Package 'cyclestreets'

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Type Package

Title Cycle Routing and Data for Cycling Advocacy

Version 1.0.3

Description An interface to the cycle routing/data services provided by 'CycleStreets', a not-for-profit social enterprise and advocacy organisation. The application programming interfaces (APIs) provided by 'CycleStreets' are documented at (<https://www.cyclestreets.net/api/>). The focus of this package is the journey planning API, which aims to emulate the routes taken by a knowledgeable cyclist. An innovative feature of the routing service of its provision of fastest, quietest and balanced profiles. These represent routes taken to minimise time, avoid traffic and compromise between the two, respectively.

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URL https://rpackage.cyclestreets.net/, https://github.com/cyclestreets/cyclestreets-r

BugReports https://github.com/cyclestreets/cyclestreets-r/issues

Depends R (>= 3.6.0)

Imports checkmate, curl, dplyr, data.table, geojsonsf, httr, jsonlite, magrittr, progressr, RcppSimdJson, readr, sf, stringr, stringi

Suggests covr, od, stplanr

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NeedsCompilation no

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Contents

`batch` *Interface to CycleStreets Batch Routing API*

Description

Note: set `CYCLESTREETS_BATCH`, `CYCLESTREETS_PW` and `CYCLESTREETS_PW` environment variables, e.g. with `usethis::edit_r_environ()` before trying this.

Usage

```
batch(
  desire_lines = NULL,
  id = NULL,
  directory = tempdir(),
  wait = FALSE,
  wait_time = NULL,
  name = "Batch job",
  serverId = 21,
  strategies = "quietest",
  bothDirections = 0,
  minDistance = 50,
  maxDistance = 5000,
  filename = "test",
  includeJsonOutput = 1,
  emailOnCompletion = "you@example.com",
  username = Sys.getenv("CYCLESTREETS_UN"),
  password = Sys.getenv("CYCLESTREETS_PW"),
  base_url = "https://api.cyclestreets.net/v2/batchroutes.createjob",
```

```
  pat = Sys.getenv("CYCLESTREETS_BATCH"),
  silent = TRUE,
  delete_job = TRUE,
 cols_to_keep = c("id", "name", "provisionName", "distances", "time", "quietness",
    "gradient_smooth"),
  segments = TRUE
)
```

Arguments

desire_lines	Geographic desire lines representing origin-destination data
id	int Batch job ID, as returned from batchroutes.createjob. action string (start|pause|continue|terminate) Action to take. Available actions are: start: Start (open) job pause: Pause job continue: Continue (re-open) job terminate: Terminate job and delete data
directory	Where to save the data? `tempdir()` by default
wait	Should the process block your R session but return a route? FALSE by default.
wait_time	How long to wait before getting the data in seconds? NULL by default, meaning it will be calculated by the private function `wait_s()`.
name	The name of the batch routing job for CycleStreets
serverId	The server ID to use (21 by default)
strategies	Route plan types, e.g. `"fastest"`
bothDirections	int (1|0) Whether to plan in both directions, i.e. A-B as well as B-A. 0, meaning only one way routes, is the default in the R default.
minDistance	Min Euclidean distance of routes to be calculated
maxDistance	Maximum Euclidean distance of routes to be calculated
filename	Character string
includeJsonOutput	int (1|0) Whether to include a column in the resulting CSV data giving the full JSON output from the API, rather than just summary information like distance and time.
emailOnCompletion	Email on completion?
username	string Your CycleStreets account username. In due course this will be replaced with an OAuth token.
password	string Your CycleStreets account password. You can set it with Sys.setenv(CYCLESTREETS_PW="xxxx
base_url	The base url from which to construct API requests (with default set to main server)
pat	The API key used. By default this uses `Sys.getenv("CYCLESTREETS")`.
silent	Logical (default is FALSE). TRUE hides request sent.
delete_job	Delete the job? TRUE by default to avoid clogged servers
cols_to_keep	Columns to return in output sf object
segments	logical, return segments TRUE/FALSE/"both"

Details

See https://www.cyclestreets.net/journey/batch/ for web UI.

Recommneded max batch size: 300k routes

Examples

```
if(FALSE) {
library(sf)
desire_lines = od::od_to_sf(od::od_data_df, od::od_data_zones)[4:5, 1:3]
u = paste0("https://github.com/cyclestreets/cyclestreets-r/",
  "releases/download/v0.5.3/od-longford-10-test.Rds")
desire_lines = readRDS(url(u))
routes_id = batch(desire_lines, username = "robinlovelace", wait = FALSE)
# Wait for some time, around a minute or 2
routes_wait = batch(id = routes_id, username = "robinlovelace", wait = TRUE, delete_job = FALSE)
names(routes_wait)
plot(routes_wait)
plot(desire_lines$geometry[4])
plot(routes_wait$geometry[routes_wait$route_number == "4"], add = TRUE)
head(routes_wait$route_number)
unique(routes_wait$route_number)
# Job is deleted after this command:
routes_attrib = batch(desire_lines, id = routes_id, username = "robinlovelace", wait = TRUE)
names(routes_attrib)
unique(routes_attrib$route_number)
desire_lines_huge = desire_lines[sample(nrow(desire_lines), 250000, replace = TRUE), ]
routes_id = batch(desire_lines_huge, username = "robinlovelace", wait = FALSE)
names(routes)
plot(routes$geometry)
plot(desire_lines$geometry, add = TRUE, col = "red")
routes = batch(desire_lines, username = "robinlovelace", wait_time = 5)
# profvis::profvis(batch_read("test-data.csv.gz"))
}
```

`batch_multi` *Batch routing for multiple plans and large datasets*

Description

Batch routing for multiple plans and large datasets

Usage

```
batch_multi(
  desire_lines,
  plans = c("fastest", "balanced"),
  nrow_batch = 10000,
  temp_folder = tempdir(),
```

```
  batch_ids = NULL,
  ...
)
```

Arguments

desire_lines	Input desire lines
plans	Plans, e.g. fastest
nrow_batch	How many rows per batch?
temp_folder	path to folder
batch_ids	NULL?
...	Arguments passed to batch

Value

A list of routes.

Examples

```
if(FALSE) {
od_df = readr::read_csv("https://github.com/nptscot/npt/raw/main/data-raw/od_subset.csv")
zones = sf::read_sf("https://github.com/nptscot/npt/raw/main/data-raw/zones_edinburgh.geojson")
desire_lines = od::od_to_sf(od_df, zones)
desire_lines = desire_lines[1:100, ]
p = c("fastest", "quietest")
routes_multi = batch_multi(desire_lines, plans = p, nrow_batch = 26, delete_job = FALSE)
names(routes_multi)
plot(routes_multi$fastest$geometry)
plot(routes_multi$quietest$geometry)
ids = list(
  fastest = 4059:(4059+3),
  quietest = 4063:(4063+3)
)
r_ids = batch_multi(desire_lines, plans = p, nrow_batch = 26, delete_job = FALSE, batch_ids = ids)
}
```

---

cyclestreets_column_names

Prices of 50,000 round cut diamonds.

Description

Variables provided by CycleStreets in their journey data

Usage

```
cyclestreets_column_names
```

Format

An object of class `character` of length 44.

Source

https://www.cyclestreets.net/

`journey` *Plan a journey with CycleStreets.net*

Description

R interface to the CycleStreets.net journey planning API, a route planner made by cyclists for cyclists. See cyclestreets.net/api for details.

Usage

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

Arguments

`from`	Longitude/Latitude pair, e.g. `c(-1.55, 53.80)`
`to`	Longitude/Latitude pair, e.g. `c(-1.55, 53.80)`
`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 uses `Sys.getenv("CYCLESTREETS")`.
`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).
`...`	Arguments passed to json2sf_cs

Details

Requires the internet and a CycleStreets.net API key. CycleStreets.net does not yet work worldwide.

You need to have an api key for this code to run. By default it uses the CYCLESTREETS environment variable. A quick way to set this is to install the `usethis` package and then executing the following command:

```
usethis::edit_r_environ()
```

That should open up a new file in your text editor where you can add the environment variable as follows (replace 1a... with your key for this to work):

CYCLESTREETS=1a43ed677e5e6fe9

After setting the environment variable, as outlined above, you need to restart your R session before the journey function will work.

See www.cyclestreets.net/help/journey/howitworks/ for details on how these are calculated.

CycleStreets can give you lots of info at route and segment level. Commonly useful columns include:

```
cols = c("name", "provisionName", "time", "quietness", "edition", "gradient_smooth")
```

See `json2sf_cs()` for details.

See Also

json2sf_cs

Examples

```
## Not run:
from = c(-1.55, 53.80) # geo_code("leeds")
to = c(-1.76, 53.80) # geo_code("bradford uk")
r1 = journey(from, to)
names(r1)
cols = c("name", "provisionName", "distances", "time", "quietness", "edition", "gradient_smooth")
r2 = journey(from, to, cols_to_keep = cols)
names(r2)
r2
r1[1:2, ]
r1$grammesCO2saved
r1$calories
plot(r1[1:4])
plot(r1[10:ncol(r1)])
to = c(-2, 53.5) # towards Manchester
r1 = journey(from, to)
names(r1)
r2 = journey(from, to, plan = "balanced")
plot(r1["quietness"], reset = FALSE)
plot(r2["quietness"], add = TRUE)
r3 = journey(from, to, silent = FALSE)
r4 = journey(from, to, save_raw = TRUE)
r5 = journey(c(-1.524, 53.819), c(-1.556, 53.806))
```

```
plot(r5["gradient_segment"])
plot(r5["gradient_smooth"])

u = paste0("https://github.com/cyclestreets/cyclestreets-r/",
  "releases/download/v0.4.0/line_with_single_segment.geojson")
desire_line = sf::read_sf(u)
r = stplanr::route(l = desire_line, route_fun = journey)
r

## End(Not run)
```

---

journey2 *Plan a journey with CycleStreets.net*

Description

R interface to the CycleStreets.net journey planning API, a route planner made by cyclists for cyclists. See cyclestreets.net/api for details.

Usage

```
journey2(
  fromPlace = NA,
  toPlace = NA,
  id = NULL,
  plan = "fastest",
  pat = NULL,
  base_url = "https://www.cyclestreets.net",
  host_con = 1,
  reporterrors = TRUE,
  segments = FALSE
)
```

Arguments

fromPlace	sf points, matrix, or vector of lng/lat coordinates
toPlace	sf points, matrix, or vector of lng/lat coordinates
id	a character ID value to be attached to the results
plan	Text strong of either "fastest" (default), "quietest" or "balanced"
pat	The API key used. By default this uses `Sys.getenv("CYCLESTREETS")`.
base_url	The base url from which to construct API requests (with default set to main server)
host_con	number of threads to use passed to curl::new_pool
reporterrors	Boolean value (TRUE/FALSE) indicating if cyclestreets (TRUE by default). should report errors (FALSE by default).
segments	Logical, if true route segments returned otherwise whole routes

Details

Requires the internet and a CycleStreets.net API key. CycleStreets.net does not yet work worldwide.

You need to have an api key for this code to run. By default it uses the CYCLESTREETS environment variable. A quick way to set this is to install the `usethis` package and then executing the following command:

```
usethis::edit_r_environ()
```

That should open up a new file in your text editor where you can add the environment variable as follows (replace 1a... with your key for this to work):

CYCLESTREETS=1a43ed677e5e6fe9

After setting the environment variable, as outlined above, you need to restart your R session before the journey function will work.

See www.cyclestreets.net/help/journey/howitworks/ for details on how these are calculated.

See Also

json2sf_cs

Examples

```
## Not run:
from = c(-1.55, 53.80) # geo_code("leeds")
to = c(-1.76, 53.80) # geo_code("bradford uk")
r1 = journey(from, to)
r2 = journey2(from, to, segments = TRUE)
# waldo::compare(r1, r2) # see differences
sum(sf::st_length(r1))
sum(sf::st_length(r2))
# waldo::compare(sum(sf::st_length(r1)), sum(sf::st_length(r2)))
# waldo::compare(names(r1), names(r2))
# waldo::compare(r1[1, ], r2[1, ])
r1[1:2, ]
r2[1:2, ]
r1$grammesCO2saved
r1$calories

## End(Not run)
```

`json2sf_cs` *Quickly convert output from CycleStreets.net into sf object*

Description

Available fields from CycleStreets include:

Usage

```
json2sf_cs(
  results_raw,
  id = 1,
  segments = TRUE,
  route_variables = c("start", "finish", "start_longitude", "start_latitude",
   "finish_longitude", "finish_latitude", "crow_fly_distance", "event", "whence",
   "speed", "itinerary", "plan", "note", "length", "west", "south", "east", "north",
    "leaving", "arriving", "grammesCO2saved", "calories", "edition"),
  cols_to_keep = c("id", "time", "busynance", "quietness", "signalledJunctions",
   "signalledCrossings", "name", "walk", "elevations", "distances", "type", "legNumber",
   "distance", "turn", "startBearing", "color", "provisionName", "start", "finish",
    "start_longitude", "start_latitude", "finish_longitude", "finish_latitude",
   "crow_fly_distance", "event", "whence", "speed", "itinerary", "plan", "note",
   "length", "west", "south", "east", "north", "leaving", "arriving", "grammesCO2saved",
    "calories", "edition", "gradient_segment",
     "elevation_change",
    "gradient_smooth")
)
```

Arguments

results_raw	Raw result from CycleStreets.net read-in with readLines or similar
id	id of the result
segments	Return segment level data? TRUE by default.
route_variables	Route level variables
cols_to_keep	Columns to return in output sf object

Details

```
c("id", "time", "busynance", "quietness", "signalledJunctions",
  "signalledCrossings", "name", "walk", "elevations", "distances",
  "type", "legNumber", "distance", "turn", "startBearing", "color",
  "provisionName", "start", "finish", "start_longitude", "start_latitude",
  "finish_longitude", "finish_latitude", "crow_fly_distance", "event",
  "whence", "speed", "itinerary", "plan", "note", "length", "west",
  "south", "east", "north", "leaving", "arriving", "grammesCO2saved",
  "calories", "edition", "gradient_segment", "elevation_change",
  "gradient_smooth", "geometry")
```

Examples

```
from = "Leeds Rail Station"
to = "University of Leeds"
# from_point = tmaptools::geocode_OSM(from)
# to_point = tmaptools::geocode_OSM(to)
from_point = c(-1.54408, 53.79360)
```

```
to_point =   c(-1.54802, 53.79618)
# save result from the API call to journey.json
# res_json = journey(from_point, to_point, silent = FALSE, save_raw = TRUE)
# jsonlite::write_json(res_json, "inst/extdata/journey.json")
# f = "inst/extdata/journey.json"
f = system.file(package = "cyclestreets", "extdata/journey.json")
rsf = json2sf_cs(readLines(f), id = 1, segments = TRUE)
names(rsf)
json2sf_cs(readLines(f), id = 1, segments = TRUE, cols_to_keep = "quietness")
# save result from the API call to journey.json
# res_json = journey(from_point, to_point, silent = FALSE, save_raw = TRUE)
# jsonlite::write_json(res_json, "inst/extdata/journey_short.json")
# f = "inst/extdata/journey_short.json"
f = system.file(package = "cyclestreets", "extdata/journey_short.json")
obj = jsonlite::read_json(f, simplifyVector = TRUE)
# Inclusion of "start_longitude" leads to the additional ProvisionName1 colum:
cols = c("name", "distances", "provisionName")
json2sf_cs(readLines(f), id = 1, segments = TRUE, cols_to_keep = cols)
```

`ltns` *Download data on 'Low Traffic Neighbourhoods' or 'rat runs' from CycleStreets*

Description

R interface to the CycleStreets.net LTN. See ltn API docs and an article on the methods for further details: https://www.cyclestreets.org/news/2021/07/25/mapping-ltns/

Usage

```
ltns(bb, pat = Sys.getenv("CYCLESTREETS"))
```

Arguments

bb	An sf or 'bounding box' like object
pat	The API key used. By default this uses `Sys.getenv("CYCLESTREETS")`.

Examples

```
## Not run:
bb = "0.101131,52.195807,0.170288,52.209719"
ltn_data = ltns(bb)
plot(ltn_data)
bb = stplanr::routes_fast_sf
ltn_data = ltns(bb)
plot(ltn_data)

## End(Not run)
```

`smooth_with_cutoffs` *Identify and smooth-out anomalous gradient values*

Description

When `distance_cutoff` and `gradient_cutoff` thresholds are both broken for route segments, this function treats them as anomalous and sets the offending gradient values to the mean of the `n` segments closest to (in front of and behind) the offending segment.

Usage

```
smooth_with_cutoffs(
  gradient_segment,
  elevation_change,
  distances,
  distance_cutoff = 50,
  gradient_cutoff = 0.1,
  n = 3,
  warnNA = FALSE
)
```

Arguments

`gradient_segment`	The gradient for each segment from CycleStreets.net
`elevation_change`	The difference between the maximum and minimum elevations within each segment
`distances`	The distance of each segment
`distance_cutoff`	Distance (m) used to identify anomalous gradients
`gradient_cutoff`	Gradient (%, e.g. 0.1 being 10%) used to identify anomalous gradients
`n`	The number of segments to use to smooth anomalous gradents.
`warnNA`	Logical should NA warning be given? The default is 3, meaning segments directly before, after and including the offending segment.

Examples

```
f = system.file(package = "cyclestreets", "extdata/journey.json")
rsf = json2sf_cs(readLines(f))
rsf$gradient_segment
rsf$elevation_change
rsf$distances
smooth_with_cutoffs(rsf$gradient_segment, rsf$elevation_change, rsf$distances)
smooth_with_cutoffs(rsf$gradient_segment, rsf$elevation_change, rsf$distances, 20, 0.05)
smooth_with_cutoffs(rsf$gradient_segment, rsf$elevation_change, rsf$distances, 200, 0.02)
smooth_with_cutoffs(rsf$gradient_segment, rsf$elevation_change, rsf$distances, 200, 0.02, n = 5)
```

ways *Download data on 'Ways' with cyclability (quietness) ratings*

Description

R interface to the CycleStreets.net LTN. See API docs.

Usage

```
ways(
  bb,
  pat = Sys.getenv("CYCLESTREETS"),
  base_url = "https://api.cyclestreets.net/v2/mapdata?",
  limit = 400,
  types = "way",
  wayFields =
   "name,ridingSurface,id,cyclableText,quietness,speedMph,speedKmph,pause,color",
  zoom = 16
)
```

Arguments

bb	An sf or 'bounding box' like object
pat	The API key used. By default this uses `Sys.getenv("CYCLESTREETS")`.
base_url	The base url from which to construct API requests (with default set to main server)
limit	Maximum number of features to return
types	The type of way to get. Default: "way".
wayFields	Which attributes of the ways to return?
zoom	Zoom level

Examples

```
## Not run:

u_test = paste0("https://api.cyclestreets.net/v2/mapdata?key=c047ed46f7b50b1x",
  "&limit=400&types=way&wayFields=name,ridingSurface,id,cyclableText,",
  "quietness,speedMph,speedKmph,pause,color&zoom=16&",
  "bbox=-9.160863,38.754642,-9.150128,38.75764")
# ways_test = sf::read_sf(u_test)
bb = "0.101131,52.195807,0.170288,52.209719"
bb = "-9.160863,38.754642,-9.150128,38.75764"
way_data = ways(bb)
plot(way_data)
bb = stplanr::routes_fast_sf
way_data = ways(bb)
```

```
plot(way_data)

## End(Not run)
```

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