Package ‘sugarbag’

October 26, 2020

Title Create Tessellated Hexagon Maps

Version 0.1.3

Description Create a hexagon tile map display from spatial polygons. Each polygon is represented by a hexagon tile, placed as close to its original centroid as possible, with a focus on maintaining spatial relationship to a focal point. Developed to aid visualisation and analysis of spatial distributions across Australia, which can be challenging due to the concentration of the population on the coast and wide open interior.


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Encoding UTF-8

LazyData true

Depends R (>= 3.5.0), dplyr (>= 1.0.0)

Imports geosphere (>= 1.5), lwgeom (>= 0.2), progress (>= 1.2.2), purrr (>= 0.3.4), rlang (>= 0.4.6), rmapshaper (>= 0.4.4), sf (>= 0.9), tibble (>= 3.0.1), tidyr (>= 1.1.0), utf8 (>= 1.1.4)

RoxygenNote 7.1.1

Suggests ggplot2 (>= 3.1.0), knitr, pkgdown, rmarkdown, spData, testthat (>= 2.1.0)

VignetteBuilder knitr

NeedsCompilation no

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Repository CRAN

Date/Publication 2020-10-26 14:20:03 UTC
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Description

Chooses a hexagon centroid for each polygon in the shape file, from a grid spanning the longitudes and latitudes in the expanded bounding box.

Usage

```r
allocate(
  centroids,  # a data frame with centroids of non empty polygons
  hex_grid,    # a data frame containing all possible hexagon points
  sf_id = names(centroids)[1],  # a string to indicate the column to identify individual polygons
  hex_size,    #
  hex_filter,  #
  focal_points = NULL,  #
  order_sf_id = NULL,  #
  width = 30,  #
  verbose      #
)
```

Arguments

- **centroids**: a data frame with centroids of non empty polygons
- **hex_grid**: a data frame containing all possible hexagon points
- **sf_id**: a string to indicate the column to identify individual polygons
hex_size  a float value in degrees for the diameter of the hexagons
hex_filter  amount of hexagons around centroid to consider
focal_points  a data frame of reference locations when allocating hexagons, capital cities of
Australia are used in the example
order_sf_id  a string to indicate the column used to order polygons
width  a numeric indicating the angle used to filter the hexagon grid
verbose  a boolean to indicate whether to show polygon id

Value

a data frame of all allocated hexagon points

Examples

# Create centroids set
centroids <- create_centroids(tas_lga, sf_id = "LGA_CODE16")
# Create hexagon location grid
data(capital_cities)
grid <- create_grid(centroids = centroids, hex_size = 0.2, buffer_dist = 1.2)
# Allocate polygon centroids to hexagon grid points
hex_allocated <- allocate(
  centroids = centroids,
  hex_grid = grid,
  hex_size = 0.2, # same size used in create_grid
  hex_filter = 10,
  focal_points = capital_cities,
  width = 30, verbose = TRUE
)
# same column used in create_centroids
# create a set of hexagon points for plotting
fort_hex <- fortify_hexagon(data = hex_allocated, sf_id = "LGA_CODE16", hex_size = 0.2)
# plot the hexagons

capital_cities  The point locations of Australian capital cities.

Description

A dataset containing the longitude and latitude values of Australian capital cities.

Usage

capital_cities
Format

A data frame with 8 rows and 3 variables:

- **points**  name of cities
- **longitude**  location of point in longitude degrees
- **latitude**  location of point in latitude degrees

---

**closest_focal_point**  
For the polygon provided, find the closest focal point in the set provided

---

Description

For one row of an sf data frame, calculate the distance to the closest focal point. Return the name of the focal point, and the angle between focal point and centroid.

Usage

`closest_focal_point(centroid, focal_points)`

Arguments

- **centroid**  a data frame describing one centroid
- **focal_points**  a data frame of the longitude and latitude values

Value

data frame containing the name and location of the closest focal

Examples

```r
# Create a set of polygon centroids
centroids <- create_centroids(tas_sa2, "SA2_5DIG16")

# Find the closest capital city for the first centroid
closest_focal_point(centroids[1, ], capital_cities)
```
create_buffer

Expand points to extend beyond the outermost centroids

Description
Called from within create_grid function, this function takes the bounding box of a group of polygons, or a specific table of minimum and maximum longitudes and latitudes to create points for each polygon to be allocated to that will tessellate into hexagons.

Usage
create_buffer(centroids, grid, hex_size, buffer_dist, verbose = FALSE)

Arguments
- centroids: data frame of centroids to be allocated
- grid: data frame of hexagon centroids
- hex_size: a float value in degrees for the diameter of the hexagons
- buffer_dist: distance to extend beyond the geometry provided
- verbose: a boolean to indicate whether to show function progress

Value
data frame of hexagon centroids

Examples
lga_centroids <- create_centroids(sugarbag::tas_lga, "LGA_CODE16")
lga_grid <- create_grid(lga_centroids, hex_size = 0.2, buffer_dist = 1.2)

create_centroids
Create a data frame of longitude and latitude centroids of each polygon.

Description
Create a data frame of longitude and latitude centroids of each polygon.

Usage
create_centroids(shp_sf, sf_id, largest = TRUE, verbose = FALSE)
create_grid

Arguments

- **shp_sf**: an sf object, a data set with a simple feature list column
- **sf_id**: a string to indicate the column to identify individual polygons
- **largest**: logical; for st_centroid: if TRUE, return centroid of the largest subpolygon of a MULTIPOLYGON rather than the whole MULTIPOLYGON
- **verbose**: a boolean to indicate whether to show function progress

Value

A tibble containing longitude and latitude

Examples

```r
centroids <- create_centroids(tas_lga, "LGA_CODE16")
```

create_grid

Create a grid of evenly spaced points to allow hexagons to tessellate

Description

This function takes the output from the create_centroids function, or a set of centroids in a table with the columns latitude and longitude

Usage

```r
create_grid(
  centroids,
  hex_size,
  buffer_dist,
  latitude = "latitude",
  longitude = "longitude",
  verbose = FALSE
)
```

Arguments

- **centroids**: data frame of centroids to be allocated, this should have columns for longitude and latitude value of centroids, as
- **hex_size**: a float value in degrees for the diameter of the hexagons
- **buffer_dist**: distance to extend beyond the geometry provided
- **latitude**: the column name for the latitude values of the centroids
- **longitude**: the column name for the longitude values of the centroids
- **verbose**: a boolean to indicate whether to show function progress
create_hexmap

Value

grid

Examples

# Create a set of centroids for grid to overlay
centroids <- create_centroids(tas_lga, "LGA_CODE16")
# Create the grid
grid <- create_grid(centroids = centroids, hex_size = 0.2, buffer_dist = 1.2, verbose = FALSE)

create_hexmap  

Create a tessellated hexagon map from a set of polygons

Description

Allocates each polygon in a shape file to a grid point to create a map of tessellated hexagons. The spatial relationships of areas are preserved while the geographic shape of each area is lost.

Usage

create_hexmap(
  shp,
  sf_id,
  hex_size = NULL,
  buffer_dist = NULL,
  hex_filter = 10,
  f_width = 30,
  focal_points = NULL,
  order_sf_id = NULL,
  export_shp = FALSE,
  verbose = FALSE
)

Arguments

- **shp**: a shape file, if class is SPDF, will be converted to sf
- **sf_id**: name of a unique column that distinguishes areas
- **hex_size**: a float value in degrees for the diameter of the hexagons
- **buffer_dist**: distance in degrees to extend beyond the geometry provided
- **hex_filter**: amount of hexagons around centroid to consider
- **f_width**: the angle used to filter the grid points around a centroid
- **focal_points**: a data frame of reference locations when allocating hexagons, capital cities of Australia are used in the example
- **order_sf_id**: a string name of a column to order by for allocating
- **export_shp**: export the simple features set
- **verbose**: a boolean to indicate whether to show function progress
**filter_grid_points**

**Value**

A data set containing longitude and latitude of allocated hexagon points for each non null geometry passed in the shape file.

**Examples**

```r
data(tas_sa2)
data(capital_cities)
hexmap <- create_hexmap(
  shp = tas_lga,
  sf_id = "LGA_CODE16",
  focal_points = capital_cities, verbose = TRUE)
```

---

**Description**

Filter full set of grid points for those within range of original point.

**Usage**

```r
filter_grid_points(
  f_grid, 
  f_centroid, 
  focal_points = NULL, 
  f_dist = filter_dist, 
  angle_width = width, 
  h_size = hex_size
)
```

**Arguments**

- **f_grid**: Complete grid of hexagon centroids.
- **f_centroid**: Longitude and latitude values for the current centroid.
- **focal_points**: A tibble of focal locations, an optional argument that allows allocation of polygons to hexagon centroids in ascending order of the distance to the closest focal point. It also filters the grid points to those within a 30 degree range of the angle from focal point to centroid. The default "capitals" uses the locations of the Australian capital cities as focal points.
- **f_dist**: A distance in degrees, used as a boundary to filter the hexagon centroids considered for each polygon centroid to be allocated.
- **angle_width**: A numeric used to filter the hexagon grid.
- **h_size**: A float value in degrees for the diameter of the hexagons.
Value

a tibble of filtered grid points

Description

Creates the points that define a hexagon polygon for plotting

Usage

fortify_hexagon(data, sf_id, hex_size)

Arguments

data a data frame created by the allocate function
sf_id a string to indicate the column to identify individual polygons
hex_size a float value in degrees for the diameter of the hexagons

Value

a data frame of the seven points used to draw a hexagon

Examples

# Create centroids set
centroids <- create_centroids(tas_lga, "LGA_CODE16")
# Create hexagon location grid
grid <- create_grid(centroids = centroids, hex_size = 0.2, buffer_dist = 1.2)
# Allocate polygon centroids to hexagon grid points
allocated <- allocate(
centroids = centroids,
sf_id = "LGA_CODE16",
hex_grid = grid,
hex_size = 0.2, # same size used in create_grid
hex_filter = 1,
width = 30,
focal_points = capital_cities,
verbose = TRUE
)
# same column used in create_centroids
fortify_hexagon(data = allocated, sf_id = "LGA_CODE16", hex_size = 0.2)
fortify_sfc  
*Convert a simple features tibble to tibble for plotting.*

**Description**

This will contain individual points for plotting the polygon, indicating the longitude and latitude, order of points, if a hole is present, the piece, id and group.

**Usage**

```r
fortify_sfc(sfc_df, keep = NULL)
```

**Arguments**

- `sfc_df`: a simples features data set
- `keep`: ratio of points to keep

**Value**

A tibble point of long lat points used to plot polygons

---

**fp19**  
*2019 Australian Federal election data: First preference votes for candidates (House of Representatives) in each electorate.*

**Description**

A dataset containing first preference vote counts, candidate names, and other results for the House of Representatives from the 2016 Australian federal election. The data were obtained from the Australian Electoral Commission, and downloaded from https://results.aec.gov.au/24310/Website/Downloads/HouseFirstPrefsByPartyDownload-24310.csv

**Usage**

```r
fp19
```

**Format**

A data frame with the following variables:

- `StateAbAbbreviation`: for state name
- `UniqueID`: numeric identifier that links the electoral division with Census and other election datasets.
- `DivisionNm`: electoral division name
- `BallotPosition`: candidate’s position on the ballot
The amount of homeless people in each Statistical Area at Level 2 in 2016.

Description

A data frame of the Statistical Area at Level 2 names and amount of homeless

Usage

homeless

Format

A data frame with 545 rows and 2 variables:

- **homeless**  amount of homeless people
- **SA2_NAME16**  name of the Statistical Area at Level 2

read_shape

Read in the shape file as sf object

Description

read_shape

Usage

read_shape(shp_path, simplify = TRUE, keep = 0.1)
Arguments

shp_path  character vector location of shape file, extension .shp
simplify  a boolean to decide whether to simplify the shape file using rmapshaper, keeping all shapes.
keep      ratio of points to keep

Value

an sf data frame, with a column of non null geometries

Examples

```r
## Not run:
# Find the location of shape data
shape <- read_shape(shp_path = file.choose())
## End(Not run)
```

tas_lga  

The polygons of Tasmanian Local Government Areas in 2016.

Description

A simple features dataset containing the polygons for all Australian LGAs in 2016.

Usage

```r
tas_lga
```

Format

A simple features data frame with 39 rows and 6 variables:

- **LGA_CODE16** code for the Local Government Area
- **LGA_NAME16** name of the Local Government Area
- **STE_CODE16** code for the state containing the Local Government Area
- **STE_NAME16** name of the state containing the Local Government Area
- **AREA_SQKM** area contained in the polygon
- **geometry** describes where on Earth the polygon is located
The polygons of Tasmanian Statistical Areas in 2016.

Description

A simple features dataset containing the polygons for all Tasmanian SA2s in 2016.

Usage

tas_sa2

Format

A simple features data frame with 99 rows and 15 variables:

- **SA2_MAIN16** complete code of the Statistical Area
- **SA2_5DIG16** simple code for the Statistical Area
- **SA2_NAME16** name of the Statistical Area
- **SA3_CODE16** code for the SA3 containing the Statistical Area
- **SA3_NAME16** name of the SA3 containing the Statistical Area
- **SA4_CODE16** code for the SA4 containing the Statistical Area
- **SA4_NAME16** name of the SA4 containing the Statistical Area
- **GCC_CODE16** code for the Greater Capital City region containing the Statistical Area
- **GCC_NAME16** name of the Greater Capital City region containing the Statistical Area
- **STE_CODE16** code for the state containing the Statistical Area
- **STE_NAME16** name of the state containing the Statistical Area
- **AREASQKM16** area contained in the polygon
- **id** distinguishes SA2 regions
- **population** amount of people living within the region
- **SA2_CODE16** code of the Statistical Area
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