Package ‘basemaps’
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Description A lightweight package to access spatial basemaps from open sources such as 'OpenStreetMap', 'Carto', 'Mapbox' and others in R.
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basemap

Get a spatial basemap

Description

These functions (down)load and cache a basemap of a defined extent ext, map_service and map_type and return it as an object of the defined class. Alternatively to defining the following arguments, set_defaults can be used to define basemap preferences once for the running session.

Usage

```r
basemap(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  class = "plot",
  force = FALSE,
  ...
  verbose = TRUE
)
```

```
basemap_plot(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ...
  verbose = TRUE
)
```

```
basemap_magick(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ...
  verbose = TRUE
)
```
basemap.png(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ..., 
  verbose = TRUE
)

basemap_geotif(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ..., 
  verbose = TRUE
)

basemap_terra(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ..., 
  verbose = TRUE
)

basemap_raster(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ..., 
  verbose = TRUE
)
basemap_stars(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ...
  verbose = TRUE
)

basemap_ggplot(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ...
  verbose = TRUE
)

basemap_gglayer(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ...
  verbose = TRUE
)

basemap_mapview(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL,
  force = NULL,
  ...
  verbose = TRUE
)
Arguments

- **ext**: extent to be covered by the basemap as any spatial class supported by \texttt{st_bbox}.
- **map_service**: character, a map service, either "osm", "carto" or "mapbox". Default is "osm".
- **map_type**: character, a map type, e.g. "streets". For a full list of available map types, see \texttt{get_maptypes}.
- **map_res**: numeric, resolution of base map in range from 0 to 1.
- **map_token**: character, authentication token for services that require registration, which are "osm_stamen", "osm_stadia", "osm_thunderforest" and "mapbox". Register at \texttt{https://stadiamaps.com/} (for stamen and stadia), \texttt{https://www.thunderforest.com/} and/or \texttt{https://www.mapbox.com/} to get tokens. Ignored for all other map services.
- **map_dir**: character, cache directory where downloaded basemap tiles will be stored. By default, a temporary directory is used, which is destroyed when the session is terminated.
- **class**: character, output class, either either \texttt{plot} (default), \texttt{magick}, \texttt{png}, \texttt{geotif} or if suggested packages are installed, \texttt{terra}, \texttt{raster}, \texttt{stars}, \texttt{ggplot}, \texttt{gglayer} or \texttt{mapview}.
- **force**: logical, whether to force download over cached files or not. Default is \texttt{FALSE}.
- **...**: additional arguments, including
  - **browse**, logical, for \texttt{class = "png"} and interactive sessions only. Whether to open the png file in the system’s default PNG viewer or not. Default is \texttt{TRUE}.
  - **col**, character vector of colours for transforming single-layer basemaps into RGB, if \texttt{class = "png"} or \texttt{class = "magick"}. Default is \texttt{topo.colors(25)}.
  - **dpi**, numeric vector of length 1 or 2 specifying the resolution of the image in DPI (dots per inch) for x and y (in that order) - it is recycled to length 2.
- **verbose**: logical, if \texttt{TRUE}, messages and progress information are displayed on the console (default).

Value

A basemap of the defined class in Web/Pseudo Mercator Projection (EPSG: 3857)

Note

See \texttt{get_maptypes} for available map services and their sources.

The use of the map services "osm_thunderforest" and "mapbox" require registration to obtain an API token/key which can be supplied to \texttt{map_token}. Register at \texttt{https://www.thunderforest.com/} and/or \texttt{https://www.mapbox.com/} to get a token.

Examples

library(basemaps)

# example extent
data(ext)

# view all available maps
get_maptypes()

# set defaults for the basemap
set_defaults(map_service = "osm", map_type = "terrain_bg")

# for "osm_stamen", "osm_stadia", osm "thunderforest" and "mapbox" maps, you need a API token.
# Register for free at stadiamaps.com, thunderforest.com and mapbox.com to get tokens.

## Not run:
# load and return basemap map as raster (default)
map <- basemap(ext)

# or explicitly as different classes such as:
basemap_magick(ext)
basemap_raster()
basemap_stars()

# or as files:
basemap_geotif()
basemap_png()

# or as plots:
basemap_plot(ext)
basemap_mapview()

# including ggplot2:
basemap_ggplot(ext)

# or as ggplot2 layer:
library(ggplot2)
   ggplot() +
     basemap_gglayer(ext) +
     scale_fill_identity() +
     coord_sf()

# or, when combined with an sf vector object,
# make sure to use Web/Pseudo Mercator (EPSG 3857), as this is
# the CRS in which all basemaps are returned (see "Value"):
library(sf)
ext <- st_transform(ext, crs = st_crs(3857))
   ggplot() +
     basemap_gglayer(ext) +
     geom_sf(data = ext, color = "red", fill = "transparent") +
     coord_sf() +
     scale_fill_identity()

## End(Not run)
**Description**

This function flushes the basemaps cache and thereby removes all previously queried and/or composited products from the map directories (temporary or user-defined using the argument map_dir) used during the current session.

**Usage**

```r
flush_cache()
```

**Value**

None.

**Examples**

```r
library(basemaps)
flush_cache()
```

---

<table>
<thead>
<tr>
<th>data</th>
<th>Example extent</th>
</tr>
</thead>
</table>

**Description**

The example datasets contain the sf objects `ext` and `ext_eur` that can be used to call `basemap` and the associated functions.

**Usage**

```r
data(ext)
data(ext_eur)
```

**Format**

- sf object
  
  An object of class `sf` (inherits from `data.frame`) with 1 rows and 3 columns.
**Description**

These functions set, get or reset the defaults of all map arguments passed to `basemap` and associated functions.

**Usage**

```r
defaults$set_defaults(
  ext = NULL,
  map_service = NULL,
  map_type = NULL,
  map_res = NULL,
  map_token = NULL,
  map_dir = NULL
)
defaults$get_defaults()
defaults$reset_defaults()
```

**Arguments**

- **ext**
  - extent to be covered by the basemap as any spatial class supported by `st_bbox`.
- **map_service**
  - character, a map service, either "osm", "carto" or "mapbox". Default is "osm".
- **map_type**
  - character, a map type, e.g. "streets". For a full list of available map types, see `get_maptypes`.
- **map_res**
  - numeric, resolution of base map in range from 0 to 1.
- **map_token**
  - character, authentication token for services that require registration, which are "osm_stamen", "osm_stadia", "osm_thunderforest" and "mapbox". Register at [https://stadiamaps.com/](https://stadiamaps.com/) (for stamen and stadia), [https://www.thunderforest.com/](https://www.thunderforest.com/) and/or [https://www.mapbox.com/](https://www.mapbox.com/) to get tokens. Ignored for all other map services.
- **map_dir**
  - character, cache directory where downloaded basemap tiles will be stored. By default, a temporary directory is used, which is destroyed when the session is terminated.

**Value**

- For `get_defaults`, a list of defaults, otherwise none.
Examples

library(basemaps)
data(ext)

# set defaults for the basemap
set_defaults(ext = ext, map_service = "osm", map_type = "terrain_bg")

# get defaults
get_defaults()

## Not run:
# load and return basemap map as raster (default)
map <- basemap()

## End(Not run)

# reset defaults
reset_defaults()

draw_ext

Description

This function lets you draw an extent on an interactive map. It is a simple wrapper around mapedit::drawFeatures() written by Tim Appelhans et al.

Usage

draw_ext()

Value

An sf object

Examples

## Not run:
library(basemaps)

# draw extent interactively
ext <- draw_ext()

# set defaults for the basemap
set_defaults(ext = ext, map_service = "osm", map_type = "terrain_bg")
# for mapbox maps, you need a map_token. Register for free at mapbox.com to get a token

# load and return basemap map as raster (default)
map <- basemap()
## End(Not run)

---

**get_maptypes**

Get all supported map types

### Description

This function returns every supported map type that can be used as input to the `map_type` argument of `set_defaults`, `basemap` or associated functions.

### Usage

```r
get_maptypes(map_service = NULL)
```

### Arguments

- `map_service` character, optional, either "osm", "osm_stamen", "osm_stadia", "osm_thunderforest", "carto", "mapbox" or "esri". Otherwise, a list of map types for both services is returned.

### Value

A character vector of supported map types

### Source

- "osm": Open Street Map contributors (https://www.openstreetmap.org/copyright), Open Topo Map (https://opentopomap.org/), Martin Tesar (http://mtbmap.cz/)
- "osm_stadia": Stadia Maps (https://stadiamaps.com/), Open Street Map contributors (https://www.openstreetmap.org/copyright)
- "osm_thunderforest": Thunderforest (https://www.thunderforest.com/), Open Street Map contributors (https://www.openstreetmap.org/copyright)
- "carto": Carto (https://carto.com/)
- "mapbox": Mapbox (https://www.mapbox.com)

### See Also

basemap
Examples

# for all services
get_maptypes()

# for osm only
get_maptypes("osm")
# or
get_maptypes()$osm

# for mapbox only
get_maptypes("mapbox")
# or
get_maptypes()$mapbox

# same for all other map services

plot

Plot raster objects using ggplot

Description

This function plots objects of class SpatRaster, RasterLayer, RasterBrick or RasterStack as ggplot2. It is used internally by basemap* functions that return ggplot plots.

Usage

gg_raster(r, r_type = "RGB", gglayer = F, ...)

Arguments

- **r**: raster of class SpatRaster, RasterLayer, RasterBrick or RasterStack.
- **r_type**: character, either "gradient" or "discrete".
- **gglayer**: logical, if FALSE (default), a ggplot2 plot is returned, if TRUE, a ggplot2 layer is returned.
- **...**: additional arguments, including
  - maxpixels, numeric, maximum number of pixels to be plotted (default: 500000)
  - alpha, numeric between 0 and 1, alpha value of the plotted data (transparency).
  - maxColorValue, numeric, the value to use as colour maximum.
  - interpolate, logical, whether to smooth the plot (default is TRUE).

Value

A ggplot2 object
Examples

library(basemaps)

# example extent
data(ext)

## Not run:
# raster object: Brick
map <- basemap_raster(ext)

# plotting RasterBrick
gg_raster(map, r_type = "RGB")

## End(Not run)
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