Package 'aRtsy'

August 27, 2021

Title Generative Art with 'ggplot2'

Description Provides various algorithms for creating artworks in the 'ggplot2' language that incorporate some form of randomness.

Version 0.1.1

Date 2021-08-25

BugReports https://github.com/koenderks/aRtsy/issues

URL https://koenderks.github.io/aRtsy/, https://github.com/koenderks/aRtsy, https://twitter.com/aRtsy_package

Imports dplyr, e1071, ggplot2, kknn, randomForest, Rcpp, reshape2, stats

LinkingTo Rcpp, RcppArmadillo

Language en-US

License GPL-3

Encoding UTF-8

RoxygenNote 7.1.1

Suggests testthat (>= 3.0.0)

Config/testthat/edition 3

R topics documented:

`aRtsy-package` *aRtsy — Generative Art using* `ggplot2`

Description

`aRtsy` is an attempt at making generative art available for the masses in a simple and standardized format. The package provides various algorithms for creating artworks in ggplot2 that incorporate some form of randomness (depending on the set `seed`). Each type of artwork is implemented in a separate function.

For documentation on `aRtsy` itself, including the manual and user guide for the package, worked examples, and other tutorial information visit the package website.

Author(s)

Koen Derks (maintainer, author) <koen-derks@hotmail.com>

Please use the citation provided by R when citing this package. A BibTex entry is available from `citation("aRtsy")`.

See Also

Useful links:

- The twitter feed to check the artwork of the day.
- The issue page to submit a bug report or feature request.

`canvas_ant` *Paint Langton's Ant on a Canvas*

Description

This function paints Langton's Ant. Langton's ant is a two-dimensional universal Turing machine with a very simple set of rules but complex emergent behavior.

Usage

```
canvas_ant(colors, background = '#fafafa', iterations = 1e7,
           width = 200, height = 200)
```

Arguments

colors	a string or character vector specifying the color(s) used for the artwork.
background	a character specifying the color used for the background.
iterations	a positive integer specifying the number of iterations of the algorithm.
width	a positive integer specifying the width of the artwork in pixels.
height	a positive integer specifying the height of the artwork in pixels.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

References

https://en.wikipedia.org/wiki/Langtons_ant

Examples

```
set.seed(1)
palette <- colorPalette('random', n = 10)
canvas_ant(colors = palette)
```

---

canvas_blacklight *Paint Random Blacklights on a Canvas*

Description

This function creates an artwork from randomly generated data by running a support vector machines regression algorithm to predict the color of each pixel on the canvas.

Usage

```
canvas_blacklight(colors, n = 1000, resolution = 500)
```

Arguments

colors	a string or character vector specifying the color(s) used for the artwork.
n	a positive integer specifying the number of random data points to generate.
resolution	a positive integer specifying the number of pixels (resolution x resolution) of the artwork.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

References

https://en.wikipedia.org/wiki/Support-vector_machine

Examples

```
set.seed(2)
palette <- colorPalette('random', n = 5)
canvas_blacklight(colors = palette)
```

---

canvas_circlemap *Paint a Circle Map on a Canvas*

Description

This function draws a circle map on the canvas.

Usage

```
canvas_circlemap(colors, xmin = 0, xmax = 12.56, ymin = 0, ymax = 1,
                 iterations = 10, width = 1500, height = 1500)
```

Arguments

colors	a string or character vector specifying the color(s) used for the artwork.
xmin	a value specifying the minimum location on the x-axis.
xmax	a value specifying the maximum location on the x-axis.
ymin	a value specifying the minimum location on the y-axis.
ymax	a value specifying the maximum location on the y-axis.
iterations	a positive integer specifying the number of iterations of the algorithm.
width	a positive integer specifying the width of the artwork in pixels.
height	a positive integer specifying the height of the artwork in pixels.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

References

https://en.wikipedia.org/wiki/Arnold_tongue

https://linas.org/art-gallery/circle-map/circle-map.html

Examples

```
set.seed(3)
palette <- colorPalette('random', n = 5)
canvas_circlemap(colors = palette)
```

---

canvas_collatz *Paint Random Collatz Sequences on a Canvas*

Description

This function draws the Collatz conjecture on the canvas.

Usage

```
canvas_collatz(colors, background = '#fafafa', n = 200,
               angle.even = 0.0075, angle.odd = 0.0145, side = FALSE)
```

Arguments

colors	a string or character vector specifying the color(s) used for the artwork.
background	a character specifying the color used for the background.
n	a positive integer specifying the number of random starting integers to use for the lines. Can also be a vector of numbers to use as starting numbers.
angle.even	a value specifying the angle (in radials) to use in bending the sequence at each odd number.
angle.odd	a value specifying the angle (in radials) to use in bending the sequence at each even number.
side	logical. Whether to put the artwork on its side.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

References

https://nl.wikipedia.org/wiki/Collatz_Conjecture

Examples

```
set.seed(4)
palette <- colorPalette('random', n = 5)
canvas_collatz(colors = palette, n = 100)
```

`canvas_diamonds` *Paint Random Diamonds on a Canvas*

Description

This function draws many diamonds on the canvas and places two lines behind them. The diamonds can be transparent or have a random color sampled from the input.

Usage

```
canvas_diamonds(colors, background = '#fafafa', col.line = 'black',
                radius = 10, alpha = 1, p = 0.2,
                width = 500, height = 500)
```

Arguments

`colors`	a string or character vector specifying the color(s) used for the artwork.
`background`	a character specifying the color used for the background.
`col.line`	a character specifying the color of the diamond borders.
`radius`	a positive value specifying the radius of the diamonds.
`alpha`	a value specifying the transparency of the diamonds. If `NULL` (the default), added layers become increasingly more transparent.
`p`	a value specifying the probability of drawing an empty diamond.
`width`	a positive integer specifying the width of the artwork in pixels.
`height`	a positive integer specifying the height of the artwork in pixels.

Value

A `ggplot` object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

Examples

```
set.seed(5)
palette <- colorPalette('random', n = 5)
canvas_diamonds(colors = palette, radius = 10)
```

canvas_forest *Paint a Random Forest on a Canvas*

Description

This function creates an artwork from randomly generated data by running a random forest classification algorithm to predict the color of each pixel on the canvas.

Usage

```
canvas_forest(colors, n = 1000, resolution = 500)
```

Arguments

colors	a string or character vector specifying the color(s) used for the artwork.
n	a positive integer specifying the number of random data points to generate.
resolution	a positive integer specifying the number of pixels (resolution x resolution) of the artwork.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

Examples

```
set.seed(6)
palette <- colorPalette('random', n = 5)
canvas_forest(colors = palette)
```

canvas_function *Paint A Random Function on a Canvas*

Description

This function paints functions with random parameters and mimics the functionality of the generativeart package.

Usage

```
canvas_function(color, background = '#fafafa')
```

Arguments

color	a string specifying the color used for the artwork.
background	a character specifying the color used for the background.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

References

https://github.com/cutterkom/generativeart

Examples

```
set.seed(10)
canvas_function(color = '#000000')
```

---

canvas_gemstone *Paint a Random Gemstone on a Canvas*

Description

This function creates an artwork from randomly generated data by running a k-nearest neighbors regression algorithm to predict the color of each pixel on the canvas.

Usage

```
canvas_gemstone(colors, maxk = 1, n = 1000, resolution = 500)
```

Arguments

colors	a string or character vector specifying the color(s) used for the artwork.
maxk	a positive integer specifying the maximum number of nearest neighbors to consider.
n	a positive integer specifying the number of random data points to generate.
resolution	a positive integer specifying the number of pixels (resolution x resolution) of the artwork.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

References

https://en.wikipedia.org/wiki/K-nearest_neighbors_algorithm

Examples

```
set.seed(7)
palette <- colorPalette('random', n = 10)
canvas_gemstone(colors = palette)
```

`canvas_mandelbrot` *Paint the Mandelbrot Set on a Canvas*

Description

This function draws the Mandelbrot set on the canvas.

Usage

```
canvas_mandelbrot(colors, iterations = 100, zoom = 1, xmin = -1.7, xmax = -0.2,
                  ymin = -0.2999, ymax = 0.8001, width = 500, height = 500)
```

Arguments

`colors`	a string or character vector specifying the color(s) used for the artwork.
`iterations`	a positive integer specifying the number of iterations of the algorithm.
`zoom`	a positive value specifying the amount of zoom to apply.
`xmin`	a value specifying the minimum location on the x-axis.
`xmax`	a value specifying the maximum location on the x-axis.
`ymin`	a value specifying the minimum location on the y-axis.
`ymax`	a value specifying the maximum location on the y-axis.
`width`	a positive integer specifying the width of the artwork in pixels.
`height`	a positive integer specifying the height of the artwork in pixels.

Value

A `ggplot` object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

References

https://en.wikipedia.org/wiki/Mandelbrot_set

Examples

```
set.seed(8)
palette <- colorPalette('random', n = 6)
canvas_mandelbrot(colors = palette, zoom = 10)
```

canvas_mosaic *Paint a Random Mosaic on a Canvas*

Description

This function paints a mosaic from randomly generated data by running a k-nearest neighbors classification algorithm to predict the color of each pixel on the canvas. Low values of maxk produce a mosaic like artwork, while higher values produce a more smooth decision boundary.

Usage

```
canvas_mosaic(colors, maxk = 1, n = 1000, resolution = 500)
```

Arguments

colors	a string or character vector specifying the color(s) used for the artwork.
maxk	a positive integer specifying the maximum number of nearest neighbors to consider.
n	a positive integer specifying the number of random data points to generate.
resolution	a positive integer specifying the number of pixels (resolution x resolution) of the artwork.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

References

https://en.wikipedia.org/wiki/K-nearest_neighbors_algorithm

Examples

```
set.seed(9)
palette <- colorPalette('random', n = 10)
canvas_mosaic(colors = palette)
```

canvas_planet *Paint a Random Planet on a Canvas*

Description

This function paints one or multiple planets and uses a cellular automata to fill their surfaces.

Usage

```
canvas_planet(colors, threshold = 4, iterations = 200,
              starprob = 0.01, fade = 0.2,
              radius = NULL, center.x = NULL, center.y = NULL,
              light.right = TRUE, width = 1500, height = 1500)
```

Arguments

colors	a character specifying the colors used for the planet(s). Can also be a list where each entry is a vector of colors for each planet.
threshold	a character specifying the threshold for a color take.
iterations	a positive integer specifying the number of iterations of the algorithm.
starprob	a value specyfing the probability of drawing a star in outer space.
fade	a value specifying the amount of fading to apply.
radius	a numeric (vector) specifying the radius of the planet(s).
center.x	the x-axis coordinate(s) for the center(s) of the planet(s).
center.y	the y-axis coordinate(s) for the center(s) of the planet(s).
light.right	whether to draw the light from the right or the left.
width	a positive integer specifying the width of the artwork in pixels.
height	a positive integer specifying the height of the artwork in pixels.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

References

https://fronkonstin.com/2021/01/02/neighborhoods-experimenting-with-cyclic-cellular-automata/

Examples

```
# Sun behind Earth and Moon
set.seed(1)
colors <- list(c("khaki1", "lightcoral", "lightsalmon"),
               c("dodgerblue", "forestgreen", "white"),
               c("gray", "darkgray", "beige"))
canvas_planet(colors, radius = c(800, 400, 150),
```

```
center.x = c(1, 500, 1100),
center.y = c(1400, 500, 1000),
starprob = 0.005)
```

---

canvas_polylines *Paint Random Polygons and Lines on a Canvas*

Description

This function draws many points on the canvas and connects these points into a polygon. After repeating this for all the colors, the edges of all polygons are drawn on top of the artwork.

Usage

```
canvas_polylines(colors, background = '#fafafa', ratio = 0.5, iterations = 1000,
                 alpha = NULL, size = 0.1, width = 500, height = 500)
```

Arguments

colors	a string or character vector specifying the color(s) used for the artwork.
background	a character specifying the color used for the lines.
ratio	a positive value specifying the width of the polygons. Larger ratios cause more overlap.
iterations	a positive integer specifying the number of iterations of the algorithm.
alpha	a value specifying the transparency of the polygons. If NULL (the default), added layers become increasingly more transparent.
size	a positive value specifying the size of the borders.
width	a positive integer specifying the width of the artwork in pixels.
height	a positive integer specifying the height of the artwork in pixels.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

Examples

```
set.seed(11)
palette <- colorPalette('random', n = 10)
canvas_polylines(colors = palette)
```

canvas_ribbons *Paint Random Ribbons on a Canvas*

Description

This function paints random ribbons and (optionally) a triangle in the middle.

Usage

```
canvas_ribbons(colors, background = '#fdf5e6', triangle = TRUE)
```

Arguments

colors	a string or character vector specifying the color(s) used for the artwork. The number of colors determines the number of ribbons.
background	a character specifying the color of the background.
triangle	logical. Whether to draw the triangle that breaks the ribbon polygons.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

Examples

```
set.seed(12)
palette <- colorPalette('random', n = 4)
canvas_ribbons(colors = palette)
```

canvas_segments *Paint Random Line Segments on a Canvas*

Description

This function draws many random line segments on the canvas.

Usage

```
canvas_segments(colors, background = '#fafafa', n = 100,
                p = 0.5, H = 0.1, size = 0.2)
```

Arguments

colors	a string or character vector specifying the color(s) used for the artwork.
background	a character specifying the color used for the background.
n	a positive integer specifying the number of line segments to draw.
p	a value specifying the probability of drawing a vectical line segment.
H	a positive value specifying the scaling factor for the line segments.
size	a positive value specifying the size of the line segments.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

Examples

```
set.seed(13)
palette <- colorPalette('random', n = 4)
canvas_segments(colors = palette)
```

---

canvas_squares *Paint Random Squares on a Canvas*

Description

This function paints random squares. It works by repeatedly cutting into the canvas at random locations and coloring the area that these cuts create.

Usage

```
canvas_squares(colors, background = '#000000', cuts = 50, ratio = 1.618,
               width = 100, height = 100)
```

Arguments

colors	a string or character vector specifying the color(s) used for the artwork.
background	a character specifying the color used for the borders of the squares.
cuts	a positive integer specifying the number of cuts to make.
ratio	a value specifying the 1:1 ratio for each cut.
width	a positive integer specifying the width of the artwork in pixels.
height	a positive integer specifying the height of the artwork in pixels.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

Examples

```
set.seed(14)
palette <- colorPalette('random', n = 4)
canvas_squares(colors = palette)
```

---

canvas_stripes *Paint Random Stripes on a Canvas*

Description

This function creates a brownian motion on each row of the artwork and colors it according to the height of the motion.

Usage

```
canvas_stripes(colors, n = 300, H = 1, burnin = 1)
```

Arguments

colors	a string or character vector specifying the color(s) used for the artwork.
n	a positive integer specifying the length of the brownian motion (effectively the width of the artwork).
H	a positive value specifying the square of the standard deviation of each step in the motion.
burnin	a positive integer specifying the number of steps to discard before filling each row.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

Examples

```
set.seed(15)
palette <- colorPalette('random', n = 4)
canvas_stripes(colors = palette)
```

canvas_strokes *Paint Random Strokes on a Canvas*

Description

This function creates an artwork that resembles paints strokes. The algorithm is based on the simple idea that each next point on the grid has a chance to take over the color of an adjacent colored point but also has a change of generating a new color.

Usage

```
canvas_strokes(colors, neighbors = 1, p = 0.01, iterations = 1,
               width = 500, height = 500, side = FALSE)
```

Arguments

colors	a string or character vector specifying the color(s) used for the artwork.
neighbors	a positive integer specifying the number of neighbors a block considers when taking over a color. More neighbors fades the artwork.
p	a value specifying the probability of selecting a new color at each block. A higher probability adds more noise to the artwork.
iterations	a positive integer specifying the number of iterations of the algorithm. More iterations generally apply more fade to the artwork.
width	a positive integer specifying the width of the artwork in pixels.
height	a positive integer specifying the height of the artwork in pixels.
side	logical. Whether to put the artwork on its side.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

Examples

```
set.seed(16)
palette <- colorPalette('random', n = 6)
canvas_strokes(colors = palette)
```

canvas_turmite *Paint a Random Turmite on a Canvas*

Description

This function paints a turmite. A turmite is a Turing machine which has an orientation in addition to a current state and a "tape" that consists of a two-dimensional grid of cells. The algorithm is simple: 1) turn on the spot (left, right, up, down) 2) change the color of the square 3) move forward one square.

Usage

```
canvas_turmite(color, background = '#fafafa', p = 0.5, iterations = 1e7,
               width = 1500, height = 1500)
```

Arguments

color	a character specifying the color used for the artwork.
background	a character specifying the color used for the background.
p	a value specifying the probability of a state switch within the turmite.
iterations	a positive integer specifying the number of iterations of the algorithm.
width	a positive integer specifying the width of the artwork in pixels.
height	a positive integer specifying the height of the artwork in pixels.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

References

https://en.wikipedia.org/wiki/Turmite

Examples

```
set.seed(17)
canvas_turmite(color = '#000000')
```

`colorPalette` *Color palette generator.*

Description

This function creates a random color palette, or allows the user to select a pre-implemented palette.

Usage

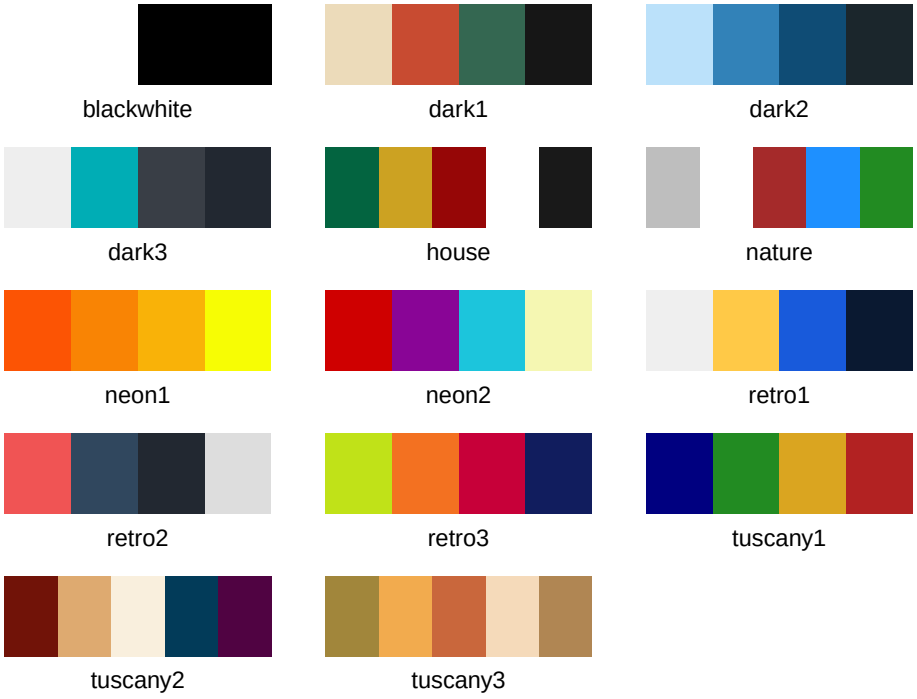
```
colorPalette(name, n = NULL)
```

Arguments

`name`	name of the color palette. Can be `random` for random colors, but can also be the name of a pre-implemented palette. See the `details` section for a list of pre-implemented palettes.
`n`	the number of colors to select from the palette. Required if `name = 'random'`. Otherwise, if `NULL`, automatically selects all colors from the chosen palette.

Details

The following color palettes are implemented:



Value

A vector of colors.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

Examples

```
colorPalette('random', 5)
```

---

saveCanvas *Save a canvas to an external device.*

Description

This function is a wrapper around `ggplot2::ggsave`. It provides a suggested export with square dimensions for a canvas created using the `aRtsy` package.

Usage

```
saveCanvas(plot, filename, width = 7, height = 7, resolution = 300)
```

Arguments

`plot`	a ggplot2 object to be saved.
`filename`	the filename of the export.
`width`	the width of the artwork in cm.
`height`	the height of the artwork in cm.
`dpi`	the `dpi` (dots per inch) of the file.

Value

No return value, called for saving plots.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

---

theme_canvas *Canvas theme for ggplot2 objects*

Description

Add a canvas theme to the plot. The canvas theme by default has no margins and fills any empty canvas with a background color.

Usage

```
theme_canvas(x, background = '#fafafa', margin = -1.25)
```

Arguments

x	a ggplot2 object.
background	a character specifying the color used for the empty canvas.
margin	margins of the plot.

Value

A ggplot object containing the artwork.

Author(s)

Koen Derks, <koen-derks@hotmail.com>

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