation
# Closer lookup to set
  imageN <- 5;
  centre <- -0.5
  L <- 2.0
  image<-MandelImage(imageN,centre,L);
  # file <- "mandelbrot.png"
  #writePNG(image,file); # possible visualisation
```

MandelIterate *MandelIterate*

Description

'MandelIterate' returns the number of iteration until a complex value diverges for the Mandelbrot map for a give complex number.

Usage

```
MandelIterate(z_0)
```

Arguments

z_0	A complex coordinate (constant coefficient value for the map)

Details

Iterate function.

Value

Returns an integer

Note

Iterate function

Author(s)

Mehmet Suzen <mehmet.suzen@physics.org>

References

The Fractal Geometry of Nature, Benoit B. Mandelbrot, W.H.Freeman & Co Ltd (18 Nov 1982)

See Also

JuliaIterate and MandelIterate

Examples

```
z_0 <- 0-0.5i
it  <- MandelIterate(z_0)
```

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