Package ‘stplanr’

October 20, 2018

Type Package
Title Sustainable Transport Planning
Version 0.2.6
Maintainer Robin Lovelace <rob@0x@gmail.com>
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License MIT + file LICENSE
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Malcolm Morgan [ctb] (Co-author of angle_diff),
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Scott Chamberlin [rev] (Scott reviewed the package for rOpenSci, see https://github.com/ropensci/onboarding/issues/10)

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**Description**

The stplanr package provides functions to access and analyse data for transportation research, including origin-destination analysis, route allocation and modelling travel patterns.

**Interesting functions**

- `overline()` - Aggregate overlaying route lines and data intelligently
- `calc_catchment()` - Create a 'catchment area' to show the areas serving a destination
- `route_cyclestreet()` - Finds the fastest routes for cyclists between two places.

**Author(s)**

Robin Lovelace <rob00x@gmail.com>

**See Also**

[https://github.com/ropensci/stplanr](https://github.com/ropensci/stplanr)
**angle_diff**

*Calculate the angular difference between lines and a predefined bearing*

**Description**

This function was designed to find lines that are close to parallel and perpendicular to some predefined route. It can return results that are absolute (contain information on the direction of turn, i.e. + or - values for clockwise/anticlockwise), bidirectional (which mean values greater than +/- 90 are impossible).

**Usage**

```r
angle_diff(l, angle, bidirectional = FALSE, absolute = TRUE)
```

**Arguments**

- `l`: A spatial lines object
- `angle`: an angle in degrees relative to North, with 90 being East and -90 being West. (direction of rotation is ignored).
- `bidirectional`: Should the result be returned in a bidirectional format? Default is FALSE. If TRUE, the same line in the opposite direction would have the same bearing
- `absolute`: If TRUE (the default) only positive values can be returned

**Details**

Building on the convention used in `bearing()` and in many applications, North is defined as 0, East as 90 and West as -90.

**Author(s)**

Robin Lovelace and Malcolm Morgan

**Examples**

```r
data(flowlines)
# Find all routes going North-South
a <- angle_diff(flowlines, angle = 0, bidirectional = TRUE, absolute = TRUE)
plot(flowlines)
plot(flowlines[a < 15, ], add = TRUE, lwd = 3, col = "red")
# East-West
plot(flowlines[a > 75, ], add = TRUE, lwd = 3, col = "green")
angle_diff(flowlines_sf[2, ], angle = 0)
```
as_sf_fun  
*Convert functions support sf/sp*

**Description**

Convert functions support sf/sp

**Usage**

```r
as_sf_fun(input, FUN, ...)
```

**Arguments**

- `input`: Input object - an sf or sp object
- `FUN`: A function that works on sp/sf data
- `...`: Arguments passed to `FUN`

---

bbox_scale  
*Scale a bounding box*

**Description**

Takes a bounding box as an input and outputs a bounding box of a different size, centred at the same point.

**Usage**

```r
bbox_scale(bb, scale_factor)
```

**Arguments**

- `bb`: the bounding box or spatial object that will be used to crop shp
- `scale_factor`: Numeric vector determining how much the bounding box will grow or shrink. Two numbers refer to extending the bounding box in x and y dimensions, respectively. If the value is 1, the output size will be the same as the input.

**Examples**

```r
bb <- matrix(c(-1.55, 53.80, -1.50, 53.83), nrow = 2)
bb1 <- bbox_scale(bb, scale_factor = 1.05)
bb2 <- bbox_scale(bb, scale_factor = c(2, 1.05))
bb3 <- bbox_scale(bb, 0.1)
plot(x = bb2[1, ], y = bb2[2, ])
points(bb1[1, ], bb1[2, ])
points(bb3[1, ], bb3[2, ])
points(bb[1, ], bb[2, ], col = "red")
```
buff_geo

Create a buffer of n metres for non-projected 'geographical' spatial data

Description

Solves the problem that buffers will not be circular when used on non-projected data.

Usage

buff_geo(shp, width, ...)

Arguments

shp
A spatial object with a geographic CRS (e.g. WGS84) around which a buffer should be drawn

width
The distance (in metres) of the buffer (when buffering sp objects)

...  
Arguments passed to the buffer (see ?rgeos::gBuffer or ?sf::st_buffer for details)

Details

Returns a

Examples

r <- routes_fast[1:3, ]
buff <- buff_geo(r, width = 100)
plot(buff)
plot(r, add = TRUE) # Test it works the same on projected data
shp <- sp::spTransform(r, sp::CRS("+init=epsg:27700"))
buff2 <- buff_geo(shp, 50) # test if it works the same on projected data
plot(buff2)
plot(r, add = TRUE) # note they do not show
buff3 <- sp::spTransform(buff2, sp::CRS("+init=epsg:4326"))
plot(buff)
plot(buff3, add = TRUE, col = "black")
calc_catchment  

*Calculate catchment area and associated summary statistics.*

**Description**

Calculate catchment area and associated summary statistics.

**Usage**

```r
calc_catchment(polygonlayer, targetlayer, calccols, distance = 500,
projection = paste0("+proj=aea +lat_1=90 +lat_2=-18.416667 ",
"+lat_0=0 +lon_0=10 +x_0=0 +y_0=0 +ellps=GRS80",
" +towgs84=0,0,0,0,0,0,0 +units=m +no_defs"),
retainAreaProportion = FALSE, dissolve = FALSE, quadsegs = NULL)
```

**Arguments**

- **polygonlayer**: A SpatialPolygonsDataFrame containing zones from which the summary statistics for the catchment variable will be calculated. Smaller polygons will increase the accuracy of the results.

- **targetlayer**: A SpatialPolygonsDataFrame, SpatialLinesDataFrame, SpatialPointsDataFrame, SpatialPolygons, SpatialLines or SpatialPoints object containing the specifications of the facility for which the catchment area is being calculated. If the object contains more than one facility (e.g., multiple cycle paths) the aggregate catchment area will be calculated.

- **calccols**: A vector of column names containing the variables in the polygonlayer to be used in the calculation of the summary statistics for the catchment area. If `dissolve = FALSE`, all other variables in the original SpatialPolygonsDataFrame for zones that fall partly or entirely within the catchment area will be included in the returned SpatialPolygonsDataFrame but will not be adjusted for the proportion within the catchment area.

- **distance**: Defines the size of the catchment area as the distance around the targetlayer in the units of the projection (default = 500 metres)

- **projection**: The proj4string used to define the projection to be used for calculating the catchment areas or a character string 'austalbers' to use the Australian Albers Equal Area projection. Ignored if the polygonlayer is projected in which case the targetlayer will be converted to the projection used by the polygonlayer. In all cases the resulting object will be reprojected to the original coordinate system and projection of the polygon layer. Default is an Albers Equal Area projection but for more reliable results should use a local projection (e.g., Australian Albers Equal Area project).

- **retainAreaProportion**: Boolean value. If TRUE retains a variable in the resulting SpatialPolygonsDataFrame containing the proportion of the original area within the catchment area (Default = FALSE).
calc_catchment_sum

**dissolve**
Boolean value. If TRUE collapses the underlying zones within the catchment area into a single region with statistics for the whole catchment area.

**quadsegs**
Number of line segments to use to approximate a quarter circle. Parameter passed to buffer functions, default is 5 for sp and 30 for sf.

**Details**
Calculates the catchment area of a facility (e.g., cycle path) using straight-line distance as well as summary statistics from variables available in a SpatialPolygonsDataFrame with census tracts or other zones. Assumes that the frequency of the variable is evenly distributed throughout the zone. Returns a SpatialPolygonsDataFrame.

**Examples**

```r
## Not run:
data_dir <- system.file("extdata", package = "stplanr")
unzip(file.path(data_dir, "smallsa1.zip"))
unzip(file.path(data_dir, "testcycleway.zip"))
salincome <- readOGR(".", "smallsa1")
testcycleway <- readOGR(".", "testcycleway")
calc_catchment(
  polygonlayer = salincome,
  targetlayer = testcycleway,
  calccols = c("Total"),
  distance = 800,
  projection = "austalbers",
  dissolve = TRUE
)

## End(Not run)
```

---

**calc_catchment_sum**  
*Calculate summary statistics for catchment area.*

**Description**
Calculate summary statistics for catchment area.

**Usage**

```r
calc_catchment_sum(polygonlayer, targetlayer, calccols, distance = 500,
  projection = paste0("+proj=aea +lat_1=90 +lat_2=-18.416667",
  " +lat_0=0 +lon_0=10 +x_0=0 +y_0=0",
  " +ellps=GRS80 +towgs84=0,0,0,0,0,0,0 +units=m +no_defs"),
  retainAreaProportion = FALSE, quadsegs = NA)
```
Arguments

polygonlayer A SpatialPolygonsDataFrame containing zones from which the summary statistics for the catchment variable will be calculated. Smaller polygons will increase the accuracy of the results.

targetlayer A SpatialPolygonsDataFrame, SpatialLinesDataFrame, SpatialPointsDataFrame, SpatialPolygons, SpatialLines or SpatialPoints object containing the specifications of the facility for which the catchment area is being calculated. If the object contains more than one facility (e.g., multiple cycle paths) the aggregate catchment area will be calculated.

calccols A vector of column names containing the variables in the polygonlayer to be used in the calculation of the summary statistics for the catchment area.

distance Defines the size of the catchment area as the distance around the targetlayer in the units of the projection (default = 500 metres)

projection The proj4string used to define the projection to be used for calculating the catchment areas or a character string 'austalbers' to use the Australian Albers Equal Area projection. Ignored if the polygonlayer is projected in which case the targetlayer will be converted to the projection used by the polygonlayer. In all cases the resulting object will be reprojected to the original coordinate system and projection of the polygon layer. Default is an Albers Equal Area projection but for more reliable results should use a local projection (e.g., Australian Albers Equal Area project).

retainAreapropportion Boolean value. If TRUE retains a variable in the resulting SpatialPolygonsDataFrame containing the proportion of the original area within the catchment area (Default = FALSE).

quadsegs Number of line segments to use to approximate a quarter circle. Parameter passed to buffer functions, default is 5 for sp and 30 for sf.

Details

Calculates the summary statistics for a catchment area of a facility (e.g., cycle path) using straight-line distance from variables available in a SpatialPolygonsDataFrame with census tracts or other zones. Assumes that the frequency of the variable is evenly distributed throughout the zone. Returns either a single value if calccols is of length = 1, or a named vector otherwise.

Examples

```r
# Not run:
data_dir <- system.file("extdata", package = "stplanr")
unzip(file.path(data_dir, "smallsa1.zip"))
unzip(file.path(data_dir, "testcycleway.zip"))
salincome <- readOGR(".", "smallsa1")
testcycleway <- readOGR(".", "testcycleway")
calc_catchment_sum(
  polygonlayer = salincome,
  targetlayer = testcycleway,
  calcccols = c("Total"),
  distance = 800,
)```

calc_moving_catchment

  projection = "austalbers"
)

calc_catchment_sum(
polygonlayer = sa1income,
targetlayer = testcycleway,
calccols = c("Total"),
distance = 800,
projection = "austalbers"
)

## End(Not run)

calc_moving_catchment  Calculate summary statistics for all features independently.

Description

Calculate summary statistics for all features independently.

Usage

calc_moving_catchment(polygonlayer, targetlayer, calccols,
distance = 500, projection = "worldalbers",
retainAreaProportion = FALSE)

Arguments

<table>
<thead>
<tr>
<th>polygonlayer</th>
<th>A SpatialPolygonsDataFrame containing zones from which the summary statistics for the catchment variable will be calculated. Smaller polygons will increase the accuracy of the results.</th>
</tr>
</thead>
<tbody>
<tr>
<td>targetlayer</td>
<td>A SpatialPolygonsDataFrame, SpatialLinesDataFrame or SpatialPointsDataFrame object containing the specifications of the facilities and zones for which the catchment areas are being calculated.</td>
</tr>
<tr>
<td>calccols</td>
<td>A vector of column names containing the variables in the polygonlayer to be used in the calculation of the summary statistics for the catchment areas.</td>
</tr>
<tr>
<td>distance</td>
<td>Defines the size of the catchment areas as the distance around the targetlayer in the units of the projection (default = 500 metres)</td>
</tr>
<tr>
<td>projection</td>
<td>The proj4string used to define the projection to be used for calculating the catchment areas or a character string 'austalbers' to use the Australian Albers Equal Area projection. Ignored if the polygonlayer is projected in which case the targetlayer will be converted to the projection used by the polygonlayer. In all cases the resulting object will be reprojected to the original coordinate system and projection of the polygon layer. Default is an Albers Equal Area projection but for more reliable results should use a local projection (e.g., Australian Albers Equal Area project).</td>
</tr>
</tbody>
</table>
calc_network_catchment

retainAreaProportion

Boolean value. If TRUE retains a variable in the resulting SpatialPolygonsDataFrame containing the proportion of the original area within the catchment area (Default = FALSE).

Details

Calculates the summary statistics for a catchment area of multiple facilities or zones using straight-line distance from variables available in a SpatialPolygonsDataFrame with census tracts or other zones. Assumes that the frequency of the variable is evenly distributed throughout the zone. Returns the original source dataframe with additional columns with summary variables.

Examples

```r
## Not run:
data_dir <- system.file("extdata", package = "stplanr")
unzip(file.path(data_dir, "smallsa1.zip"))
unzip(file.path(data_dir, "testcycleway.zip"))
salincome <- readOGR(".", "smallsa1")
testcycleway <- readOGR(".", "testcycleway")
calc_moving_catchment(
polygonlayer = salincome,
targetlayer = testcycleway,
calccols = c("Total"),
distance = 800,
projection = "austalbers"
)
## End(Not run)
```

calc_network_catchment

*Calculate catchment area and associated summary statistics using network.*

Description

Calculate catchment area and associated summary statistics using network.

Usage

calc_network_catchment(sln, polygonlayer, targetlayer, calccols, maximpedance = 1000, distance = 100, projection = paste0("+proj=aea +lat_1=90 +lat_2=-18.416667", "+lat_0=0 +lon_0=10 +x_0=0 +y_0=0", "+ellps=GRS80 +towgs84=0,0,0,0,0,0,0 +units=m +no_defs"), retainAreaProportion = FALSE, dissolve = FALSE)
Arguments

- **sln**
  - The SpatialLinesNetwork to use.

- **polygonlayer**
  - A SpatialPolygonsDataFrame containing zones from which the summary statistics for the catchment variable will be calculated. Smaller polygons will increase the accuracy of the results.

- **targetlayer**
  - A SpatialPolygonsDataFrame, SpatialLinesDataFrame or SpatialPointsDataFrame object containing the specifications of the facilities and zones for which the catchment areas are being calculated.

- **calccols**
  - A vector of column names containing the variables in the polygonlayer to be used in the calculation of the summary statistics for the catchment area. If dissolve = FALSE, all other variables in the original SpatialPolygonsDataFrame for zones that fall partly or entirely within the catchment area will be included in the returned SpatialPolygonsDataFrame but will not be adjusted for the proportion within the catchment area.

- **maximpedance**
  - The maximum value of the network’s weight attribute in the units of the weight (default = 1000).

- **distance**
  - Defines the additional catchment area around the network in the units of the projection. (default = 100 metres)

- **projection**
  - The proj4string used to define the projection to be used for calculating the catchment areas or a character string 'austalbers' to use the Australian Albers Equal Area projection. Ignored if the polygonlayer is projected in which case the targetlayer will be converted to the projection used by the polygonlayer. In all cases the resulting object will be reprojected to the original coordinate system and projection of the polygon layer. Default is an Albers Equal Area projection but for more reliable results should use a local projection (e.g., Australian Albers Equal Area project).

- **retainAreaProportion**
  - Boolean value. If TRUE retains a variable in the resulting SpatialPolygonsDataFrame containing the proportion of the original area within the catchment area (Default = FALSE).

- **dissolve**
  - Boolean value. If TRUE collapses the underlying zones within the catchment area into a single region with statistics for the whole catchment area.

Details

Calculates the catchment area of a facility (e.g., cycle path) using network distance (or other weight variable) as well as summary statistics from variables available in a SpatialPolygonsDataFrame with census tracts or other zones. Assumes that the frequency of the variable is evenly distributed throughout the zone. Returns a SpatialPolygonsDataFrame.

Examples

```r
## Not run:
data_dir <- system.file("extdata", package = "stplanr")
unzip(file.path(data_dir, "smallsa1.zip"), exdir = tempdir())
unzip(file.path(data_dir, "testcycleway.zip"), exdir = tempdir())
```
unzip(file.path(data_dir, "sydroads.zip"), exdir = tempdir())
salincome <- readOGR(tempdir(), "smallsa1")
testcycleway <- readOGR(tempdir(), "testcycleway")
sydroads <- readOGR(tempdir(), "roads")
sydnetwork <- SpatialLinesNetwork(sydroads)
calc_network_catchment(
  sln = sydnetwork,
  polygonlayer = salincome,
  targetlayer = testcycleway,
  calccols = c("Total"),
  maximpedance = 800,
  distance = 200,
  projection = "australbers",
  dissolve = TRUE
)

## End(Not run)

---

**ca_local**

*SpatialPointsDataFrame representing road traffic deaths*

**Description**

This dataset represents the type of data downloaded and cleaned using stplanr functions. It repre-
sents a very small sample (with most variables stripped) of open data from the UK’s Stats19 dataset.

**Usage**

`data(ca_local)`

**Format**

A *SpatialPointsDataFrame* with 11 rows and 2 columns

**Examples**

```r
## Not run:
# Generate data
c <- read_stats19_acc
ca <- read_stats19_ca
ve <- read_stats19_ve
library(dplyr)
ca_ac <- inner_join(ca, ac)
ca_cycle <- ca_ac %>%
  filter(Casualty_Severity == "Fatal" & !is.na(Latitude)) %>%
  select(Age = Age_of_Casualty, Mode = Casualty_Type, Longitude, Latitude)
ca_sp <- sp::SpatialPointsDataFrame(coords = ca_cycle[3:4], data = ca_cycle[1:2])
data("route_network")
proj4string(ca_sp) <- proj4string(route_network)
bb <- bb2poly(route_network)
```
ca_local <- ca_sp[bb, ]

## End(Not run)

cents Spatial points representing home locations

Description

These points represent population-weighted centroids of Medium Super Output Area (MSOA) zones within a 1 mile radius of my home when I was writing this package.

Usage

data(cents)

Format

A spatial dataset with 8 rows and 5 variables

Details

- geo_code the official code of the zone
- MSOA11NM name zone name
- percent_fem the percent female
- avslope average gradient of the zone

Cents was generated from the data repository pct-data: https://github.com/npct/pct-data. This data was accessed from within the pct repo: https://github.com/npct/pct, using the following code:

Examples

## Not run:
cents <- rgdal::readOGR(dsn = "/home robin/npct/pct-bigdata/cents.geojson", layer = "OGRGeoJSON")
# library(geojsonio) # load with the ropensci package geojsonio if rgdal fails
# cents <- geojsonio::geojson_read(x = "/repos/pct/pct-data/national/cents.geojson"

crs <- sp::CRS("+init=epsg:4326")
crsuk <- sp::CRS("+init=epsg:27700")
cents <- sp::SpatialPoints(matrix(cents, ncol = 2), proj4string = crs)
home <- geo_code("LS7 3HB")
home <- sp::spTransform(x = home, CRSobj = crsuk)
buf <- rgeos::gBuffer(home, width = 2000)
# Check it saved the points OK
cents <- cents buf, ]
plot(buf)
points(cents)
cents <- sp::spTransform(x = cents, CRSobj = crs)
cents$geo_code <- as.character(cents$geo_code)
library(devtools)
# use_data(cents, overwrite = TRUE)
cents_sf <- sf::st_as_sf(cents)
devtools::use_data(cents_sf)

## End(Not run)

crs_select_aeq

Select a custom projected CRS for the area of interest

Description

This function takes a spatial object with a geographic (WGS84) CRS and returns a custom projected CRS focussed on the centroid of the object. This function is especially useful for using units of metres in all directions for data collected anywhere in the world.

Usage

crs_select_aeq(shp)

Arguments

shp A spatial object with a geographic (WGS84) coordinate system

Details

The function is based on this stackexchange answer: [http://gis.stackexchange.com/questions/121489](http://gis.stackexchange.com/questions/121489)

Examples

data("routes_fast")
new_crs <- crs_select_aeq(routes_fast)
plot(routes_fast)
rf_projected <- sp::spTransform(routes_fast, new_crs)
plot(rf_projected)
sp::bbox(rf_projected)
line_length <- rgeos::gLength(rf_projected, byid = TRUE)
plot(line_length, rf_projected$length)
cor(line_length, rf_projected$length)
**decode_gl**

*Decode Google polyline compressed string*

**Description**

Decode Google polyline compressed string

**Usage**

`decode_gl(polyline, precision = 6, forceline = TRUE)`

**Arguments**

- **polyline**: A character string or vector of character strings containing the encoded polyline to be decoded.
- **precision**: An integer indicating the number of decimals in the initial encoded coordinates. Default is 6 (for OSRM default).
- **forceline**: Boolean value indicating if the returned coordinates should be a line (i.e., minimum two points) Default is TRUE.

**Details**

An implementation of the Google Maps Encoded Polyline Algorithm for decoding strings. Returns a dataframe if polyline is of length 1 and a list of dataframes otherwise.

**Examples**

```r
## Not run:
decode_gl("_p-If-ps|U_uLnnqC_mqNvxq\"", precision = 5)
## End(Not run)
```

**destination_zones**

*example destinations data*

**Description**

This dataset represents trip destinations on a different geographic level than the origins stored in the cents.

**Usage**

`data(destination_zones)`
Format

A spatial dataset with 87 features

Examples

```r
## Not run:
# This is how the dataset was constructed - see
# http://cowz.geodata.soton.ac.uk/download/
download.file(
  "http://cowz.geodata.soton.ac.uk/download/files/COWZ_EW_2011_BFC.zip",
  "COWZ_EW_2011_BFC.zip"
)
unzip("COWZ_EW_2011_BFC.zip")
wz <- raster::shapefile("COWZ_EW_2011_BFC.shp")
to_remove <- list.files(pattern = "COWZ", full.names = TRUE, recursive = TRUE)
file.remove(to_remove)
proj4string(wz)
wz <- sp::spTransform(wz, proj4string(zones))
destination_zones <- wz[zones, ]
plot(destination_zones)
devtools::use_data(destination_zones)
head(destination_zones$data)
destinations <- rgeos::gCentroid(destinations, byid = TRUE)
destinations <- sp::SpatialPointsDataFrame(destinations, destination_zones$data)
devtools::use_data(destinations, overwrite = TRUE)
destinations_sf <- sf::st_as_sf(destinations)
devtools::use_data(destinations_sf)

## End(Not run)
```

---

**dist_google**  
*Return travel network distances and time using the Google Maps API*

Description

Return travel network distances and time using the Google Maps API

Usage

```r
dist_google(from, to, google_api = Sys.getenv("GOOGLEDIST"),
  g_units = "metric", mode = c("bicycling", "walking", "driving",
  "transit"), arrival_time = "")
```

Arguments

- `from` Two-column matrix or data frame of coordinates representing latitude and longitude of origins.
- `to` Two-column matrix or data frame of coordinates representing latitude and longitude of destinations.
dist_google

```r
google_api String value containing the Google API key to use.
g_units Text string, either metric (default) or imperial.
mode Text string specifying the mode of transport. Can be bicycling (default), walking, driving or transit
arrival_time Time of arrival in date format.
```

Details

Absent authorization, the google API is limited to a maximum of 100 simultaneous queries, and so will, for example, only returns values for up to 10 origins times 10 destinations.

Details

Estimate travel times accounting for the road network - see [https://developers.google.com/maps/documentation/distance-matrix/](https://developers.google.com/maps/documentation/distance-matrix/) Note: Currently returns the json object returned by the Google Maps API and uses the same origins and destinations.

Examples

```r
## Not run:
# Distances from one origin to one destination
from <- c(-46.3, -23.4)
to <- c(-46.4, -23.4)
out_google(from = from, to = to, mode = "walking") # not supported on last test
out_google(from = from, to = to, mode = "driving")
out_google(from = c(0, 52), to = c(0, 53))
data("cents")
# Distances from between all origins and destinations
dists_cycle <- out_google(from = cents, to = cents)
dists_drive <- out_google(cents, cents, mode = "driving")
dists_trans <- out_google(cents, cents, mode = "transit")
dists_trans_am <- out_google(cents, cents,
                    mode = "transit",
                    arrival_time = strftime("2016-05-27 09:00:00",
                    format = "%Y-%m-%d %H:%M:%S", tz = "BST"
                    )
)
# Find out how much longer (or shorter) cycling takes than walking
summary(dists_cycle$duration / dists_trans$duration)
# Difference between travelling now and for 9am arrival
summary(dists_trans_am$duration / dists_trans$duration)
odf <- points2odf(cents)
odf <- cbind(odf, dists)
head(odf)
```

flow <- points2flow(cents)
# show the results for duration (thicker line = shorter)
plot(flow, lwd = mean(odf$duration) / odf$duration)
out_google(c("Hereford"), c("Weobley", "Leominster", "Kington"))
out_google(c("Hereford"), c("Weobley", "Leominster", "Kington"),
            mode = "transit", arrival_time = strftime("2016-05-27 17:30:00",
            format = "%Y-%m-%d %H:%M:%S", tz = "BST"
```
dl_stats19

Download Stats19 data

Description

Download Stats19 data

Usage

dl_stats19(zip_url = paste0("http://data.dft.gov.uk.s3.amazonaws.com/",
data_dir = tempdir())

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>zip_url</td>
<td>The url where the data is stored</td>
</tr>
<tr>
<td>data_dir</td>
<td>Directory to which to download the file</td>
</tr>
</tbody>
</table>

Details

This convenience function downloads and unzips UK road traffic casualty data. It results in unzipped .csv data in R’s temporary directory.

Ensure you have a fast internet connection and at least 100 Mb space

Examples

```r
## Not run:
dl_stats19()

# Load all stats19 datasets
ac <- read_stats19_ac()
ca <- read_stats19_ca()
ve <- read_stats19_ve()
# now you can analyse the UK's stats19 data in a single table

## End(Not run)
```
find_network_nodes

Find network nodes

Description

Find graph node ID of closest node to given coordinates

Usage

find_network_nodes(sln, x, y = NULL, maxdist = 1000)

Arguments

sln SpatialLinesNetwork to search.

x Either the x (longitude) coordinate value, a vector of x values, a dataframe or matrix with (at least) two columns, the first for coordinate for x (longitude) values and a second for y (latitude) values, or a named vector of length two with values of 'lat' and 'lon'. The output of geo_code() either as a single result or as multiple (using rbind()) can also be used.

y Either the y (latitude) coordinate value or a vector of y values.

maxdist The maximum distance within which to match the nodes to coordinates. If the SpatialLinesNetwork is projected then distance should be in the same units as the projection. If longlat, then distance is in metres. Default is 1000.

Value

An integer value with the ID of the node closest to (x, y) with a value of NA the closest node is further than maxdist from (x, y). If x is a vector, returns a vector of Node IDs.

Details

Finds the node ID of the closest point to a single coordinate pair (or a set of coordinates) from a SpatialLinesNetwork.

Examples

data(routes_fast)
rnet <- overline(routes_fast, attrib = "length")
SLN <- SpatialLinesNetwork(rnet)
find_network_nodes(SLN, -1.516734, 53.828)
flow  
*data frame of commuter flows*

**Description**

This dataset represents commuter flows (work travel) between origin and destination zones (see `cents()`). The data is from the UK and is available as open data: [http://wicid.ukdataservice.ac.uk/](http://wicid.ukdataservice.ac.uk/).

**Usage**

`data(flow)`

**Format**

A data frame with 49 rows and 15 columns

**Details**

The variables are as follows:

- Area.of.residence. id of origin zone
- Area.of.workplace id of destination zone
- All. Travel to work flows by all modes
- [,4:15]. Flows for different modes
- id. unique id of flow

Although these variable names are unique to UK data, the data structure is generalisable and typical of flow data from any source. The key variables are the origin and destination ids, which link to the cents georeferenced spatial objects.

**Examples**

```r
## Not run:
# This is how the dataset was constructed - see
# https://github.com/npct/pct - if download to ~/repos
flow <- readRDS("~/repos/pct/pct-data/national/flow.Rds")
data(cents)
o <- flow$Area.of.residence %in% cents$geo_code[-1]
d <- flow$Area.of.workplace %in% cents$geo_code[-1]
flow <- flow[o & d, ] # subset flows with o and d in study area
library(devtools)
flow$id <- paste(flow$Area.of.residence, flow$Area.of.workplace)
use_data(flow, overwrite = TRUE)

# Convert flows to spatial lines dataset
flowlines <- od2line(flow = flow, zones = cents)
# use_data(flowlines, overwrite = TRUE)
```
# Convert flows to routes
routes_fast <- line2route(l = flowlines, plan = "fastest")
routes_slow <- line2route(l = flowlines, plan = "quietest")

use_data(routes_fast)
use_data(routes_slow)
routes_fast_sf <- sf::st_as_sf(routes_fast)
routes_slow_sf <- sf::st_as_sf(routes_slow)

## End (Not run)

---

**flowlines**  
*spatial lines dataset of commuter flows*

**Description**

Flow data after conversion to a spatial format with `od2line()` (see `flow()`).

**Format**

A spatial lines dataset with 49 rows and 15 columns

---

**flow_dests**  
*data frame of invented commuter flows with destinations in a different layer than the origins*

**Description**

Data frame of invented commuter flows with destinations in a different layer than the origins

**Usage**

data(flow_dests)

**Format**

A data frame with 49 rows and 15 columns
Examples

## Not run:
# This is how the dataset was constructed
flow_dests <- flow
flow_dests$Area.of.workplace <- sample(x = destinations$WZ11CD, size = nrow(flow))
flow_dests <- dplyr::rename(flow_dests, WZ11CD = Area.of.workplace)
devtools::use_data(flow_dests)

## End(Not run)

---

format_stats19_ac  
Format UK 'Stats19' road traffic casualty data

Description

Format UK 'Stats19' road traffic casualty data

Usage

format_stats19_ac(ac)

Arguments

ac  
Dataframe representing the raw Stats19 data read-in with read_csv().

Details

This is a helper function to format raw stats19 data

Examples

## Not run:
ac <- format_stats19_ac(ac)

## End(Not run)
**format_stats19_ca**

*Format UK 'Stats19' road traffic casualty data*

**Description**

Format UK 'Stats19' road traffic casualty data

**Usage**

```r
format_stats19_ca(ca)
```

**Arguments**

- **ca** Dataframe representing the raw Stats19 data read-in with `read_csv()`.

**Details**

This is a helper function to format raw stats19 data

**Examples**

```r
## Not run:
ca <- format_stats19_ca(ca)

## End(Not run)
```

---

**format_stats19_ve**

*Format UK 'Stats19' road traffic casualty data*

**Description**

Format UK 'Stats19' road traffic casualty data

**Usage**

```r
format_stats19_ve(ve)
```

**Arguments**

- **ve** Dataframe representing the raw Stats19 data read-in with `read_csv()`.

**Details**

This is a helper function to format raw stats19 data
Examples

```r
## Not run:
ve <- format_stats19_ve(ve)

## End(Not run)
```

---

gclip

*Crops spatial object x to the bounding box of spatial object (or matrix)*

\[ b \]

---

Description

This function is a cross between the spatial subsetting functions such as `sp::over()`, `rgeos::gIntersects()` etc, and the cropping functions of `raster::crop()` and `rgeos::gIntersection()`. The output is the subset of spatial object \( a \) with an outline described by a square bounding box. The utility of such a function is illustrated in the following question: [http://gis.stackexchange.com/questions/46954/clip-spatial-object-to-bounding-box-in-r/](http://gis.stackexchange.com/questions/46954/clip-spatial-object-to-bounding-box-in-r/).

Usage

```r
gclip(shp, bb)
```

Arguments

- **shp**: The spatial object \( a \) to be cropped
- **bb**: the bounding box or spatial object that will be used to crop \( shp \)

Examples

```r
data(cents)
cb <- rgeos::gBuffer(cents[8, ], width = 0.012, byid = TRUE)
plot(cents)
plot(cb, add = TRUE)
clipped <- gclip(cents, cb)
plot(clipped, add = TRUE)
clipped$avgslope # gclip also returns the data attribute
points(clipped)
points(cents[cb, ], col = "red") # note difference
gclip(cents_sf, cb)
```
Flexible function to generate bounding boxes

Description
Takes a geographic object or bounding box as an input and outputs a bounding box, represented as a bounding box, corner points or rectangular polygon.

Usage
geo_bb(shp, scale_factor = 1, distance = 0, output = c("polygon", "points", "bb"))

Arguments
- **shp**: Spatial object (from sf or sp packages)
- **scale_factor**: Numeric vector determining how much the bounding box will grow or shrink. Two numbers refer to extending the bounding box in x and y dimensions, respectively. If the value is 1, the output size will be the same as the input.
- **distance**: Distance in metres to extend the bounding box by
- **output**: Type of object returned (polygon by default)

See Also
- bb_scale

Examples
```r
plot(geo_bb(routes_fast, distance = 100), col = "red")
plot(geo_bb(routes_fast, scale_factor = 0.8), col = "green", add = TRUE)
plot(geo_bb(sp::bbox(routes_fast)), add = TRUE) # works on bb also
plot(geo_bb(routes_fast, output = "points"), add = TRUE)
# Simple features implementation:
bb_sf1 <- geo_bb(routes_fast_sf, scale_factor = c(2, 1.5))
bb_sf2 <- geo_bb(routes_fast_sf, c(2, 1.5), distance = 100)
plot(bb_sf1)
plot(bb_sf2, add = TRUE)
plot(routes_fast, add = TRUE)
plot(geo_bb(routes_fast_sf, output = "points"), add = TRUE)
bb_matrix <- geo_bb(routes_fast, scale_factor = c(2, 1.1), output = "bb")
plot(routes_fast_sf[2:6, ], bbox = bb_matrix)
```
### geo_bb_matrix

Create matrix representing the spatial bounds of an object

**Description**

Converts a range of spatial data formats into a matrix representing the bounding box

**Usage**

```r
geo_bb_matrix(shp)
```

**Arguments**

- `shp` Spatial object (from sf or sp packages)

**Examples**

- `geo_bb_matrix(routes_fast)`
- `geo_bb_matrix(routes_fast_sf)`
- `geo_bb_matrix(cents[1,])`
- `geo_bb_matrix(c(-2, 54))`
- `geo_bb_matrix(sf::st_coordinates(cents_sf))`

---

### geo_buffer

Perform a buffer operation on a temporary projected CRS

**Description**

This function solves the problem that buffers will not be circular when used on non-projected data.

**Usage**

```r
geo_buffer(shp, dist = NULL, width = NULL, ...)
```

**Arguments**

- `shp` A spatial object with a geographic CRS (e.g. WGS84) around which a buffer should be drawn
- `dist` The distance (in metres) of the buffer (when buffering simple features)
- `width` The distance (in metres) of the buffer (when buffering sp objects)
- `...` Arguments passed to the buffer (see ?rgeos::gBuffer or ?sf::st_buffer for details)

**See Also**

`buff_geo`
Examples

```r
buff_sp <- geo_buffer(routes_fast, width = 100)
class(buff_sp)
plot(buff_sp, col = "red")
routes_fast_sf <- sf::st_as_sf(routes_fast)
buff_sf <- geo_buffer(routes_fast_sf, dist = 50)
plot(buff_sf$geometry, add = TRUE)
```

---

**geo_code**  
Convert text strings into points on the map

**Description**

Generate a lat/long pair from data using Google's geolocation API.

**Usage**

```r
geo_code(address, service = "nominatim",
          base_url = "https://maps.google.com/maps/api/geocode/json",
          return_all = FALSE, pat = NULL)
```

**Arguments**

- **address** Text string representing the address you want to geocode
- **service** Which service to use? Nominatim by default
- **base_url** The base url to query
- **return_all** Should the request return all information returned by Google Maps? The default is FALSE: to return only two numbers: the longitude and latitude, in that order
- **pat** The API key used. By default this is set to NULL and this is usually aquired automatically through a helper, api_pat().

**Examples**

```r
## Not run:
geo_code(address = "Hereford")
geo_code("LS7 3HB")
geo_code("hereford", return_all = TRUE)
# needs api key in .Renviron
geo_code("hereford", service = "google", pat = Sys.getenv("GOOGLE"), return_all = TRUE)

## End(Not run)
```
geo_length

Calculate line length of line with geographic or projected CRS

Description
Takes a line (represented in sf or sp classes) and returns a numeric value representing distance in meters.

Usage
geo_length(shp)

Arguments
shp A spatial line object

See Also
buff_geo

Examples
geo_length(routes_fast)
geo_length(routes_fast_sf)

geo_projected

Perform GIS functions on a temporary, projected version of a spatial object

Description
This function performs operations on projected data.

Usage
geo_projected(shp, fun, crs, silent, ...)

Arguments
shp A spatial object with a geographic (WGS84) coordinate system
fun A function to perform on the projected object (e.g. the rgeos or sf packages)
crs An optional coordinate reference system (if not provided it is set automatically by crs_select_aeq())
silent A binary value for printing the CRS details (default: TRUE)
... Arguments to pass to fun, e.g. byid = TRUE if the function is rgeos::gLength())
geo_select_aeq

Examples

```
shp <- routes_fast_sf[2:4, ]
plot(geo_projected(shp, sf::st_buffer, dist = 100)$geometry)
shp <- routes_fast[2:4, ]
geo_projected(shp, fun = rgeos::gBuffer, width = 100, byid = TRUE)
rlen <- geo_projected(routes_fast, fun = rgeos::gLength, byid = TRUE)
plot(routes_fast$rlen, rlen)
```

geo_select_aeq  Select a custom projected CRS for the area of interest

Description

This function takes a spatial object with a geographic (WGS84) CRS and returns a custom projected CRS focussed on the centroid of the object. This function is especially useful for using units of metres in all directions for data collected anywhere in the world.

Usage

```
geo_select_aeq(shp)
```

Arguments

- `shp`  
  A spatial object with a geographic (WGS84) coordinate system

Details

The function is based on this stackexchange answer: [http://gis.stackexchange.com/questions/121489](http://gis.stackexchange.com/questions/121489)

Examples

```
sp::bbox(routes_fast)
new_crs <- crs_select_aeq(routes_fast)
rf_projected <- sp::spTransform(routes_fast, new_crs)
sp::bbox(rf_projected)
line_length <- rgeos::gLength(rf_projected, byid = TRUE)
plot(line_length, rf_projected$length)
geo_select_aeq(zones_sf)
```
**geo_toptail**

*Clip the first and last n metres of SpatialLines*

**Description**

Takes lines and removes the start and end point, to a distance determined by the user.

**Usage**

```r
geo_toptail(l, toptail_dist, ...)
```

**Arguments**

- `l` A SpatialLines object
- `toptail_dist` The distance (in metres) to top and tail the line by. Can either be a single value or a vector of the same length as the SpatialLines object.
- `...` Arguments passed to rgeos::gBuffer()

**Details**

Note: `toptail()` is around 10 times faster, but only works on data with geographic CRS’s due to its reliance on the geosphere package.

**Examples**

```r
l <- routes_fast[2:4,]
l_toptail <- geo_toptail(l, toptail_dist = 300)
plot(l)
plot(l_toptail, col = "red", add = TRUE, lwd = 3)
plot(cents, col = "blue", add = TRUE, pch = 15)  # Note the behaviour when the buffer size removes lines
r_toptail <- geo_toptail(l, toptail_dist = 900)
plot(r_toptail, lwd = 9, add = TRUE)  # short route removed
g_toptail(routes_fast_sf[2:4,], 300)
```

---

**gsection**

*Function to split overlapping SpatialLines into segments*

**Description**

Divides SpatialLinesDataFrame objects into separate Lines. Each new Lines object is the aggregate of a single number of aggregated lines.

**Usage**

```r
gsection(sl, buff_dist = 0)
```
Arguments

sl          SpatialLinesDataFrame with overlapping Lines to split by number of overlapping features.

buff_dist   A number specifying the distance in meters of the buffer to be used to crop lines before running the operation. If the distance is zero (the default) touching but non-overlapping lines may be aggregated.

Examples

sl <- routes_fast[2:4, ]
rsec <- gsection(sl)
rsec_buff <- gsection(sl, buff_dist = 1)
plot(sl[1], lwd = 9, col = 1:nrow(sl))
plot(rsec, col = 5 + (1:length(rsec)), add = TRUE, lwd = 3)
plot(rsec_buff, col = 5 + (1:length(rsec_buff)), add = TRUE, lwd = 3)
## Not run:
sl <- routes_fast_sf[2:4, ]
rsec <- gsection(sl)
rsec <- gsection(sl, buff_dist = 100) # 4 features: issue
## End(Not run)

gtfs2sldf

Import GTFS shapes and route data to SpatialLinesDataFrame.

Description

Takes a string with the file path of the zip file with the GTFS feed, imports the shapes (geometry), route and agency data and returns a SpatialLinesDataFrame for the GTFS feed.

Usage

gtfs2sldf(gtfszip = "")

Arguments

gtfszip     String with the file path of the GTFS feed zip file

Examples

f <- system.file("extdata", "beartransit-ca-us.zip", package = "stplanr")
# update file to latest version
# see https://code.google.com/p/googletransitdatafeed/wiki/PublicFeeds
u <- "http://data.trilliumtransit.com/gtfs/beartransit-ca-us/beartransit-ca-us.zip"
# download.file(u, f)
gtfs <- gtfs2sldf(gtfszip = f)
plot(gtfs, col = gtfs$route_long_name)
plot(gtfs[gtfs$route_long_name == "Central Campus", ])

islines

Do the intersections between two geometries create lines?

Description

This is a function required in `overline()`. It identifies whether sets of lines overlap (beyond shared points) or not.

Usage

```r
islines(g1, g2)
```

Arguments

- `g1`: A spatial object
- `g2`: A spatial object

Examples

```r
## Not run:
# A spatial object
plot(rnet)
lines(routes_fast[2, ], col = "red")  # line without overlaps
islines(routes_fast[2, ], routes_fast[3, ])
## sf implementation
islines(routes_fast_sf[2, ], routes_fast_sf[3, ])
## End(Not run)
```
**is_linepoint**

*Identify lines that are points*

**Description**

OD matrices often contain 'intrazonal' flows, where the origin is the same point as the destination. This function can help identify such intrazonal OD pairs, using 2 criteria: the total number of vertices (2 or fewer) and whether the origin and destination are the same.

**Usage**

```r
is_linepoint(l)
```

**Arguments**

- `l`: A spatial lines object

**Details**

Returns a boolean vector. TRUE means that the associated line is in fact a point (has no distance). This can be useful for removing data that will not be plotted.

**Examples**

```r
data(flowlines)
islp <- is_linepoint(flowlines)
nrow(flowlines)
sum(islp)
# Remove invisible 'linepoints'
nrow(flowlines[!islp, ])
```

---

**line2df**

*Convert geographic line objects to a data.frame with from and to co-ords*

**Description**

This function returns a data frame with fx and fy and tx and ty variables representing the beginning and end points of spatial line features respectively.

**Usage**

```r
line2df(l)
```

**Arguments**

- `l`: A spatial lines object
Examples

data(flowlines)
  line2df(flowlines[5, ]) # beginning and end of a single straight line
  line2df(flowlines) # on multiple lines
  line2df(routes_fast[5:6, ]) # beginning and end of routes
  line2df(routes_fast_sf[5:6, ]) # beginning and end of routes

line2route

Convert straight OD data (desire lines) into routes

Description

Convert straight OD data (desire lines) into routes

Usage

  line2route(l, route_fun = "route_cyclestreet", n_print = 10,
            list_output = FALSE, l_id = NA, time_delay = 0, ...)

Arguments

  l  A SpatialLinesDataFrame
  route_fun  A routing function to be used for converting the straight lines to routes od2line()
  n_print  A number specifying how frequently progress updates should be shown
  list_output  If FALSE (default) assumes SpatialLinesDataFrame output. Set to TRUE to
               save output as a list.
  l_id  Character string naming the id field from the input lines data, typically the origin
        and destination ids pasted together. If absent, the row name of the straight lines
        will be used.
  time_delay  Number or seconds to wait between each query
  ...  Arguments passed to the routing function, e.g. route_cyclestreet()

Details

See route_cyclestreet() and other route functions for details.

A parallel implementation of this was available until version 0.1.8. See github.com/ropensci/stplanr
for details.

Examples

## Not run:
  l <- flowlines[2:5, ]
  r <- line2route(l, "route_osrm")
  rf <- line2route(l, "route_cyclestreet", plan = "fastest")
  rq <- line2route(l = 1, plan = "quietest", silent = TRUE)
  plot(r)
line2routeRetry

Convert straight SpatialLinesDataFrame from flow data into routes retrying on connection (or other) intermittent failures

Description

Convert straight SpatialLinesDataFrame from flow data into routes retrying on connection (or other) intermittent failures

Usage

line2routeRetry(lines, pattern = "^Error: ", n_retry = 3, ...)

Arguments

lines A SpatialLinesDataFrame
pattern A regex that the error messages must not match to be retried, default "^Error: " i.e. do not retry errors starting with "Error:"
n_retry Number of times to retry
... Arguments passed to the routing function, e.g. route_cyclestreet()

Details

See line2route() for the version that is not retried on errors.

Examples

## Not run:
data(flowlines)
rf_list <- line2routeRetry(flowlines[1:2, ], pattern = "nonexistenceerror", silent = F)

## End(Not run)
lineLabels  

**Label SpatialLinesDataFrame objects**

**Description**

This function adds labels to lines plotted using base graphics. Largely for illustrative purposes, not designed for publication-quality graphics.

**Usage**

```r
lineLabels(sl, attrib)
```

**Arguments**

- `sl`: A SpatialLinesDataFrame with overlapping elements
- `attrib`: A text string corresponding to a named variable in sl

**Author(s)**

Barry Rowlingson

---

line_bearing  

**Find the bearing of straight lines**

**Description**

This is a simple wrapper around the geosphere function `bearing()` to return the bearing (in degrees relative to north) of lines.

**Usage**

```r
line_bearing(l, bidirectional = FALSE)
```

**Arguments**

- `l`: A spatial lines object
- `bidirectional`: Should the result be returned in a bidirectional format? Default is FALSE. If TRUE, the same line in the opposite direction would have the same bearing

**Details**

Returns a boolean vector. TRUE means that the associated line is in fact a point (has no distance). This can be useful for removing data that will not be plotted.
Examples

```r
data(flowlines)
b1 <- line_bearing(flowlines)
b2 <- line_bearing(flowlines, bidirectional = TRUE)
plot(b1, b2)
line_bearing(flowlines_sf[1:9, ])
```

**line_length**

*Calculate length of lines in geographic CRS*

**Description**

Calculate length of lines in geographic CRS

**Usage**

```r
line_length(l, byid = TRUE)
```

**Arguments**

- `l` A spatial lines object
- `byid` Logical determining whether the length is returned per object (default is true)

**line_match**

*Match two sets of lines based on similarity*

**Description**

This function is a wrapper around gDistance that matches lines based on the Hausdorff distance

**Usage**

```r
line_match(l1, l2, threshold = 0.01, return_sp = FALSE)
```

**Arguments**

- `l1` A spatial object
- `l2` A spatial object
- `threshold` The threshold for a match - distances greater than this will not count as matches
- `return_sp` Should the function return a spatial result (FALSE by default)
**Examples**

```r
x1 <- 2:4
x2 <- 3:5
match(x1, x2) # how the base function works
l1 <- flowlines[2:4, ]
l2 <- routes_fast[3:5, ]
(lmatches <- line_match(l1, l2)) # how the stplanr version works
l2matched <- l2[!is.na(lmatches), ]
plot(l1)
plot(l2, add = TRUE)
plot(l2matched, add = TRUE, col = "red") # showing matched routes
l2matched2 <- line_match(l1, l2, return_sp = TRUE)
identical(l2matched, l2matched2)
# decreasing the match likelihood via the threshold
line_match(l1, l2, threshold = 0.003)
```

---

**line_midpoint**

*Find the mid-point of lines*

**Description**

This is a wrapper around `SpatialLinesMidPoints()` that allows it to find the midpoint of lines that are not projected, which have a lat/long CRS.

**Usage**

```r
line_midpoint(l)
```

**Arguments**

- `l` A spatial lines object

**Examples**

```r
data(routes_fast)
line_midpoint(routes_fast[2:5, ])
```

---

**line_sample**

*Sample n points along lines with density proportional to a weight*

**Description**

Sample n points along lines with density proportional to a weight

**Usage**

```r
line_sample(l, n, weights)
```
Arguments

1. The SpatialLines object along which to create sample points
2. The total number of points to sample
3. weights. The relative probabilities of lines being samples

Examples

```R
l <- flowlines[2:5,]
weights <- l$All
p <- line_sample(l, 50, weights)
plot(p)
plot(p)
p <- line_sample(l, 50, weights = 1:length(l))
plot(p)
```

---

**line_segment**

**Divide SpatialLines dataset into regular segments**

Description

Divide SpatialLines dataset into regular segments

Usage

```R
line_segment(l, n_segments, segment_length = NA)
```

Arguments

1. A spatial lines object
2. n_segments. The number of segments to divide the line into
3. segment_length. The approximate length of segments in the output (overrides n_segments if set)

Examples

```R
data(routes_fast)
l <- routes_fast[2,]
library(sp)
l_seg2 <- line_segment(l = l, n_segments = 2)
plot(l_seg2, col = l_seg2$group, lwd = 50)
```
### line_to_points

*Convert a SpatialLinesDataFrame to points* The number of points will be double the number of lines with `line2points`. A closely related function, `line2pointsn` returns all the points that were line vertices. The points corresponding with a given line, `i`, will be \((2*i):(2*(i+1)).

**Description**

Convert a SpatialLinesDataFrame to points The number of points will be double the number of lines with `line2points`. A closely related function, `line2pointsn` returns all the points that were line vertices. The points corresponding with a given line, `i`, will be \((2*i):(2*(i+1)).

**Usage**

```r
line_to_points(l, ids = rep(1:nrow(l), each = 2))
line2pointsn(l)
```

**Arguments**

- `l`: A SpatialLinesDataFrame
- `ids`: Vector of ids (by default `1:nrow(l)`)

**Examples**

```r
l <- routes_fast[2:4,]
lpoints <- line_to_points(l)
lpoints2 <- line2pointsn(l)
plot(lpoints, pch = lpoints$id, cex = lpoints$id)
points(lpoints2, add = TRUE)
line_to_points(routes_fast_sf[2:4,])
```

### line_via

*Add geometry columns representing a route via intermediary points*

**Description**

Takes an origin (A) and destination (B), represented by the linestring 1, and generates 3 extra geometries based on points `p`:

**Usage**

```r
line_via(l, p)
```
locate2spdf

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>l</td>
<td>A spatial lines object</td>
</tr>
<tr>
<td>p</td>
<td>A spatial points object</td>
</tr>
</tbody>
</table>

**Details**

1. From A to P1 (P1 being the nearest point to A)
2. From P1 to P2 (P2 being the nearest point to B)
3. From P2 to B

**Examples**

```r
l <- flowlines_sf[2:4, ]
p <- destinations_sf
lv <- line_via(l, p)
## Not run:
library(mapview)
mapview(lv) +
  mapview(lv$leg_orig, col = "red")

## End(Not run)
library(sf)
plot(lv[3], lwd = 9, reset = FALSE)
plot(lv$leg_orig, col = "red", lwd = 5, add = TRUE)
plot(lv$leg_via, col = "black", add = TRUE)
plot(lv$leg_dest, col = "green", lwd = 5, add = TRUE)
```

**Description**

Return SpatialPointsDataFrame with located points from OSRM locate service

**Usage**

```r
locate2spdf(lat, lng = lng, osrmurl = "http://router.project-osrm.org", return_sf = FALSE)
```
Arguments

- **lat**  
  Numeric vector containing latitude coordinate for each coordinate to map. Also accepts dataframe with latitude in the first column and longitude in the second column.

- **lng**  
  Numeric vector containing longitude coordinate for each coordinate to map.

- **osrmurl**  
  Base URL of the OSRM service

- **return_sf**  
  Boolean value if this function should return an sf object, if FALSE returns sp object (default FALSE).

Details

Retrieve coordinates of the node(s) on the network mapped from coordinates passed to functions using OSRM API v4 only. For API v5, use nearest_osm.

Examples

```r
## Not run:
locate2spdf(
  lat = c(50.3, 50.2),
  lng = c(13.2, 13.1))

## End(Not run)
```

---

**l_poly**  
*Line polygon*

Description

This dataset represents road width for testing.

Usage

```r
data(l_poly)
```

Format

A SpatialPolygon
### Examples

```r
## Not run:
1 <- routes_fast[13, ]
1_poly <- buff_geo(l, 8)
plot(1_poly)
plot(routes_fast, add = TRUE)
# allocate road width to relevant line
devtools::use_data(1_poly)

## End(Not run)
```

---

**mapshape**

Simplify geometry of spatial objects with the mapshaper library

### Description

Simplify geometry of spatial objects with the mapshaper library

### Usage

```r
mapshape(shp, percent = 10, ms_options = "", dsn = "mapshape",
          silent = FALSE)
```

### Arguments

- **shp**
  - A spatial object to be simplified.
- **percent**
  - A number between 1 and 100 stating how aggressively to simplify the object (1 is a very aggressive simplification)
- **ms_options**
  - Text string of options passed to mapshaper such as
- **dsn**
  - The name of the temporary file to write to (deleted after use)
- **silent**
  - Logical determining whether the function call is printed to screen (no-topology (a flag) and snap-interval=1 (a key value pair). See the mapshaper documentation for details: [https://github.com/mbloch/mapshaper/wiki/Command-Reference](https://github.com/mbloch/mapshaper/wiki/Command-Reference).

The percent argument refers to the percentage of removable points to retain. So percent = 1 is a very aggressive simplification, saving a huge amount of hard-disk space. `rgeos::gSimplify()`

### Details

Note: more advance R/mapshaper tools are provided by the rmapshaper package: [https://github.com/ateucher/rmapshaper](https://github.com/ateucher/rmapshaper).

Calls the JavaScript command-line GIS application mapshaper ([https://github.com/mbloch/mapshaper](https://github.com/mbloch/mapshaper)) from the system to simplify geographic features, and then tidies up. mapshaper must be installed and available to `system()`. mapshape writes new a file to disk. Thanks to Richard and Adrian Ellison for demonstrating this in R.
Examples

```r
## Not run:
shp <- routes_fast[2, ]
plot(shp)
rf10 <- mapshape(shp)
rf5 <- mapshape(shp, percent = 5)
rf1 <- mapshape(shp, percent = 1)
plot(rf10, add = TRUE, col = "red")
plot(rf5, add = TRUE, col = "blue")
plot(rf1, add = TRUE, col = "grey")
# snap the lines to the nearest interval
rf_int <- mapshape(shp, ms_options = "snap-interval=0.001")
plot(shp)
plot(rf_int, add = TRUE)
mapshape(routes_fast_sf[2, ])
## End(Not run)
```

mapshape_available

Does the computer have mapshaper available?

Description

This helper function for `mapshape()` determines whether or not the JavaScript library mapshaper is available.

Usage

`mapshape_available()`

Examples

`mapshape_available()`

mats2line

Convert 2 matrices to lines

Description

Convert 2 matrices to lines

Usage

`mats2line(mat1, mat2)`
Arguments

mat1  Matrix representing origins
mat2  Matrix representing origins

Examples

```r
{  
  m1 <- matrix(c(1, 2, 1, 2), ncol = 2)  
  m2 <- matrix(c(9, 9, 9, 1), ncol = 2)  
  l <- mats2line(m1, m2)  
  class(l)  
  lsf <- sf::st_sf(l, crs = 4326)  
  class(lsf)  
  plot(lsf)  
  # mapview::mapview(lsf)  
}
```

nearest2spdf  Return SpatialPointsDataFrame with nearest street from OSRM nearest service

Description

Return SpatialPointsDataFrame with nearest street from OSRM nearest service

Usage

```r
nearest2spdf(lat, lng, osrmurl = "http://router.project-osrm.org",  
              return_sf = FALSE)
```

Arguments

lat  Numeric vector containing latitude coordinate for each coordinate to map. Also accepts dataframe with latitude in the first column and longitude in the second column.

lng  Numeric vector containing longitude coordinate for each coordinate to map.

osrmurl  Base URL of the OSRM service

return_sf  Boolean value if this function should return an sf object, if FALSE returns sp object (default FALSE).

Details

Retrieve coordinates and name of the node(s) on the network mapped from coordinates passed to functions using OSRM API v4 only. For API v5, use nearest_osm.
nearest_cyclestreets

Generate nearest point on the route network of a point using the CycleStreets.net

Description
Generate nearest point on the route network of a point using the CycleStreets.net

Usage

```r
nearest_cyclestreets(shp = NULL, lat, lng, pat = api_pat("cyclestreet"))
```

Arguments

- **shp**: A spatial object
- **lat**: Numeric vector containing latitude coordinate for each coordinate to map. Also accepts dataframe with latitude in the first column and longitude in the second column.
- **lng**: Numeric vector containing longitude coordinate for each coordinate to map.
- **pat**: The API key used. By default this is set to NULL and this is usually acquired automatically through a helper, api_pat().

Details
Retrieve coordinates of the node(s) on the network mapped from coordinates passed to functions.

Examples

```r
## Not run:
nearest_cyclestreets(53, 0.02, pat = Sys.getenv("CYCLESTREET"))
nearest_cyclestreets(cents[, 1], pat = Sys.getenv("CYCLESTREET"))
nearest_cyclestreets(cents_sf[, 1], pat = Sys.getenv("CYCLESTREET"))

## End(Not run)
```
**nearest_google**

*Generate nearest point on the route network of a point using the Google Maps API*

**Description**

Generate nearest point on the route network of a point using the Google Maps API

**Usage**

`nearest_google(lat, lng, google_api)`

**Arguments**

- **lat**
  - Numeric vector containing latitude coordinate for each coordinate to map. Also accepts dataframe with latitude in the first column and longitude in the second column.
- **lng**
  - Numeric vector containing longitude coordinate for each coordinate to map.
- **google_api**
  - String value containing the Google API key to use.

**Details**

Retrieve coordinates of the node(s) on the network mapped from coordinates passed to functions.

**Examples**

```r
## Not run:
nearest_google(lat = 50.333, lng = 3.222, google_api = "api_key_here")

## End(Not run)
```

**nearest_osm**

*Generate nearest point on the route network of a point from OSRM locate service*

**Description**

Generate nearest point on the route network of a point from OSRM locate service

**Usage**

`nearest_osm(lat, lng, number = 1, api = 5, profile = "driving", protocol = "v1", osrmurl = "http://router.project-osrm.org", return_sf = FALSE)`
n_sample_length

Arguments

- **lat**: Numeric vector containing latitude coordinate for each coordinate to map. Also accepts dataframe with latitude in the first column and longitude in the second column.
- **lng**: Numeric vector containing longitude coordinate for each coordinate to map.
- **number**: Number of locations to return (API v5 only)
- **api**: An integer value containing the OSRM API version (either 4 or 5). Default is 5.
- **profile**: OSRM profile to use (for API v5), defaults to "driving".
- **protocol**: The protocol to use for the API (for v5), defaults to "v1".
- **osrmurl**: Base URL of the OSRM service
- **return_sf**: Boolean value if this function should return an sf object, if FALSE returns sp object (default FALSE).

Details

Retrieve coordinates of the node(s) on the network mapped from coordinates passed to functions.

Examples

```r
## Not run:
nearest_osm(
  lat = 50.3,
  lng = 13.2
)
## End(Not run)
```

n_sample_length

Sample integer number from given continuous vector of line lengths and probabilities, with total \( n \)

Description

Sample integer number from given continuous vector of line lengths and probabilities, with total \( n \)

Usage

```r
n_sample_length(n, l_lengths, weights)
```

Arguments

- **n**: Sum of integer values returned
- **l_lengths**: Numeric vector of line lengths
- **weights**: Relative probabilities of samples on lines
Examples

```r
n <- 10
l_lengths <- 1:5
weights <- 9:5
(res <- n_sample_length(n, l_lengths, weights))
sum(res)
n <- 100
l_lengths <- c(12, 22, 15, 14)
weights <- c(38, 10, 44, 34)
(res <- n_sample_length(n, l_lengths, weights))
sum(res)
# more examples:
n_sample_length(5, 1:5, c(0.1, 0.9, 0, 0, 0))
n_sample_length(5, 1:5, c(0.5, 0.3, 0.1, 0, 0))
l <- flowlines[2:6, ]
l_lengths <- line_length(l)
n <- n_sample_length(10, l_lengths, weights = 1)$All
```

---

### n_vertices

**Retrieve the number of vertices from a SpatialLines or SpatialPolygons object**

**Description**

Returns a vector of the same length as the number of lines, with the number of vertices per line or polygon.

**Usage**

```r
n_vertices(l)
```

**Arguments**

- `l` A SpatialLines or SpatialPolygons object

**Details**


**Examples**

```r
n_vertices(routes_fast)
n_vertices(routes_fast_sf)
```
Convert flow data to `SpatialLinesDataFrame`

**Description**

Origin-destination ('OD') flow data is often provided in the form of 1 line per flow with zone codes of origin and destination centroids. This can be tricky to plot and link-up with geographical data. This function makes the task easier.

**Usage**

```r
od2line(flow, zones, destinations = NULL, zone_code = names(zones)[1],
    origin_code = names(flow)[1], dest_code = names(flow)[2],
    zone_code_d = NA, silent = TRUE)
```

**Arguments**

- `flow`: A data frame representing the flow between two points or zones. The first two columns of this data frame should correspond to the first column of the data in the zones. Thus in `cents()`, the first column is `geo_code`. This corresponds to the first two columns of `flow()`.
- `zones`: A `SpatialPolygonsDataFrame` or `SpatialPointsDataFrame` representing origins (and destinations if no separate destinations object is provided) of travel flows.
- `destinations`: A `SpatialPolygonsDataFrame` or `SpatialPointsDataFrame` representing destinations of travel flows.
- `zone_code`: Name of the variable in `zones` containing the ids of the zone. By default this is the first column names in the zones.
- `origin_code`: Name of the variable in `flow` containing the ids of the zone of origin. By default this is the first column name in the flow input dataset.
- `dest_code`: Name of the variable in `flow` containing the ids of the zone of destination. By default this is the second column name in the flow input dataset or the first column name in the destinations if that is set.
- `zone_code_d`: Name of the variable in `destinations` containing the ids of the zone. By default this is the first column names in the destinations.
- `silent`: TRUE by default, setting it to TRUE will show you the matching columns

**Details**

The function expects zone codes to be in the 1st column of the zones/destinations datasets and the 1st and 2nd columns of the flow data, respectively.

`od2line2()` is a faster implementation (around 6 times faster on large datasets) that returns a `SpatialLines` object, omitting the data and working only when there is no destinations dataset (i.e. when the geography of origins is the same as that of destinations).
Examples

data(flow) # load example data - see ?flow for more information

data(cents)
newflowlines <- od2line(flow = flow, zones = cents)
newflowlines2 <- od2line2(flow = flow, zones = cents)
plot(cents)
lines(newflowlines, lwd = 3)
lines(newflowlines2, col = "white")

nfl_sldf <- sp::SpatialLinesDataFrame(newflowlines, flow, match.ID = FALSE)

identical(nfl_sldf, newflowlines)
# When destinations are different

data(destinations)
head(flow_dests[1:5]) # check data

head(destinations$destinations)

flowlines_dests <- od2line(flow_dests, cents, destinations = destinations, silent = FALSE)
plot(flowlines_dests)
nfl_sf <- od2line(flow, zones_sf)

---

od2odf  Extract coordinates from OD data

Description

Extract coordinates from OD data

Usage

od2odf(flow, zones)

Arguments

flow  A data frame representing the flow between two points or zones. The first two columns of this data frame should correspond to the first column of the data in the zones. Thus in cents(), the first column is geo_code. This corresponds to the first two columns of flow().

zones  A SpatialPolygonsDataFrame or SpatialPointsDataFrame representing origins and destinations of travel flows.

Details

Origin-destination (‘OD’) flow data is often provided in the form of 1 line per flow with zone codes of origin and destination centroids. This can be tricky to plot and link-up with geographical data. This function makes the task easier.

References

od_aggregate

Examples

```r
data(flow)
data(zones)
od2odf(flow, zones)
```

---

**od_aggregate**  
*Aggregate OD data between polygon geometries*

**Description**

Aggregate OD data between polygon geometries

**Usage**

```r
od_aggregate(flow, zones, aggzones, aggzone_points = NULL, 
cols = FALSE, aggcols = FALSE, FUN = sum, 
prop_by_area = ifelse(identical(FUN, mean) == FALSE, TRUE, FALSE), 
digits = getOption("digits"))
```

**Arguments**

- `flow`: A data frame representing the flow between two points or zones. The first two columns of this data frame should correspond to the first column of the data in the zones. Thus in `cents()`, the first column is `geo_code`. This corresponds to the first two columns of `flow()`.
- `zones`: A `SpatialPolygonsDataFrame` or `SpatialPointsDataFrame` representing the original centroids or boundaries of the travel flow data. Note that in the case of a `SpatialPointsDataFrame`, the entirety of the flow will be allocated to the polygon in which the point is located rather than being distributed by area.
- `aggzones`: A `SpatialPolygonsDataFrame` containing the new boundaries to aggregate to.
- `aggzone_points`: Points representing origins of OD flows (typically population-weighted centroids).
- `cols`: A character vector containing the names of columns on which to apply FUN. By default, all numeric columns are aggregated.
- `aggcols`: A character vector containing the names of columns in `aggzones` to retain in the aggregated data.frame. By default, only the first column is retained. These columns are renamed with a prefix of "o_" and "d_".
- `FUN`: Function to use on aggregation. Default is sum.
- `prop_by_area`: Boolean value indicating if the values should be proportionally adjusted based on area. Default is TRUE unless FUN = mean.
- `digits`: The number of digits to use when proportionally adjusting values based on area. Default is the value of `getOption("digits")`. 
Value

data.frame containing the aggregated od flows.

Details

Origin-destination ('OD') flow data is often provided in the form of 1 line per flow with zone codes of origin and destination centroids. This function aggregates OD flows between polygon geometries allocating the original flows to larger zones based on area.

Examples

zones$quadrant <- c(1, 2, 1, 4, 5, 6, 7, 1)
aggzones <- rgeos::gUnaryUnion(zones, id = zones@data$quadrant)
aggzones <- sp::SpatialPolygonsDataFrame(aggzones, data.frame(region = c(1:6)), match.ID = FALSE)
sp::proj4string(aggzones) <- sp::proj4string(zones)
aggzones_sf <- sf::st_as_sf(aggzones)
aggzones_sf <- sf::st_set_crs(aggzones_sf, sf::st_crs(zones_sf))
od_agg <- od_aggregate(flow, zones_sf, aggzones_sf)
colSums(od_agg[3:9]) == colSums(flow[3:9])
od_sf_agg <- od2line(od_agg, aggzones_sf)
plot(flowlines, lwd = flowlines$Bicycle)
plot(od_sf_agg$geometry, lwd = od_sf_agg$Bicycle, add = TRUE, col = "red")

od_coors

General function to create a matrix representing origins and destinations

Description

This function takes a wide range of input data types (spatial lines, points or text strings) and returns a matrix of coordinates representing origin (fx, fy) and destination (tx, ty) points.

Usage

od_coors(from = NULL, to = NULL, l = NULL)

Arguments

from An object representing origins (if lines are provided as the first argument, from is assigned to l)
to An object representing destinations
l Only needed if from and to are empty, in which case this should be a spatial object representing desire lines
Examples

od_coords(from = c(0, 52), to = c(1, 53)) # lon/lat coordinates
od_coords(from = cents[, 1], to = cents[, 2]) # Spatial points
od_coords(cents.sf[1:3,], cents.sf[2:4,]) # sf points
# od_coords("Hereford", "Leeds") # geocode locations
od_coords(flowlines[,1:3])
od_coords(flowlines.sf[,1:3])

od_dist

---

**od_dist**

Quickly calculate Euclidean distances of od pairs

Description

It is common to want to know the Euclidean distance between origins and destinations in OD data. You can calculate this by first converting OD data to SpatialLines data, e.g. with \texttt{od2line()}. However this can be slow and overkill if you just want to know the distance. This function is a few orders of magnitude faster.

Usage

\texttt{od_dist(flow, zones)}

Arguments

- **flow**: A data frame representing the flow between two points or zones. The first two columns of this data frame should correspond to the first column of the data in the zones. Thus in \texttt{cents()}, the first column is geo\_code. This corresponds to the first two columns of \texttt{flow()}.

- **zones**: A SpatialPolygonsDataFrame or SpatialPointsDataFrame representing origins (and destinations if no separate destinations object is provided) of travel flows.

Details

Note: this function assumes that the zones or centroids in \texttt{cents} have a geographic (lat/lon) CRS.

Examples

\begin{verbatim}
data(flow)
data(cents)
od_dist(flow, cents)
\end{verbatim}
**od_id_order**

*Generate ordered ids of OD pairs so lowest is always first*

**Description**

Generate ordered ids of OD pairs so lowest is always first

**Usage**

```r
od_id_order(x, id1 = names(x)[1], id2 = names(x)[2])
```

**Arguments**

- `x`: A data frame or `SpatialLinesDataFrame`, representing an OD matrix
- `id1`: Optional (it is assumed to be the first column) text string referring to the name of the variable containing the unique id of the origin
- `id2`: Optional (it is assumed to be the second column) text string referring to the name of the variable containing the unique id of the destination

**Examples**

```r
x <- data.frame(id1 = c(1, 1, 2, 2, 3), id2 = c(1, 2, 3, 1, 4))
od_id_order(x) # 4th line switches id1 and id2 so stplanr.key is in order
```

---

**od_radiation**

*Function that estimates flow between points or zones using the radiation model*

**Description**

This is an implementation of the radiation model proposed in a paper by Simini et al. (2012).

**Usage**

```r
od_radiation(p, pop_var = "population", proportion = 1)
```

**Arguments**

- `p`: A `SpatialPoints` dataframe, the first column of which contains a unique ID
- `pop_var`: A character string representing the variable that corresponds to the population of the zone or point
- `proportion`: A number representing the proportion of the population who commute (1, the default, means 100 percent of the population commute to work)
References


Examples

# load some points data
data(cents)
# plot the points to check they make sense
plot(cents)
class(cents)
# Create test population to model flows
set.seed(2050)
cents$population <- runif(n = nrow(cents), min = 100, max = 1000)
# estimate
flowlines_radiation <- od_radiation(cents, pop_var = "population")
flowlines_radiation$flow
sum(flowlines_radiation$flow, na.rm = TRUE) # the total flow in the system
sum(cents$population) # the total inter-zonal flow
plot(flowlines_radiation, lwd = flowlines_radiation$flow / 100)
points(cents, cex = cents$population / 100)

onewaygeo

Aggregate flows so they become non-directional (by geometry - the slow way)

Description

Flow data often contains movement in two directions: from point A to point B and then from B to A. This can be problematic for transport planning, because the magnitude of flow along a route can be masked by flows the other direction. If only the largest flow in either direction is captured in an analysis, for example, the true extent of travel will by heavily under-estimated for OD pairs which have similar amounts of travel in both directions. Flows in both direction are often represented by overlapping lines with identical geometries (see flowlines()) which can be confusing for users and are difficult to plot.

Usage

onewaygeo(x, attrib)

Arguments

x A SpatialLinesDataFrame
attrib A text string containing the name of the line’s attribute to aggregate or a numeric vector of the columns to be aggregated
onewayid

Aggregate ods so they become non-directional

Details

This function aggregates directional flows into non-directional flows, potentially halving the number of lines objects and reducing the number of overlapping lines to zero.

Value

onewaygeo outputs a SpatialLinesDataFrame with single lines and user-selected attribute values that have been aggregated. Only lines with a distance (i.e. not intra-zone flows) are included.

Examples

```r
plot(flowlines[1:30, ], lwd = flowlines$On.foot[1:30])
singlines <- onewaygeo(flowlines[1:30, ], attrib = which(names(flowlines) == "On.foot"))
plot(singlines, lwd = singlines$On.foot / 2, col = "red", add = TRUE)
## Not run:
plot(flowlines, lwd = flowlines$All / 10)
singlelines <- onewaygeo(flowlines, attrib = 3:14)
plot(singlelines, lwd = singlelines$All / 20, col = "red", add = TRUE)
sum(singlelines$All) == sum(flowlines$All)
nrow(singlelines)
singlelines.sf <- onewaygeo(flowlines.sf, attrib = 3:14)
sum(singlelines.sf$All) == sum(flowlines.sf$All)
summary(singlelines$All == singlelines.sf$All)
## End(Not run)
```

Description

For example, sum total travel in both directions.

Usage

```r
onewayid(x, attrib, id1 = names(x)[1], id2 = names(x)[2],
  stplanr.key = od_id_order(x, id1, id2))

## S3 method for class 'data.frame'
onewayid(x, attrib, id1 = names(x)[1],
  id2 = names(x)[2], stplanr.key = od_id_order(x, id1, id2))

## S3 method for class 'SpatialLines'
onewayid(x, attrib, id1 = names(x)[1],
  id2 = names(x)[2], stplanr.key = od_id_order(x, id1, id2))
```
Arguments

- **x**: A data frame or SpatialLinesDataFrame, representing an OD matrix
- **attrib**: A vector of column numbers or names for deciding which attribute(s) of class numeric to aggregate
- **id1**: Optional (it is assumed to be the first column) text string referring to the name of the variable containing the unique id of the origin
- **id2**: Optional (it is assumed to be the second column) text string referring to the name of the variable containing the unique id of the destination
- **stplanr.key**: A key of unique OD pairs regardless of the order, autogenerated by `od_id_order()`

Details

Flow data often contains movement in two directions: from point A to point B and then from B to A. This can be problematic for transport planning, because the magnitude of flow along a route can be masked by flows the other direction. If only the largest flow in either direction is captured in an analysis, for example, the true extent of travel will be heavily under-estimated for OD pairs which have similar amounts of travel in both directions. Flows in both direction are often represented by overlapping lines with identical geometries (see `flowlines()`) which can be confusing for users and are difficult to plot.

Value

`onewayid` outputs a data.frame with rows containing results for the user-selected attribute values that have been aggregated.

Examples

```r
data(flow)
flow_oneway <- onewayid(flow, attrib = 3)
nrow(flow_oneway) < nrow(flow) # result has fewer rows
sum(flow$All) == sum(flow_oneway$All) # but the same total flow
# using names instead of index for attribute
onewayid(flow, attrib = "All")
# using many attributes to aggregate
attrib <- which(vapply(flow, is.numeric, TRUE))
flow_oneway <- onewayid(flow, attrib)
colSums(flow_oneway[attrib]) == colSums(flow[attrib]) # test if the colSums are equal
# Demonstrate the results from onewayid and onewaygeo are identical
flow_oneway_geo <- onewaygeo(flowlines, attrib = attrib)
plot(flow_oneway$All, flow_oneway_geo$All)
onewayid(flowlines_sf, "all")
# with spatial data
data(flowlines)
fo <- onewayid(flowlines, attrib = "All")
head(fo@data)
plot(fo)
sum(fo$All) == sum(flowlines$All)
# test results for one line
n <- 3
```
overline

Convert series of overlapping lines into a route network

Description

This function takes a series of Lines stored in a SpatialLinesDataFrame and converts these into a single route network.

Usage

overline(sl, attrib, fun = sum, na.zero = FALSE, byvars = NA, buff_dist = 0)

Arguments

- **sl**: A SpatialLinesDataFrame with overlapping elements
- **attrib**: A character vector corresponding to the variables in sl$ on which the function(s) will operate.
- **fun**: The function(s) used to aggregate the grouped values (default: sum). If length of fun is smaller than attrib then the functions are repeated for subsequent attributes.
- **na.zero**: Sets whether aggregated values with a value of zero are removed.
- **byvars**: Character vector containing the column names to use for grouping
- **buff_dist**: A number specifying the distance in meters of the buffer to be used to crop lines before running the operation. If the distance is zero (the default) touching but non-overlapping lines may be aggregated.

Author(s)

Barry Rowlingson

References

plot.sfNetwork,ANY-method

Plot an sfNetwork

Description
Plot an sfNetwork

Usage

## S4 method for signature 'sfNetwork,ANY'
plot(x, component = "sl", ...)

Arguments

x
The sfNetwork to plot

component
The component of the network to plot. Valid values are "sl" for the geographic (sf) representation or "graph" for the graph representation.

... Arguments to pass to relevant plot function.

Examples

SLN_sf <- SpatialLinesNetwork(route_network_sf)
plot(SLN_sf)
plot.SpatialLinesNetwork,ANY-method

Plot a SpatialLinesNetwork

Description

Plot a SpatialLinesNetwork

Usage

## S4 method for signature 'SpatialLinesNetwork,ANY'
plot(x, component = "sl", ...)

Arguments

x
  The SpatialLinesNetwork to plot

component
  The component of the network to plot. Valid values are "sl" for the geographic (SpatialLines) representation or "graph" for the graph representation.

...
  Arguments to pass to relevant plot function.

Examples

sln <- SpatialLinesNetwork(route_network)
plot(sln)
plot(sln, component = "graph")

points2flow

Convert a series of points into geographical flows

Description

Takes a series of geographical points and converts them into a SpatialLinesDataFrame representing the potential flows, or 'spatial interaction', between every combination of points.

Usage

points2flow(p)

Arguments

p
  SpatialPointsDataFrame
**points2line**

Convert a series of points, or a matrix of coordinates, into a line

**Description**

This is a simple wrapper around `splines()` that makes the creation of `SpatialLines` objects easy and intuitive.

**Usage**

```r
points2line(p)
```

**Arguments**

- `p` A `SpatialPoints` object or matrix representing the coordinates of points.

**Examples**

```r
p <- matrix(1:4, ncol = 2)
library(sp)
l <- points2line(p)
plot(l)
l <- points2line(cents)
plot(l)
p <- line2points(routes_fast)
l <- points2line(p)
plot(l)
l_sf <- points2line(cents_sf)
plot(l_sf)
```
points2odf

Convert a series of points into a dataframe of origins and destinations

Description

Takes a series of geographical points and converts them into a data.frame representing the potential flows, or 'spatial interaction', between every combination of points.

Usage

points2odf(p)

Arguments

p A spatial points object

Examples

data(cents)
df <- points2odf(cents)
cents_centroids <- rgeos::gCentroid(cents, byid = TRUE)
df2 <- points2odf(cents_centroids)
df3 <- points2odf(cents_sf)

quadrant

Split a spatial object into quadrants

Description

Split a spatial object (initially tested on SpatialPolygons) into quadrants.

Usage

quadrant(sp_obj, number_out = FALSE)

Arguments

sp_obj Spatial object
number_out Should the output be numbers from 1:4 (FALSE by default)

Details

Returns a character vector of NE, SE, SW, NW corresponding to north-east, south-east quadrants respectively. If number_out is TRUE, returns numbers from 1:4, respectively.
Examples

```r
data(zones)
sp_obj <- zones
(quads <- quadrant(sp_obj))
plot(sp_obj, col = factor(quads))
points(rgeos::gCentroid(sp_obj), col = "white")
# edge cases (e.g. when using rasters) lead to NAs
sp_obj <- raster::rasterToPolygons(raster::raster(ncol = 3, nrow = 3))
(quads <- quadrant(sp_obj))
plot(sp_obj, col = factor(quads))
```

---

**read_stats19_ac**

*Import and format UK 'Stats19' road traffic casualty data*

**Description**

Import and format UK 'Stats19' road traffic casualty data

**Usage**

```r
read_stats19_ac(data_dir = tempdir(), filename = "Accidents2014.csv")
```

**Arguments**

- `data_dir` Character string representing where the data is stored. If empty, R will attempt to download and unzip the data for you.
- `filename` Character string of the filename of the .csv to read in - default values are those downloaded from the UK Department for Transport (DfT).

**Details**

This is a wrapper function to access and load stats 19 data in a user-friendly way. The function returns a data frame, in which each record is a reported incident in the stats19 dataset.

Ensure you have a fast internet connection and at least 100 Mb space.

**Examples**

```r
## Not run:
ac <- read_stats19_ac()
## End(Not run)""
read_stats19_ca

Description
Import and format UK 'Stats19' road traffic casualty data

Usage
read_stats19_ca(data_dir = tempdir(), filename = "Casualties0514.csv")

Arguments
- data_dir: Character string representing where the data is stored. If empty, R will attempt to download and unzip the data for you.
- filename: Character string of the filename of the .csv to read in - default values are those downloaded from the UK Department for Transport (DfT).

Details
This is a wrapper function to access and load stats 19 data in a user-friendly way. The function returns a data frame, in which each record is a reported incident in the stats19 dataset.

Ensure you have a fast internet connection and at least 100 Mb space.

Examples

## Not run:
casualties <- read_stats19_ca()

## End(Not run)

read_stats19_ve

Description
Import and format UK 'Stats19' road traffic casualty data

Usage
read_stats19_ve(data_dir = tempdir(), filename = "Vehicles0514.csv")
Arguments

data_dir Character string representing where the data is stored. If empty, R will attempt to download and unzip the data for you.

filename Character string of the filename of the .csv to read in - default values are those downloaded from the UK Department for Transport (DfT).

Details

This is a wrapper function to access and load stats 19 data in a user-friendly way. The function returns a data frame, in which each record is a reported incident in the stats19 dataset.

Ensure you have a fast internet connection and at least 100 Mb space.

Examples

```r
## Not run:
ve <- read_stats19_ve()

## End(Not run)
```

read_table_builder  **Import and format Australian Bureau of Statistics (ABS) TableBuilder files**

Description

Import and format Australian Bureau of Statistics (ABS) TableBuilder files

Usage

```r
read_table_builder(dataset, filetype = "csv", sheet = 1,
removeTotal = TRUE)
```

Arguments

dataset Either a dataframe containing the original data from TableBuilder or a character string containing the path of the unzipped TableBuilder file.

filetype A character string containing the filetype. Valid values are 'csv', 'legacycsv' and 'xlsx' (default = 'csv'). Required even when dataset is a dataframe. Use 'legacycsv' for csv files derived from earlier versions of TableBuilder for which csv outputs were csv versions of the xlsx files. Current csv output from TableBuilder follow a more standard csv format.

sheet An integer value containing the index of the sheet in the xlsx file (default = 1).

removeTotal A boolean value. If TRUE removes the rows and columns with totals (default = TRUE).
Details

The Australian Bureau of Statistics (ABS) provides customised tables for census and other datasets in a format that is difficult to use in R because it contains rows with additional information. This function imports the original (unzipped) TableBuilder files in .csv or .xlsx format before creating an R dataframe with the data.

Examples

```r
data_dir <- system.file("extdata", package = "stplanr")
t1 <- read_table_builder(file.path(data_dir, "SA1Population.csv"))
t2 <- read_table_builder(file.path(data_dir, "SA1Population.xlsx"),
  filetype = "xlsx", sheet = 1, removeTotal = TRUE
)
sa1pop <- read.csv(file.path(data_dir, "SA1Population.csv"), header = FALSE)
t3 <- read_table_builder(sa1pop)
```

reproject

Reproject lat/long spatial object so that they are in units of 1m

Description

Many GIS functions (e.g. finding the area)

Usage

```r
reproject(shp, crs = crs_select_aeq(shp))
```

Arguments

- `shp` A spatial object with a geographic (WGS84) coordinate system
- `crs` An optional coordinate reference system (if not provided it is set automatically by `crs_select_aeq()`).

Examples

```r
data(routes_fast)
rf_aeq <- reproject(routes_fast[, 1:3])
rf_osgb <- reproject(routes_fast[, 1:3], 27700)
```
route  

Plan routes on the transport network

Description

Takes origins and destinations, finds the optimal routes between them and returns the result as a spatial (sf or sp) object. The definition of optimal depends on the routing function used.

Usage

```r
route(from = NULL, to = NULL, l = NULL,
route_fun = route_cyclestreet, n_print = 10, list_output = FALSE,
...)
```

Arguments

- **from**
  - An object representing origins (if lines are provided as the first argument, from is assigned to l)
- **to**
  - An object representing destinations
- **l**
  - Only needed if from and to are empty, in which case this should be a spatial object representing desire lines
- **route_fun**
  - A routing function to be used for converting the straight lines to routes `od2line()`
- **n_print**
  - A number specifying how frequently progress updates should be shown
- **list_output**
  - If FALSE (default) assumes SpatialLinesDataFrame output. Set to TRUE to save output as a list.
- `...`
  - Arguments passed to the routing function, e.g. `route_cyclestreet()`

Examples

```r
## Not run:
from <- "Leek, UK"
to <- "Hereford, UK"
route_leek_to_hereford <- route(from, to)
route(cents_sf[1:3, ], cents_sf[2:4, ]) # sf points
route(flowlines_sf[2:4, ]) # lines

## End(Not run)
```
routes_fast

Description

spatial lines dataset of commuter flows on the travel network

Usage

data(routes_fast)

Format

A spatial lines dataset with 49 rows and 15 columns

routes_slow

Description

spatial lines dataset of commuter flows on the travel network

Usage

data(routes_slow)

Format

A spatial lines dataset with 49 rows and 15 columns

route_cyclestreet

Plan a single route with CycleStreets.net

Description

Provides an R interface to the CycleStreets.net cycle planning API, a route planner made by cyclists for cyclists. The function returns a SpatialLinesDataFrame object representing the an estimate of the fastest, quietest or most balance route. Currently only works for the United Kingdom and part of continental Europe, though other areas may be requested by contacting CycleStreets. See https://www.cyclestreets.net/api/ for more information.
route_cyclestreet

Usage

route_cyclestreet(from, to, plan = "fastest", silent = TRUE,
                  pat = NULL, base_url = "https://www.cyclestreets.net",
                  reporterrors = TRUE, save_raw = "FALSE")

Arguments

from Text string or coordinates (a numeric vector of length = 2 representing latitude
       and longitude) representing a point on Earth.
to Text string or coordinates (a numeric vector of length = 2 representing latitude
       and longitude) representing a point on Earth. This represents the destination of
       the trip.
plan Text strong of either "fastest" (default), "quietest" or "balanced"
silent Logical (default is FALSE). TRUE hides request sent.
pat The API key used. By default this is set to NULL and this is usually acquired
       automatically through a helper, api_pat().
base_url The base url from which to construct API requests (with default set to main
       server)
reporterrors Boolean value (TRUE/FALSE) indicating if cyclestreets (TRUE by default).
       should report errors (FALSE by default).
save_raw Boolean value which returns raw list from the json if TRUE (FALSE by default).

Details

This function uses the online routing service CycleStreets.net to find routes suitable for cyclists
between origins and destinations. Requires an internet connection, a CycleStreets.net API key and
origins and destinations within the UK (and various areas beyond) to run.

Note that if from and to are supplied as character strings (instead of lon/lat pairs), Google’s geo-
coding services are used via geo_code().

You need to have an api key for this code to run. Loading a locally saved copy of the api key text
string before running the function, for example, will ensure it is available on any computer:

mytoken <- readLines("~/Dropbox/dotfiles/cyclestreets-api-key-rl") Sys.setenv(CYCLESTREET = mytoken)

if you want the API key to be available in future sessions, set it using the .Renviron file e.g. on
Linux machines in bash via:

echo "CYCLESTREET=f3fe3d078ac34737" >> ~/.Renviron

Read more about the .Renviron here: ?.Renviron

See Also

line2route
Examples

```r
## Not run:
from <- c(-1.55, 53.80) # geo_code("leeds")
to <- c(-1.76, 53.80) # geo_code("bradford uk")
json_output <- route_cyclestreet(from = from, to = to, plan = "quietest", save_raw = TRUE)
str(json_output) # what does cyclestreets give you?
rf_lb <- route_cyclestreet(from, to, plan = "fastest")
rf_lb$data
plot(rf_lb)
(rf_lb$length / (1000 * 1.61)) / # distance in miles
(rf_lb$time / (60 * 60)) # time in hours - average speed here: ~8mph
# Plan a 'balanced' route from Pedaller's Arms to the University of Leeds
rb_pa <- route_cyclestreet("Pedaller's Arms, Leeds", "University of Leeds, UK", "balanced")
## End(Not run)
```

route_graphhopper

Plan a route with the graphhopper routing engine

Description

Provides an R interface to the graphhopper routing engine, an open source route planning service.

Usage

```r
route_graphhopper(from, to, l = NULL, vehicle = "bike", silent = TRUE, pat = NULL, base_url = "https://graphhopper.com")
```

Arguments

- `from`: Text string or coordinates (a numeric vector of length = 2 representing latitude and longitude) representing a point on Earth.
- `to`: Text string or coordinates (a numeric vector of length = 2 representing latitude and longitude) representing a point on Earth. This represents the destination of the trip.
- `l`: Only needed if from and to are empty, in which case this should be a spatial object representing desire lines.
- `vehicle`: A text string representing the vehicle. Can be bike (default), car or foot. See [https://graphhopper.com/api/1/docs/supported-vehicle-profiles/](https://graphhopper.com/api/1/docs/supported-vehicle-profiles/) for further details.
- `silent`: Logical (default is FALSE). TRUE hides request sent.
- `pat`: The API key used. By default this is set to NULL and this is usually acquired automatically through a helper, api_pat().
- `base_url`: The base url from which to construct API requests (with default set to main server).
Details

The function returns a SpatialLinesDataFrame object. See https://github.com/graphhopper for more information.

To test graphhopper is working for you, try something like this, but with your own API key: To use this function you will need to obtain an API key from https://graphhopper.com/#directions-api. It is assumed that you have set your api key as a system environment for security reasons (so you avoid typing the API key in your code). Do this by adding the following to your .Renviron file (see ?.Renviron or the 'api-packages' vignette at https://cran.r-project.org/package=httr for more on this):

GRAPHHOPPER='FALSE-Key-eccbf612-214e-437d-8b73-06bdf9e6877d'.

(Note: key not real, use your own key.)

obj <- jsonlite::fromJSON(url)

Where url is an example api request from https://github.com/graphhopper/directions-api/blob/master/routing.md.

See Also

route_cyclestreet

Examples

## Not run:
from <- c(-0.12, 51.5)
to <- c(-0.14, 51.5)

r1 <- route_graphhopper(from = from, to = to, silent = FALSE)
r2 <- route_graphhopper("London Eye", "Westminster", vehicle = "foot")
r3 <- route_graphhopper("London Eye", "Westminster", vehicle = "car")

plot(r1)
plot(r2, add = TRUE, col = "blue") # compare routes
plot(r3, add = TRUE, col = "red")

## End(Not run)
Arguments

sln  The SpatialLinesNetwork to use.

from  Text string or coordinates (a numeric vector of length = 2 representing latitude and longitude) representing a point on Earth.

to  Text string or coordinates (a numeric vector of length = 2 representing latitude and longitude) representing a point on Earth. This represents the destination of the trip.

l  Only needed if from and to are empty, in which case this should be a spatial object representing desire lines

Examples

bb = sf::st_bbox(routes_fast)
set.seed(5)
from = c(runif(1, bb$xmin, bbxmax), runif(1, bb$ymin, bbymax))
to = c(runif(1, bb$xmin, bbxmax), runif(1, bb$ymin, bbymax))
sln = SpatialLinesNetwork(routes_fast)
r <- route_local(sln, from, to)
plot(r)
## Not run:
# todo: next code chunk is not currently working:
r2 = route_local(sln = sln, cents_sf[5, ], cents_sf[6, ])
plot(r2)
r_many <- line2route(flowlines_sf[2:9, ], route_local, sln = sln)
plot(cents)
plot(sln@sl, add = TRUE)
plot(r_many, add = TRUE)

## End(Not run)

route_network  spatial lines dataset representing a route network

Description

spatial lines dataset representing a route network

Usage

data(route_network)

Format

A spatial lines dataset 80 rows and 1 column
route_osrm

Plan a route with OSRM

Description

This is a wrapper around viaroute that returns a single route between A and B.

Usage

```r
route_osrm(from, to, l = NULL, alt = FALSE, ..., singleline = TRUE)
```

Arguments

- `from`: Text string or coordinates (a numeric vector of length 2 representing latitude and longitude) representing a point on Earth.
- `to`: Text string or coordinates (a numeric vector of length 2 representing latitude and longitude) representing a point on Earth. This represents the destination of the trip.
- `l`: Only needed if from and to are empty, in which case this should be a spatial object representing desire lines.
- `alt`: Boolean value to return alternative routes (default = TRUE).
- `...`: Arguments passed to viaroute()
- `singleline`: Should a single line be returned? Default is TRUE.

Note

The public-facing OSRM routing service (the default) only provides routing for cars by default. For details, see [https://github.com/Project-OSRM/osrm-backend/issues/4530](https://github.com/Project-OSRM/osrm-backend/issues/4530).

Examples

```r
## Not run:
from <- c(-1.55, 53.80) # geo_code("leeds")
to <- c(-1.76, 53.80) # geo_code("bradford uk")
r <- route_osrm(from, to)
plot(r)
r_many <- line2route(flowlines_sf[2:9, ], route_osrm, time_delay = 1)
plot(cents)
plot(r_many$geometry)
## End(Not run)
```
Plan a single route with TransportAPI.com

Description

Provides an R interface to the TransportAPI.com public transport API. The function returns a SpatialLinesDataFrame object representing the public route. Currently only works for the United Kingdom. See https://developer.transportapi.com/documentation for more information.

Usage

route_transportapi_public(from, to, silent = FALSE,
region = "southeast", modes = NA, not_modes = NA)

Arguments

- **from**: Text string or coordinates (a numeric vector of length = 2 representing latitude and longitude) representing a point on Earth.
- **to**: Text string or coordinates (a numeric vector of length = 2 representing latitude and longitude) representing a point on Earth. This represents the destination of the trip.
- **silent**: Logical (default is FALSE). TRUE hides request sent.
- **region**: String for the active region to use for journey plans. Possible values are ’south-east’ (default) or ’tfl’.
- **modes**: Vector of character strings containing modes to use. Default is to use all modes.
- **not_modes**: Vector of character strings containing modes not to use. Not used if modes is set.

Details

This function uses the online routing service TransportAPI.com to find public routes between origins and destinations. It does not require any key to access the API.

Note that if from and to are supplied as character strings (instead of lon/lat pairs), Google’s geocoding services are used via geo_code.

See Also

line2route
Examples

```r
## Not run:
# Plan the 'public' route from Hereford to Leeds
rqh <- route_transportapi_public(from = "Hereford", to = "Leeds")
plot(rq_hfd)

## End(Not run)

# Aim plan public transport routes with transportAPI
```

---

**sfNetwork-class**  
*An S4 class representing a (typically) transport network*

**Description**

This class uses a combination of a sf layer and an igraph object to represent transport networks that can be used for routing and other network analyses.

**Slots**

- `s1` A sf line layer with the geometry and other attributes for each link the in network.
- `g` The graph network corresponding to `s1`.
- `nb` A list containing vectors of the nodes connected to each node in the network.
- `weightfield` A character vector containing the variable (column) name from the SpatialLinesDataFrame to be used for weighting the network.

---

**sln2points**  
*Generate spatial points representing nodes on a SpatialLinesNetwork or sfNetwork.*

**Description**

Generate spatial points representing nodes on a SpatialLinesNetwork or sfNetwork.

**Usage**

`sln2points(sln)`

**Arguments**

- `sln` The SpatialLinesNetwork to use.
SpatialLinesNetwork

Examples

data(routes_fast)
rnet <- overline(routes_fast, attrib = "length")
SLN <- SpatialLinesNetwork(rnet)
(sln_nodes <- sln2points(SLN))
plot(SLN)
plot(sln_nodes, add = TRUE)

SpatialLinesNetwork  Create object of class SpatialLinesNetwork or sfNetwork

Description

Creates a new SpatialLinesNetwork (for SpatialLines) or sfNetwork (for sf) object that can be used for routing analysis within R.

Usage

SpatialLinesNetwork(sl, uselonglat = FALSE, tolerance = 0)

Arguments

sl  A SpatialLines or SpatialLinesDataFrame containing the lines to use to create the network.
uselonglat  A boolean value indicating if the data should be assumed to be using WGS84 latitude/longitude coordinates. If FALSE or not set, uses the coordinate system specified by the SpatialLines object.
tolerance  A numeric value indicating the tolerance (in the units of the coordinate system) to use as a tolerance with which to match nodes.

Details

This function is used to create a new SpatialLinesNetwork from an existing SpatialLines or SpatialLinesDataFrame object. A typical use case is to represent a transport network for routing and other network analysis functions. This function and the corresponding SpatialLinesNetwork class is an implementation of the SpatialLinesNetwork developed by Edzer Pebesma and presented on RPubs. The original implementation has been rewritten to better support large (i.e., detailed city-size) networks and to provide additional methods useful for conducting transport research following on from the initial examples provided by Janoska(2013).

References

SpatialLinesNetwork-class

An S4 class representing a (typically) transport network

Description

This class uses a combination of a SpatialLinesDataFrame and an igraph object to represent transport networks that can be used for routing and other network analyses.

Slots

s1  A SpatialLinesDataFrame with the geometry and other attributes for each link the in network.
g  The graph network corresponding to s1.

nb  A list containing vectors of the nodes connected to each node in the network.

weightfield  A character vector containing the variable (column) name from the SpatialLinesDataFrame to be used for weighting the network.

Examples

SLN <- SpatialLinesNetwork(route_network)
class(SLN)
weightfield(SLN) # field used to determine shortest path
plot(SLN)

## Not run:
points(sln2points(SLN)[1, ], cex = 5)
points(sln2points(SLN)[50, ], cex = 5)
shortpath <- sum_network_routes(SLN, 1, 50, sumvars = "length")
plot(shortpath, col = "red", lwd = 4, add = TRUE)
points(sln2points(SLN)[35, ], cex = 5)
shortpath <- sum_network_routes(SLN, 1, 35, sumvars = "length")
plot(shortpath, col = "red", lwd = 4, add = TRUE)
library(sf)
SLN_sf <- SpatialLinesNetwork(route_network_sf)
plot(SLN_sf)
shortpath <- sum_network_routes(SLN_sf, 1, 50, sumvars = "length")
plot(shortpath$geometry, col = "red", lwd = 4, add = TRUE)

## End(Not run)
sp_aggregate

Aggregate SpatialPolygonsDataFrame to new geometry.

Description

Aggregate SpatialPolygonsDataFrame to new geometry.

Usage

sp_aggregate(zones, aggzones, cols = FALSE, FUN = sum,
  prop_by_area = ifelse(identical(FUN, mean) == FALSE, TRUE, FALSE),
  digits = getOption("digits"))

Arguments

zones A SpatialPolygonsDataFrame or SpatialPointsDataFrame representing the original centroids or boundaries. Note that in the case of a SpatialPointsDataFrame, the original value will be allocated to the polygon in which the point is located rather than being distributed by area.

aggzones A SpatialPolygonsDataFrame containing the new boundaries to aggregate to.

cols A character vector containing the names of columns on which to apply FUN. By default, all numeric columns are aggregated.

FUN Function to use on aggregation. Default is sum.

prop_by_area Boolean value indicating if the values should be proportionally adjusted based on area. Default is TRUE unless FUN = mean.

digits The number of digits to use when proportionally adjusting values based on area. Default is the value of getOption("digits").

Value

SpatialPolygonsDataFrame

Details

This function performs aggregation on a SpatialPolygonsDataFrame to a different geometry specified by another SpatialPolygons object.

Examples

## Not run:
zones$data$region <- 1
zones$data[c(2, 5), c("region")] <- 2
aggzones <- sp::SpatialPolygonsDataFrame(rgl::gUnaryUnion(
  zones,
  id = zones$data$region
), data.frame(region = c(1, 2)))
zones$data$region <- NULL
summary.sfnetwork-method

Print a summary of a sfNetwork

Description

Print a summary of a sfNetwork

Usage

## S4 method for signature 'sfNetwork'
summary(object, ...)

Arguments

object The sfNetwork

... Arguments to pass to relevant summary function.

Examples

data(routes_fast)
rnet <- overline(routes_fast, attrib = "length")
SLN <- SpatialLinesNetwork(rnet)
summary(SLN)

summary.spatiallinesnetwork-method

Print a summary of a SpatialLinesNetwork

Description

Print a summary of a SpatialLinesNetwork

Usage

## S4 method for signature 'SpatialLinesNetwork'
summary(object, ...)

Examples

zones@data$exdata <- 5
library(sp)
sp_aggregate(zones, aggzones)

## End(Not run)
Arguments

object
  The SpatialLinesNetwork

...  Arguments to pass to relevant summary function.

Examples

data(routes_fast)
rnet <- overline(routes_fast, attrib = "length")
SLN <- SpatialLinesNetwork(rnet)
summary(SLN)

sum_network_links   Summarise links from shortest paths data

Description

Summarise links from shortest paths data

Usage

sum_network_links(sln, routedata)

Arguments

sln  The SpatialLinesNetwork or sfNetwork to use.
routedata  A dataframe where the first column contains the Node ID(s) of the start of the routes, the second column indicates the Node ID(s) of the end of the routes, and any additional columns are summarised by link. If there are no additional columns, then overlapping routes are counted.

Details

Find the shortest path on the network between specified nodes and returns a SpatialLinesDataFrame or sf containing the path(s) and summary statistics of each one.

Examples

data(routes_fast)
rnet <- overline(routes_fast, attrib = "length")
SLN <- SpatialLinesNetwork(rnet)
weightfield(SLN) # field used to determine shortest path
shortpath <- sum_network_links(
  SLN,
  data.frame(
    start = rep(c(1, 2, 3, 4, 5), each = 4),
    end = rep(c(50, 51, 52, 33), times = 5)
  )
)
plot(shortpath, lwd = shortpath$count)
sum_network_routes  
*Summarise shortest path between nodes on network*

**Description**

Summarise shortest path between nodes on network

**Usage**

```
sum_network_routes(sln, start, end, sumvars, combinations = FALSE)
```

**Arguments**

- `sln` The SpatialLinesNetwork to use.
- `start` Node ID(s) of route starts.
- `end` Node ID(s) of route ends.
- `sumvars` Character vector of variables for which to calculate summary statistics.
- `combinations` Boolean value indicating if all combinations of start and ends should be calculated. If TRUE then every start Node ID will be routed to every end Node ID. This is faster than passing every combination to start and end. Default is FALSE.

**Details**

Find the shortest path on the network between specified nodes and returns a SpatialLinesDataFrame containing the path(s) and summary statistics of each one.

**Examples**

```r
data(routes_fast)
rnet <- overline(routes_fast, attrib = "length")
SLN <- SpatialLinesNetwork(rnet)
weightfield(SLN) # field used to determine shortest path
shortpath <- sum_network_routes(SLN, 1, 50, sumvars = "length")
plot(shortpath, col = "red", lwd = 4)
plot(SLN, add = TRUE)
```

---

table2matrix  
*Return Matrix containing travel times between origins and destinations*

**Description**

Return Matrix containing travel times between origins and destinations
Usage

table2matrix(lat, lng, destlat = NA, destlng = NA, api = 5,
profile = "driving", protocol = "v1",
osrmurl = "http://router.project-osrm.org")

Arguments

lat Numeric vector containing latitude coordinate for each coordinate to calculate travel times. Also accepts dataframe with latitude in the first column and longitude in the second column.
lng Numeric vector containing longitude coordinate for each coordinate to calculate travel times.
destlat Numeric vector containing destination latitude coordinate for each coordinate to calculate travel times. Also accepts dataframe with latitude in the first column and longitude in the second column. Default is value of lat.
destlng Numeric vector containing longitude coordinate for each destination coordinate to calculate travel times. Default is value of lng.
api An integer value containing the OSRM API version (either 4 or 5). Default is 5.
profile OSRM profile to use (for API v5), defaults to "driving".
protocol The protocol to use for the API (for v5), defaults to "v1".
osrmurl Base URL of the OSRM service

Details

Return a matrix containing travel times between origins and destinations

Examples

### Not run:

```r
table2matrix(seq(from = 50, to = 52, by = 0.1), seq(from = 12, to = 14, by = 0.1))
```

### End(Not run)

toptailgs

*Clip the first and last n metres of SpatialLines*

Description

Takes lines and removes the start and end point, to a distance determined by the user. Uses the geosphere::distHaversine function and requires coordinates in WGS84 (lng/lat).

Usage

toptailgs(l, toptail_dist, tail_dist = NULL)
Arguments

1. A SpatialLines object

toptail_dist  The distance (in metres) to top the line by. Can be either a single value or a vector of the same length as the SpatialLines object. If tail_dist is missing, is used as the tail distance.

tail_dist  The distance (in metres) to tail the line by. Can be either a single value or a vector of the same length as the SpatialLines object.

Examples

data("routes_fast")
rf <- routes_fast[2:3, ]
r_toptail <- toptailgs(rf, toptail_dist = 300)
plot(rf, lwd = 3)
plot(r_toptail, col = "red", add = TRUE)
plot(cents, add = TRUE)

Description

Takes lines and removes the start and end point, to a distance determined by the nearest polygon border.

Usage

toptail_buff(l, buff, ...)

Arguments

1. A SpatialLines object

buff  A SpatialPolygons object to act as the buffer

...  Arguments passed to rgeos::gBuffer()

Examples

r_toptail <- toptail_buff(routes_fast, zones)
sel <- row.names(routes_fast) %in% row.names(r_toptail)
rf_cross_poly <- routes_fast[sel, ]
plot(zones)
plot(routes_fast, col = "blue", lwd = 4, add = TRUE)
# note adjacent lines removed
plot(rf_cross_poly, add = TRUE, lwd = 2)
plot(r_toptail, col = "red", add = TRUE)
**update_line_geometry**

*Description*

Take two SpatialLines objects and update the geometry of the former with that of the latter, retaining the data of the former.

*Usage*

```r
update_line_geometry(l, nl)
```

*Arguments*

- `l`: A SpatialLines object, whose geometry is to be modified.
- `nl`: A SpatialLines object of the same length as `l` to provide the new geometry.

*Examples*

```r
data(flowlines)
l <- flowlines[2:5, ]
nl <- routes_fast
nrow(l)
nrow(nl)
l <- l[is_linepoint(l), ]
names(l)
names(routes_fast)
l_newgeom <- update_line_geometry(l, nl)
plot(l, lwd = 1$All / mean(l$All))
plot(l_newgeom, lwd = 1$All / mean(l$All))
names(l_newgeom)
```

**viaroute**

*Description*

Query OSRM service and return json string result.

*Usage*

```r
viaroute(startlat = NULL, startlng = NULL, endlat = NULL, endlng = NULL, viapoints = NULL, api = 5, profile = "driving", protocol = "v1", osrmurl = "http://router.project-osrm.org", zoom = 18, instructions = TRUE, alt = TRUE, geometry = TRUE, uturns = "default")
```
Arguments

- **startlat**: A single value or vector containing latitude(s) of the start of routes.
- **startlng**: A single value or vector containing longitude(s) of the end of routes.
- **endlat**: A single value or vector containing latitude(s) of the end of routes.
- **endlng**: A single value or vector containing longitude(s) of the end of routes.
- **viapoints**: A list of dataframes containing latitude (first column), longitude (second) column for points to use for each route. Optionally a third column containing a boolean value indicating if u-turns are allowed at each viapoint.
- **api**: An integer value containing the OSRM API version (either 4 or 5). Default is 5.
- **profile**: OSRM profile to use (for API v5), defaults to "driving".
- **protocol**: The protocol to use for the API (for v5), defaults to "v1".
- **osrmurl**: URL for OSRM service, e.g. an osrm instance running on localhost. By default this is "http://router.project-osrm.org".
- **zoom**: Zoom level for route geometry (0 to 18) for API v4 (default = 18). Higher values are more detailed.
- **instructions**: Boolean value to return instructions (default = TRUE).
- **alt**: Boolean value to return alternative routes (default = TRUE).
- **geometry**: Boolean value to return route geometries (default = TRUE).
- **uturns**: Boolean value to allow uturns at via points (default = TRUE).

Details

Constructs the query URL used with the OSRM HTTP API and returns a string or vector of strings with the json-encoded results. Can be used in conjunction with the viaroute2sldf function.

Examples

```r
## Not run:
exroutes <- viaroute(50, 0, 51, 1)
r <- viaroute2sldf(exroutes)
plot(r)
lngs <- c(-33.5, -33.6, -33.7)
lats <- c(150, 150.1, 150.2)
exroutes <- viaroute(viapoints = list(data.frame(x = lngs, y = lats)))
r <- viaroute2sldf(exroutes)
plot(r)

## End(Not run)
```
viaroute2sldf

Convert json result of OSRM routing query to SpatialLinesDataFrame

Description

Convert json result of OSRM routing query to SpatialLinesDataFrame

Usage

viaroute2sldf(osrmresult, return_sf = FALSE)

Arguments

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<tr>
<th>Argument</th>
<th>Description</th>
</tr>
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<tr>
<td>osrmresult</td>
<td>Single character string or character vector containing encoded json result(s) of OSRM routing queries.</td>
</tr>
<tr>
<td>return_sf</td>
<td>Boolean value if this function should return an sf object, if FALSE returns sp object (default FALSE).</td>
</tr>
</tbody>
</table>

Details

Converts the result of a (successful) OSRM routing query and returns a SpatialLinesDataFrame containing the route, route summary and instructions.

Examples

```
## Not run:
viaroute2sldf(viaroute(
  startlat = 52.503033,
  startlng = 13.420526,
  endlat = 52.516582,
  endlng = 13.429290
)
)

## End(Not run)
```

weightfield

Get or set weight field in SpatialLinesNetwork

Description

Get or set value of weight field in SpatialLinesNetwork
Usage

weightfield(x)

weightfield(x, varname) <- value

weightfield(x, varname) <- value

## S4 method for signature 'SpatialLinesNetwork'
weightfield(x)

## S4 method for signature 'sfNetwork'
weightfield(x)

## S4 replacement method for signature 'SpatialLinesNetwork',ANY'
weightfield(x) <- value

## S4 replacement method for signature 'sfNetwork',ANY'
weightfield(x) <- value

## S4 replacement method for signature 'SpatialLinesNetwork',character'
weightfield(x, varname) <- value

## S4 replacement method for signature 'sfNetwork',character'
weightfield(x, varname) <- value

Arguments

x SpatialLinesNetwork to use
varname The name of the variable to set/use.
value Either the name of the variable to use as the weight field or a dataframe or vector containing the weights to use if varname is passed to the replacement function. If the dataframe contains multiple columns, the column with the same name as varname is used, otherwise the first column is used.

Details

These functions manipulate the value of weightfield in a SpatialLinesNetwork. When changing the value of weightfield, the weights of the graph network are updated with the values of the corresponding variables.

Examples

data(routes_fast)
rnet <- overline(routes_fast, attrib = "length")
SLN <- SpatialLinesNetwork(rnet)
weightfield(SLN) <- "length"
weightfield(SLN, "randomnum") <- sample(1:10, size = nrow(SLN@sl), replace = TRUE)
**writeGeoJSON**  
*Write to geojson easily*

**Description**

Provides a user-friendly wrapper for rgdal::writeOGR(). Note, geojson_write from the geojsonio package provides the same functionality [https://github.com/ropensci/geojsonio](https://github.com/ropensci/geojsonio).

**Usage**

writeGeoJSON(shp, filename)

**Arguments**

- **shp**  
The spatial object a to be cropped
- **filename**  
The file name of the output geojson

**zones**  
*Spatial polygons of home locations for flow analysis.*

**Description**

These correspond to the `cents()` data.

**Details**

- geo_code. the official code of the zone

**Examples**

```r
## Not run:
zones <- rgdal::readOGR(dsn = "/home/robin/n pct/pct-bigdata/msoas.geojson", layer = "OGRGeoJSON")
proj4string(zones) <- proj4string(cents)
zones <- zones[cents, ]
plot(zones)
points(cents)
zones_sf <- sf::st_as_sf(zones)
## End(Not run)
```
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