Package 'valhallr'

October 12, 2022

Type Package

Title A Tidy Interface to the 'Valhalla' Routing Engine

Version 0.1.0

Author Christopher Belanger

Maintainer Christopher Belanger <christopher.a.belanger@gmail.com>

Description An interface to the 'Valhalla' routing engine's
application programming interfaces (APIs) for turn-by-turn routing,
isochrones, and origin-destination analyses. Also includes several
user-friendly functions for plotting outputs, and strives to follow
``tidy'' design principles. Please note that this package requires
access to a running instance of 'Valhalla', which is open source and
can be downloaded from <https://github.com/valhalla/valhalla>.

License GPL (>= 3)

Encoding UTF-8

LazyData true

Imports httr, purrr, jsonlite, dplyr, magrittr, tibble, tidyr, sf,
leaflet, ggplot2, htmltools, stringr, ggspatial, geojsonio,
rlang, Cairo

RoxygenNote 7.1.1

URL https://github.com/chris31415926535/valhallr

BugReports https://github.com/chris31415926535/valhallr/issues

Suggests knitr, rmarkdown

VignetteBuilder knitr

NeedsCompilation no

Repository CRAN

Date/Publication 2021-03-09 08:40:02 UTC

R **topics documented:**

---

decode   *Decode Valhalla Route Shape*

Description

For point-to-point routing, Valhalla's API provides a route shapefile in a special ASCII-encoded format. This function takes an encoded string, decodes it, and returns the lat/lon coordinates as a tibble.

Usage

```
decode(encoded)
```

Arguments

encoded   An encoded shapefile in ASCII format from Valhalla's API.

Details

To map the results, see also valhallr::map_trip().

Value

A tibble containing point locations in lat and lon columns.

---

isochrone *Generate Isochrones*

Description

An isochrone, also known as a service area, is a polygon that shows the area reachable from a starting point by traveling along a road network for a certain distance or time. This function provides an interface to the Valhalla routing engine's isochrone API. It lets you provide a starting point's latitude and longitude, a distance or time metric, and a vector of distances/times, and if it's successful it returns an sf-class tibble of polygons.

Usage

```
isochrone(
  from,
  costing = "pedestrian",
  contours = c(5, 10, 15),
  metric = "min",
  min_road_class = "residential",
  minimum_reachability = 500,
  hostname = "localhost",
  port = 8002
)
```

Arguments

from	A tibble containing one origin location in columns named `lat` and `lon`.
costing	The travel costing method: at present "auto", "bicycle", and "pedestrian" are supported.
contours	A numeric vector of values at which to produce the isochrones.
metric	Distance or time. Accepts parameters "min" and "km".
min_road_class	The minimum road classification Valhalla will consider. Defaults to `residential`.
minimum_reachability	
	The minimum number of nodes a candidate network needs to have before it is included.
hostname	Hostname or IP address of your Valhalla instance. Defaults to "localhost".
port	The port your Valhalla instance is monitoring. Defaults to 8002.

Details

More more information, please see Valhalla's API documentation:

- https://valhalla.readthedocs.io/en/latest/api/isochrone/api-reference/

Value

An sf/tibble object containing isochrone polygons.

Examples

```
## Not run:
library(valhallr)
# set up our departure point: the University of Ottawa
from <- test_data("uottawa")

# generate a set of isochrones for travel by bicycle
i <- valhallr::isochrone(from, costing = "bicycle")

# map the isochrones
map_isochrone(i)

## End(Not run)
```

---

map_isochrone   *Generate maps of isochrones*

Description

This is a convenience function that takes the output of valhallr::isochrone() and generates either a static or interactive map.

Usage

```
map_isochrone(isochrone, method = "leaflet")
```

Arguments

isochrone   An isochrone sf object generated by valhallr::isochrone().

method   The method used to map it. Two methods are supported:

- "leaflet" produces an interactive HTML map using the Leaflet package.
- "ggplot" produces a static map.

Value

A plot of the isochrones, either a a leaflet object or a ggplot object.

Examples

```
## Not run:
library(valhallr)
# set up our departure point: the University of Ottawa
from <- test_data("uottawa")

# generate a set of isochrones for travel by bicycle
i <- valhallr::isochrone(from, costing = "bicycle")

# map the isochrones
```

```
  map_isochrone(i)

## End(Not run)
```

---

map_trip   *Make a Map from a Trip*

Description

Make a Map from a Trip

Usage

```
map_trip(trip, method = "leaflet")
```

Arguments

trip   A trip response from `valhallr::route()`.

method   Which mapping service to use. Defaults to leaflet; also can use ggplot.

Value

A map object, either leaflet or ggplot.

Examples

```
## Not run:
  library(valhallr)
  # set up origin and destination data
  from <- test_data("uottawa")
  to <- test_data("cdntirecentre")

  # calculate the trip
  trip <- route(from = from, to = to)

  # show overall trip information
  print_trip(trip, all_details = FALSE)

  # make an interactive map of the trip using the leaflet package
  map_trip(trip, method = "leaflet")

## End(Not run)
```

---

od_table *Generate Tidy Origin-Destination Data using Valhalla*

Description

This function creates a tidy (i.e. long) table of origin-destination trip data using the Valhalla routing engine. For a set of o origins and d destinations, it returns a tibble with (o x d) rows with the travel distance and time between each pair. It can handle several different travel modes and routing options.

This function is a user-friendly wrapper around `valhalla::sources_to_targets()`, which calls the Valhalla API directly. `sources_to_targets()` offers finer- grained control over API options, and so this latter function may be more useful for advanced users.

Notable features of `od_matrix()`:

- You can specify human-readable indices with `from_id_col` and `to_id_col`. (Valhalla's API only returns zero-indexed integer identifiers.)

- You can specify a `batch_size` to break computation into several smaller API calls, to prevent your Valhalla instance from running out of memory. This seems especially important for pedestrian routing, where I've sometimes needed to use a batch size as small as 5.

Usage

```
od_table(
  froms,
  from_id_col,
  tos,
  to_id_col,
  costing = "auto",
  batch_size = 100,
  minimum_reachability = 500,
  verbose = FALSE,
  hostname = "localhost",
  port = 8002
)
```

Arguments

`froms`	A tibble containing origin locations in columns named `lat` and `lon`, and an optional column with human-readable names.
`from_id_col`	The name of the column in `froms` that contains human-readable names.
`tos`	A tibble containing destination locations in columns named `lat` and `lon`, and an optional column with human-readable names.
`to_id_col`	The name of the column in `tos` that contains human-readable names.
`costing`	The travel costing method: at present "auto", "bicycle", and "pedestrian" are supported.

batch_size	The number of origin points to process per API call.
minimum_reachability	
	The minimum number of nodes a candidate network needs to have before it is included. Try increasing this value (e.g. to 500) if Valhalla is getting stuck in small disconnected road networks.
verbose	Boolean. Defaults to FALSE. If TRUE, it will provide updates on on the batching process (if applicable).
hostname	Hostname or IP address of your Valhalla instance. Defaults to "localhost".
port	The port your Valhalla instance is monitoring. Defaults to 8002.

Value

A tibble showing the trip distances and times from each origin to each named destination.

Examples

```
## Not run:
library(dplyr)
library(valhallr)
# set up our inputs
origins <- bind_rows(test_data("parliament"), test_data("uottawa"), test_data("cntower"))
destinations <- bind_rows(test_data("cdntirecentre"), test_data("parliament"))

# generate a tidy origin-destination table
od <- od_table (froms = origins,
                from_id_col = "name",
                tos = destinations,
                to_id_col = "name",
                costing = "auto",
                batch_size = 100,
                minimum_reachability = 500)

## End(Not run)
```

---

print_trip	*Print Trip Summary and Turn-By-Turn Directions*

Description

Print Trip Summary and Turn-By-Turn Directions

Usage

```
print_trip(trip, all_details = FALSE)
```

Arguments

`trip`	A trip response from `valhallr::route()`.
`all_details`	Boolean. Should we print each turn-by-turn instruction along with an overall summary?

Value

The input `trip` object, invisibly.

Examples

```
## Not run:
  library(valhallr)
  # set up origin and destination data
  from <- test_data("uottawa")
  to <- test_data("cdntirecentre")

  # calculate the trip
  trip <- route(from = from, to = to)

  # show overall trip information
  print_trip(trip, all_details = FALSE)

  # make an interactive map of the trip using the leaflet package
  map_trip(trip, method = "leaflet")

## End(Not run)
```

---

route   *Point-to-Point Routing with Valhalla*

Description

This function calls Valhalla's `route` API to return turn-by-turn directions from one origin to one destination. Several costing methods are supported, and there are parameters that let you give custom options to Valhalla. **Please note that this function requires access to a running instance of Valhalla.**

Usage

```
route(
  from = NA,
  to = NA,
  costing = "auto",
  unit = "kilometers",
  from_search_filter = list(max_road_class = "motorway", min_road_class =
    "residential"),
 to_search_filter = list(max_road_class = "motorway", min_road_class = "residential"),
```

```
  minimum_reachability = 50,
  costing_options = list(),
  hostname = "localhost",
  port = 8002
)
```

Arguments

`from`	A tibble containing one origin location in columns named `lat` and `lon`.
`to`	A tibble containing one destination location in columns named `lat` and `lon`.
`costing`	The travel costing method. Values "auto", "bicycle", and "pedestrian" all work.
`unit`	Distance measurement units. Defaults to "kilometres".
`from_search_filter`	
	A named list of options provided to Valhalla API. Defaults set a maximum road class ("motorway", the highest) and minimum road class ("residential", which is one above the lowest, "service_other"). See API documentation for details.
`to_search_filter`	
	A named list of options provided to Valhalla API. Defaults set a maximum road class ("motorway", the highest) and minimum road class ("residential", which is one above the lowest, "service_other"). See API documentation for details.
`minimum_reachability`	
	The minimum number of nodes a candidate network needs to have before it is included. Try increasing this value (e.g. to 500) if Valhalla is getting stuck in small disconnected road networks.
`costing_options`	
	A named list of options provided to the Valhalla API that affect route costing, e.g. willingness to travel on highways or through alleys. See API documentation for details.
`hostname`	Hostname or IP address of your Valhalla instance. Defaults to "localhost".
`port`	The port your Valhalla instance is monitoring. Defaults to 8002.

Details

For more details, please check the Valhalla API documentation here:

- https://valhalla.readthedocs.io/en/latest/api/turn-by-turn/api-reference/

Value

A trip object.

Examples

```
## Not run:
  library(valhallr)
  # set up origin and destination data
  from <- test_data("uottawa")
  to <- test_data("cdntirecentre")
```

```
    # calculate the trip
    trip <- route(from = from, to = to)

    # show overall trip information
    print_trip(trip, all_details = FALSE)

    # make an interactive map of the trip using the leaflet package
    map_trip(trip, method = "leaflet")

  ## End(Not run)
```

---

sources_to_targets   *Source-to-Targets Origin/Destination Matrices with Valhalla*

Description

This function creates a tidy (i.e. long) table of origin-destination trip data using the Valhalla routing engine. For a set of o origins and d destinations, it returns a tibble with (o x d) rows with the travel distance and time between each pair. It can handle several different travel modes and routing options. **Please note that this function requires access to a running instance of Valhalla.**

This function provides fine-grained control over Valhalla's API options.

  • For a user-friendly function, see the function valhallr::od_table().

  • For details about the API, see Valhalla's documentation here: https://valhalla.readthedocs.io/en/latest/api/matrix/api-reference/

Usage

```
sources_to_targets(
  froms,
  tos,
  costing = "auto",
  from_search_filter = list(max_road_class = "motorway", min_road_class =
    "residential"),
  to_search_filter = list(max_road_class = "motorway", min_road_class = "residential"),
  minimum_reachability = 50,
  costing_options = list(),
  hostname = "localhost",
  port = 8002
)
```

Arguments

froms	A tibble containing origin locations in columns named lat and lon.
tos	A tibble containing destination locations in columns named lat and lon.

costing   The travel costing method: at present "auto", "bicycle", and "pedestrian" are
                  supported.

from_search_filter

                  A named list of options provided to Valhalla API. Defaults set a maximum road
                  class ("motorway", the highest) and minimum road class ("residential", which
                  is one above the lowest, "service_other"). See API documentation for details.

to_search_filter

                  A named list of options provided to Valhalla API. Defaults set a maximum road
                  class ("motorway", the highest) and minimum road class ("residential", which
                  is one above the lowest, "service_other"). See API documentation for details.

minimum_reachability

                  The minimum number of nodes a candidate network needs to have before it is
                  included. Try increasing this value (e.g. to 500) if Valhalla is getting stuck in
                  small disconnected road networks.

costing_options

                  A named list of options provided to the Valhalla API that affect route costing,
                  e.g. willingness to travel on highways or through alleys. See API documentation
                  for details.

hostname   Hostname or IP address of your Valhalla instance. Defaults to "localhost".

port   The port your Valhalla instance is monitoring. Defaults to 8002.

Value

A tibble showing the trip distances and times from each origin to each destination.

Examples

```
## Not run:
# NOTE: Assumes an instance of Valhalla is running on localhost:8002.
library(dplyr)
library(valhallr)
froms <- bind_rows(test_data("parliament"), test_data("uottawa"))
tos <- bind_rows(test_data("cdntirecentre"), test_data("parliament"))
st <- sources_to_targets(froms, tos)

## End(Not run)
```

---

test_data   *Get Lat/Lon Coordinates for Testing*

Description

This function gives quick access to lat/lon coordinates for a few points around Ontario for testing
and benchmarking purposes.

Usage

```
test_data(dataset = NA)
```

Arguments

dataset   The name of a test dataset. By default, and if an unknown input is given, it
                       returns all values.

Value

A tibble with one or more location names, latitudes, and longitudes.

Index