

Package ‘mapsf’

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Title Thematic Cartography

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Description Create and integrate thematic maps in your workflow. This package helps to design various cartographic representations such as proportional symbols, choropleth or typology maps. It also offers several functions to display layout elements that improve the graphic presentation of maps (e.g. scale bar, north arrow, title, labels). 'mapsf' maps 'sf' objects on 'base' graphics.

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URL <https://riatelab.github.io/mapsf/>

BugReports <https://github.com/riatelab/mapsf/issues/>

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mapsf

Package description

Description

Create and integrate thematic maps in your workflow. This package helps to design various cartographic representations such as proportional symbols, choropleth or typology maps. It also offers several functions to display layout elements that improve the graphic presentation of maps (e.g. scale bar, north arrow, title, labels). mapsf maps `sf` objects on base graphics.

A "Get Started" **vignette** contains commented scripts on how to create various maps: `vignette(topic = "mapsf", package = "mapsf")`

Symbology

These functions display cartographic layers.

- `mf_map()` Plot a map
- `mf_label()` Plot labels
- `mf_raster()` Plot a raster
- `mf_graticule()` Plot graticules

Map layout

These functions are dedicated to the map layout design.

- `mf_init()` Initialize a map with a specific extent
- `mf_theme()` Set a theme
- `mf_shadow()` Plot a shadow
- `mf_background()` Plot a background image
- `mf_annotation()` Plot an annotation
- `mf_arrow()` Plot a north arrow
- `mf_credits()` Plot credits
- `mf_layout()` Plot a map layout
- `mf_title()` Plot a title
- `mf_scale()` Plot a scale bar
- `mf_inset_on()` / `mf_inset_off()` Plot an inset
- `mf_worldmap()` Plot a point on a world map
- `mf_legend()` Plot a legend

Utility functions

- `mf_export()` Export a map
- `mf_distr()` Plot a distribution
- `mf_get_links()` Get a link layer from a data.frame of links
- `mf_get_pal()` Get color palettes
- `mf_get_breaks()` Get class intervals
- `mf_get_mtg()` Get the 'mtg' dataset
- `mf_get_ratio()` Get map width and height values

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- [Ian Fellows](#) (No overlap algorithm for labels, from wordcloud package) [copyright holder]
- [Jim Lemon](#) (Arc drawing algorithm for annotations, from plotrix package) [copyright holder]

See Also

Useful links:

- <https://riatelab.github.io/mapsf/>
- Report bugs at <https://github.com/riatelab/mapsf/issues/>

mf_annotation

Plot an annotation

Description

Plot an annotation on a map.

Usage

```
mf_annotation(
  x,
  txt,
  pos = "topright",
  cex = 0.8,
  col_arrow,
  col_txt,
  halo = FALSE,
  bg,
  s = 1,
  ...
)
```

Arguments

x	an sf object with 1 row, a couple of coordinates (c(x, y)) or "interactive"
txt	the text to display
pos	position of the text, one of "topleft", "topright", "bottomright", "bottomleft"
cex	size of the text
col_arrow	arrow color
col_txt	text color
halo	add a halo around the text
bg	halo color
s	arrow size (min=1)
...	further text arguments.

Value

No return value, an annotation is displayed.

Examples

```

mtq <- mf_get_mtg()
mf_map(mtg)
mf_annotation(
  x = c(711167.8, 1614764),
  txt = "Look!\nImportant feature\nhere!",
  pos = "bottomleft", cex = 1.2, font = 2,
  halo = TRUE, s = 1.5
)

mf_annotation(
  x = mtq[20, ],
  txt = "This is less\nimportant",
  cex = .7, font = 3, s = 1.3
)

```

mf_arrow

*Plot a north arrow***Description**

Plot a north arrow.

Usage

```
mf_arrow(pos = "topleft", col, adjust)
```

Arguments

pos	position. It can be one of 'topleft', 'top', 'topright', 'right', 'bottomright', 'bottom', 'bottomleft', 'left', 'interactive' or a vector of two coordinates in map units (c(x, y))
col	arrow color
adjust	object of class sf or sfc used to adjust the arrow to the real north

Value

No return value, a north arrow is displayed.

Examples

```

mtq <- mf_get_mtg()
mf_map(mtg)
mf_arrow(pos = "topright")

```

mf_background *Plot a background image*

Description

Plot a background image on an existing plot

Usage

```
mf_background(filename, ...)
```

Arguments

filename filename of the background image, PNG or JPG/JPEG format.
... further parameters for [rasterImage](#)

Value

No return value, a background image is displayed.

Examples

```
mtq <- mf_get_mtg()
mf_map(mtq, col = NA, border = NA)
mf_background(system.file("img/background.jpg", package = "mapsf"))
mf_map(mtq, lwd = 3, col = NA, border = "white", add = TRUE)
mf_credits(
  txt = "Background photo by Noita Digital on Unsplash",
  col = "white"
)
```

mf_credits *Plot credits*

Description

Plot credits (sources, author, year...).

Usage

```
mf_credits(
  txt = "Source(s) & Author(s)",
  pos = "bottomleft",
  col,
  cex = 0.6,
  font = 3,
  bg = NA
)
```

Arguments

txt	text of the credits, use '\n' to add line breaks
pos	position, one of 'bottomleft', 'bottomright' or 'rightbottom'
col	color
cex	cex of the credits
font	font of the credits
bg	background color

Value

No return value, credits are displayed.

Examples

```
mtq <- mf_get_mtq()
mf_map(mtq)
mf_credits(txt = "Author\nSources - Year")
```

mf_distr

Plot a distribution

Description

This function displays a histogram, a box plot, a strip chart and a density curve on the same plot.

Usage

```
mf_distr(x, nbins, bw)
```

Arguments

x	a numeric variable
nbins	number of bins in the histogram
bw	bandwidth of the density curve

Value

The number of bins of the histogram and the bandwidth of the density curve are (invisibly) returned in a list.

Examples

```
(mf_distr(rnorm(1000)))
mf_distr(rbeta(1000, .6, 7))
mf_distr(rbeta(1000, 5, .6))
```

mf_export

*Export a map***Description**

Export a map with the extent of a spatial object.

The map is exported in PNG or SVG format.

If only one of width or height is set, mf_export uses the width/height ratio of x bounding box to find a matching ratio for the export.

Always use add = TRUE in mf_map calls following an mf_export call.

Use dev.off to finish the export (see Examples).

Usage

```
mf_export(
  x,
  filename = "map.png",
  width,
  height,
  res = 96,
  ...,
  expandBB = rep(0, 4),
  theme,
  export = "png"
)
```

Arguments

x	object of class sf, sfc or SpatRaster
filename	path to the exported file. If the file extension is ".png" a png graphic device is opened, if the file extension is ".svg" a svg graphic device is opened.
width	width of the figure (pixels for png, inches for svg)
height	height of the figure (pixels for png, inches for svg)
res	resolution (for png)
...	further parameters for png or svg export
expandBB	fractional values to expand the bounding box with, in each direction (bottom, left, top, right)
theme	apply a theme (deprecated)
export	deprecated

Value

No return value, a map file is initiated (in PNG or SVG format).

Examples

```
mtq <- mf_get_mtq()
(filename <- tempfile(fileext = ".png"))
mf_export(mtq, filename = filename)
mf_map(mtq, add = TRUE)
dev.off()
```

mf_get_breaks	<i>Get class intervals</i>
---------------	----------------------------

Description

A function to classify continuous variables.

Usage

```
mf_get_breaks(x, nbreaks, breaks, k = 1, central = FALSE, ...)
```

Arguments

x	a vector of numeric values. NA and Inf values are not used in the classification.
nbreaks	a number of classes
breaks	a classification method; one of "fixed", "sd", "equal", "pretty", "quantile", "kmeans", "hclust", "bclust", "fisher", "jenks", "dpih", "q6", "geom", "arith", "em" or "msd" (see Details).
k	number of standard deviation for "msd" method (see Details)
central	creation of a central class for "msd" method (see Details)
...	further arguments of classIntervals

Details

"fixed", "sd", "equal", "pretty", "quantile", "kmeans", "hclust", "bclust", "fisher", "jenks" and "dpih" are [classIntervals](#) methods. You may need to pass additional arguments for some of them.

Jenks ("jenks" method) and Fisher ("fisher" method) algorithms are based on the same principle and give quite similar results but Fisher is much faster.

The "q6" method uses the following [quantile](#) probabilities: 0, 0.05, 0.275, 0.5, 0.725, 0.95, 1.

The "geom" method is based on a geometric progression along the variable values, all values must be strictly greater than zero.

The "arith" method is based on an arithmetic progression along the variable values.

The "em" method is based on nested averages computation.

The "msd" method is based on the mean and the standard deviation of a numeric vector. The nbreaks parameter is not relevant, use k and central instead. k indicates the extent of each class in share of standard deviation. If central=TRUE then the mean value is the center of a class else the mean is a break value.

Value

A numeric vector of breaks

Note

This function is mainly a wrapper of `classIntervals` + "arith", "em", "q6", "geom" and "msd" methods.

See Also

[classIntervals](#)

Examples

```
mtq <- mf_get_mtg()
mf_get_breaks(x = mtq$MED, nbreaks = 6, breaks = "quantile")
```

mf_get_links

Get a link layer from a data.frame of links

Description

Create a link layer from a data.frame of links and an sf object.

Usage

```
mf_get_links(x, df, x_id, df_id)
```

Arguments

x	an sf object, a simple feature collection.
df	a data.frame that contains identifiers of starting and ending points.
x_id	name of the identifier variable in x, default to the first column (optional)
df_id	names of the identifier variables in df, character vector of length 2, default to the two first columns. (optional)

Value

An sf object is returned, it is composed of df and the sfc (LINESTRING) of links.

Examples

```
mtq <- mf_get_mtg()
mob <- read.csv(system.file("csv/mob.csv", package = "mapsf"))
# Select links from Fort-de-France (97209)
mob_97209 <- mob[mob$i == 97209, ]
# Create a link layer
mob_links <- mf_get_links(x = mtq, df = mob_97209)
# Plot the links
mf_map(mtg)
mf_map(mob_links, col = "red4", lwd = 2, add = TRUE)
```

mf_get_mtg

Get the 'mtg' dataset

Description

Import the mtg dataset (Martinique municipalities).

Usage

```
mf_get_mtg()
```

Details

This a wrapper around `st_read(system.file("gpkg/mtg.gpkg", package = "mapsf"), quiet = TRUE)`.

Value

an sf object of Martinique municipalities

Examples

```
mtq <- mf_get_mtg()
```

mf_get_pal

Get color palettes

Description

`mf_get_pal` builds sequential, diverging and qualitative color palettes. Diverging color palettes can be dissymmetric (different number of colors in each of the two gradients).

Usage

```
mf_get_pal(n, palette, alpha = NULL, rev = c(FALSE, FALSE), neutral)
```

Arguments

n	the number of colors (≥ 1) to be in the palette.
palette	a valid palette name (one of <code>hcl.pals()</code>). The name is matched to the list of available palettes, ignoring upper vs. lower case, spaces, dashes, etc. in the matching.
alpha	an alpha-transparency level in the range [0,1] (0 means transparent and 1 means opaque), see argument alpha in <code>hsv</code> and <code>hcl</code> , respectively.
rev	logical indicating whether the ordering of the colors should be reversed.
neutral	a color, if two gradients are used, the 'neutral' color can be added between them.

Details

See [hcl.pals](#) to get available palette names. If two gradients are used, the 'neutral' color can be added between them.

Value

A vector of colors.

Examples

```
cols <- mf_get_pal(n = 10, pal = "Reds 2")
plot(1:10, rep(1, 10), bg = cols, pch = 22, cex = 4)
cols <- mf_get_pal(n = c(3, 7), pal = c("Reds 2", "Greens"))
plot(1:10, rep(1, 10), bg = cols, pch = 22, cex = 4)
cols <- mf_get_pal(n = c(5, 5), pal = c("Reds 2", "Greens"))
plot(1:10, rep(1, 10), bg = cols, pch = 22, cex = 4)
cols <- mf_get_pal(n = c(7, 3), pal = c("Reds 2", "Greens"))
plot(1:10, rep(1, 10), bg = cols, pch = 22, cex = 4)
cols <- mf_get_pal(
  n = c(5, 5), pal = c("Reds 2", "Greens"),
  neutral = "grey"
)
plot(1:11, rep(1, 11), bg = cols, pch = 22, cex = 4)
opar <- par(bg = "black")
cols <- mf_get_pal(
  n = c(7, 3), pal = c("Reds 2", "Greens"),
  alpha = c(.3, .7)
)
plot(1:10, rep(1, 10), bg = cols, pch = 22, cex = 4)
par(opar)
cols <- mf_get_pal(
  n = c(5, 5), pal = c("Reds 2", "Greens"),
  rev = c(TRUE, TRUE)
)
plot(1:10, rep(1, 10), bg = cols, pch = 22, cex = 4)
```

`mf_get_ratio`*Get map width and height values*

Description

This function is to be used to get width and height values for maps created in reports (*.Rmd, *.qmd).

It uses the width / height ratio of a spatial object bounding box to find a matching ratio for the map. If width is specified, then height is deduced from the width / height ratio of x, figure margins and title size.

If height is specified, then width is deduced from the width / height ratio of x, figure margins and title size.

Usage

```
mf_get_ratio(  
  x,  
  width,  
  height,  
  res = 96,  
  expandBB = rep(0, 4),  
  theme = mf_theme()  
)
```

Arguments

<code>x</code>	object of class <code>sf</code> , <code>sfc</code> or <code>SpatRaster</code>
<code>width</code>	width of the figure (inches), use only one of width or height
<code>height</code>	height of the figure (inches), use only one of width or height
<code>res</code>	resolution
<code>expandBB</code>	fractional values to expand the bounding box with, in each direction (bottom, left, top, right)
<code>theme</code>	theme used for the map

Value

Width and height are returned in inches.

Examples

```
mtq <- mf_get_mtg()  
mf_get_ratio(x = mtq, width = 5)
```

mf_graticule	<i>Plot graticules</i>
--------------	------------------------

Description

Display graticules and labels on a map.

Usage

```
mf_graticule(
  x,
  col = col,
  lwd = 1,
  lty = 1,
  expandBB = rep(0, 4),
  label = TRUE,
  pos = c("top", "left"),
  cex = 0.7,
  add = TRUE
)
```

Arguments

x	object of class sf, sfc or SpatRaster
col	graticules and label color
lwd	graticules line width
lty	graticules line type
expandBB	fractional values to expand the bounding box with, in each direction (bottom, left, top, right)
label	whether to add labels (TRUE) or not (FALSE)
pos	labels positions ("bottom", "left", "top" and / or "right")
cex	labels size
add	whether to add the layer to an existing plot (TRUE) or not (FALSE)

Value

An (invisible) layer of graticules is returned (LINESTRING).

Use of graticules

From [st_graticule](#): "In cartographic visualization, the use of graticules is not advised, unless the graphical output will be used for measurement or navigation, or the direction of North is important for the interpretation of the content, or the content is intended to display distortions and artifacts created by projection. Unnecessary use of graticules only adds visual clutter but little relevant information. Use of coastlines, administrative boundaries or place names permits most viewers of the output to orient themselves better than a graticule."

Examples

```

mtq <- mf_get_mtg()
mf_map(mtg, expandBB = c(0, .1, .1, 0))
mf_graticule(mtg)

mf_graticule(
  x = mtq,
  col = "coral4",
  lwd = 2,
  lty = 2,
  expandBB = c(.1, 0, 0, .1),
  label = TRUE,
  pos = c("right", "bottom"),
  cex = .8,
  add = FALSE
)
mf_map(mtg, add = TRUE)

```

mf_init

*Initialize a map with a specific extent***Description**

Plot an invisible layer with the extent of a spatial object.

Always use `add = TRUE` in `mf_map` calls following an `mf_init` call. This function is similar to `mf_map(x, col = NA, border = NA)`.

Usage

```
mf_init(x, expandBB = rep(0, 4), theme)
```

Arguments

<code>x</code>	object of class <code>sf</code> , <code>sfc</code> or <code>SpatRaster</code>
<code>expandBB</code>	fractional values to expand the bounding box with, in each direction (bottom, left, top, right)
<code>theme</code>	apply a theme (deprecated)

Value

No return value, a map is initiated.

Examples

```

mtq <- mf_get_mtg()
target <- mtq[30, ]
mf_init(target)
mf_map(mtg, add = TRUE)

```

mf_inset_on	<i>Plot an inset</i>
-------------	----------------------

Description

This function is used to add an inset map to the current map.

Usage

```
mf_inset_on(x, pos = "topright", cex = 0.2, fig)
```

```
mf_inset_off()
```

Arguments

x	an sf object, or "worldmap" to use with mf_worldmap .
pos	position, one of "bottomleft", "left", "topleft", "top", "bottom", "bottomright", "right", "topright"
cex	share of the map width occupied by the inset
fig	coordinates of the inset region (in NDC, see in ?par())

Details

If x is used (with pos and cex), the width/height ratio of the inset will match the width/height ratio of x bounding box.

If fig is used, coordinates (xmin, xmax, ymin, ymax) are expressed as fractions of the mapping space (i.e. excluding margins).

If map layers have to be plotted after the inset (i.e after mf_inset_off()), please use add = TRUE.

It is not possible to plot an inset within an inset.

It is possible to plot anything (base plots) within the inset, not only map layers.

Value

No return value, an inset is initiated or closed.

Note

This function does not work when mfrow is used in par().

Examples

```
mtq <- mf_get_mtq()
mf_map(mtq)
mf_inset_on(x = mtq[1, ], cex = .2)
mf_map(mtq[1, ])
mf_inset_off()
```



```
mf_map(mtg)
mf_inset_on(x = "worldmap", pos = "bottomleft")
mf_worldmap(x = mtg)
mf_inset_off()

mf_map(mtg)
mf_inset_on(fig = c(0, 0.25, 0, 0.25))
mf_map(x = mtg)
mf_inset_off()
```

mf_label

Plot labels

Description

Put labels on a map.

Usage

```
mf_label(
  x,
  var,
  col,
  cex = 0.7,
  overlap = TRUE,
  lines = TRUE,
  halo = FALSE,
  bg,
  r = 0.1,
  q = 1,
  ...
)
```

Arguments

x	object of class <code>sf</code>
var	name(s) of the variable(s) to plot
col	labels color, it can be a single color or a vector of colors
cex	labels cex, it can be a single size or a vector of sizes
overlap	if FALSE, labels are moved so they do not overlap.
lines	if TRUE, then lines are plotted between x,y and the word, for those words not covering their x,y coordinate
halo	if TRUE, a 'halo' is displayed around the text and additional arguments <code>bg</code> and <code>r</code> can be modified to set the color and width of the halo.
bg	halo color, it can be a single color or a vector of colors

r	width of the halo, it can be a single value or a vector of values
q	quality of the non overlapping labels placement. Possible values are 0 (quick results), 1 (reasonable quality and speed), 2 (better quality), 3 (insane quality, can take a lot of time).
...	further text arguments.

Value

No return value, labels are displayed.

Examples

```
mtq <- mf_get_mtg()
mf_map(mtg)
mtq$cex <- c(rep(.8, 8), 2, rep(.8, 25))
mf_label(
  x = mtq, var = "LIBGEO",
  col = "grey10", halo = TRUE, cex = mtq$cex,
  overlap = FALSE, lines = FALSE
)
```

mf_layout

Plot a map layout

Description

Plot a map layout (title, credits, scalebar, north arrow, frame).

This function uses [mf_title](#), [mf_credits](#), [mf_scale](#) and [mf_arrow](#) with default values.

Usage

```
mf_layout(
  title = "Map Title",
  credits = "Authors & Sources",
  scale = TRUE,
  arrow = TRUE,
  frame = FALSE
)
```

Arguments

title	title of the map
credits	credits
scale	display a scale bar
arrow	display an arrow
frame	display a frame

Value

No return value, a map layout is displayed.

Examples

```
mtq <- mf_get_mtq()
mf_map(mtq)
mf_layout()
```

mf_legend

Plot a legend

Description

Plot different types of legend. The "type" argument defines the legend type. Please note that some arguments are available for all types of legend and some others are only relevant for specific legend types (see Details). `mf_legend()` is a wrapper for `maplegend::leg()`.

Usage

```
mf_legend(
  type,
  val,
  pos = "left",
  pal = "Inferno",
  col = "tomato4",
  inches = 0.3,
  symbol = "circle",
  self_adjust = FALSE,
  lwd = 0.7,
  border = "#333333",
  pch = seq_along(val),
  cex = rep(1, length(val)),
  title = "Legend Title",
  title_cex = 0.8 * size,
  val_cex = 0.6 * size,
  val_rnd = 0,
  col_na = "white",
  cex_na = 1,
  pch_na = 4,
  no_data = FALSE,
  no_data_txt = "No Data",
  box_border = "#333333",
  box_cex = c(1, 1),
  horiz = FALSE,
  frame_border,
  frame = FALSE,
```

```

    bg,
    fg,
    size = 1,
    return_bbox = FALSE,
    adj = c(0, 0),
    pt_pch,
    pt_cex,
    pt_cex_na,
    pt_pch_na
  )

```

Arguments

type	type of legend: <ul style="list-style-type: none"> • prop for proportional symbols, • choro for choropleth maps, • cont for continuous maps (e.g. raster), • typo for typology maps, • symb for symbols maps, • prop_line for proportional lines maps, • grad_line for graduated lines maps.
val	vector of value(s) (for "prop" and "prop_line", at least c(min, max) for "cont"), vector of categories (for "symb" and "typo"), break labels (for "choro" and "grad_line").
pos	position of the legend. It can be one of 'topleft', 'top', 'topright', 'right', 'bottomright', 'bottom', 'bottomleft', 'left', 'interactive' or a vector of two coordinates in map units (c(x, y)).
pal	a color palette name or a vector of colors
col	color of the symbols (for "prop") or color of the lines (for "prop_line" and "grad_line")
inches	size of the largest symbol (radius for circles, half width for squares) in inches
symbol	type of symbols, 'circle' or 'square'
self_adjust	if TRUE values are self-adjusted to keep min, max and intermediate rounded values
lwd	width(s) of the symbols borders (for "prop" and "symb"), width of the largest line (for "prop_line"), vector of line width (for "grad_line")
border	symbol border color(s)
pch	type(s) of the symbols (0:25)
cex	size(s) of the symbols
title	title of the legend
title_cex	size of the legend title
val_cex	size of the values in the legend
val_rnd	number of decimal places of the values in the legend

col_na	color for missing values
cex_na	size of the symbols for missing values
pch_na	type of the symbols for missing values
no_data	if TRUE a "missing value" box is plotted
no_data_txt	label for missing values
box_border	border color of legend boxes
box_cex	width and height size expansion of boxes, (or offset between circles for "prop" legends with horiz = TRUE)
horiz	if TRUE plot an horizontal legend
frame_border	border color of the frame
frame	if TRUE the legend is plotted within a frame
bg	background color of the legend
fg	foreground color of the legend
size	size of the legend; 2 means two times bigger
return_bbox	return only bounding box of the legend. No legend is plotted.
adj	adjust the position of the legend in x and y directions
pt_pch	deprecated
pt_cex	deprecated
pt_cex_na	deprecated
pt_pch_na	deprecated

Details

Some arguments are available for all types of legend: val, pos, title, title_cex, val_cex, frame, bg, fg, size, adj, return_bbox).

Relevant arguments for each specific legend types:

- leg(type = "prop", val, inches, symbol, col, lwd, border, val_rnd, self_adjust, horiz)
- leg(type = "choro", val, pal, val_rnd, col_na, no_data, no_data_txt, box_border, horiz)
- leg(type = "cont", val, pal, val_rnd, col_na, no_data, no_data_txt, box_border, horiz)
- leg(type = "typo", val, pal, col_na, no_data, no_data_txt, box_border)
- leg(type = "symb", val, pal, pch, cex, lwd, pch_na, cex_na, col_na, no_data, no_data_txt)
- leg(type = "prop_line", val, col, lwd, val_rnd)
- leg(type = "grad_line", val, col, lwd, val_rnd)

Value

No value is returned, a legend is displayed (except if return_bbox is used).

Examples

```

mtq <- mf_get_mtq()
mf_map(mtq)
mf_legend(type = "prop", pos = "topright", val = c(1, 5, 10), inches = .3)
mf_legend(
  type = "choro", pos = "bottomright", val = c(10, 20, 30, 40, 50),
  pal = hcl.colors(4, "Reds 2")
)
mf_legend(
  type = "typo", pos = "topleft", val = c("A", "B", "C", "D"),
  pal = hcl.colors(4, "Dynamic")
)
mf_legend(
  type = "symb", pos = "bottomleft", val = c("A", "B", "C"),
  pch = 21:23, cex = c(1, 2, 2),
  pal = hcl.colors(3, "Dynamic")
)
mf_legend(
  type = "grad_line", pos = "top", val = c(1, 2, 3, 4, 10, 15),
  lwd = c(0.2, 2, 4, 5, 10)
)
mf_legend(type = "prop_line", pos = "bottom", lwd = 20, val = c(5, 50, 100))

```

mf_map

*Plot a map***Description**

This is the main function of the package. `mf_map()` can be used to plot all types of maps. The three main arguments are: `x` (sf object), `var` (variable to map), and `type` (map type). Relevant arguments and default values for each map types are detailed in specific functions, see [Details](#).

Usage

```

mf_map(
  x,
  var,
  type = "base",
  breaks,
  nbreaks,
  pal,
  alpha,
  rev,
  inches,
  val_max,
  symbol,
  col,

```

```

    lwd_max,
    val_order,
    pch,
    cex,
    border,
    lwd,
    col_na,
    cex_na,
    pch_na,
    expandBB,
    add,
    leg_pos,
    leg_title,
    leg_title_cex,
    leg_val_cex,
    leg_val_rnd,
    leg_no_data,
    leg_frame,
    leg_frame_border,
    leg_horiz,
    leg_adj,
    leg_bg,
    leg_fg,
    leg_size,
    leg_border,
    leg_box_border,
    leg_box_cex,
    ...
)

```

Arguments

x	object of class sf or sfc
var	name(s) of the variable(s) to plot
type	<ul style="list-style-type: none"> • base: base maps • prop: proportional symbols maps • choro: choropleth maps • typo: typology maps • symb: symbols maps • grad: graduated symbols maps • prop_choro: proportional symbols maps with symbols colors based on a quantitative data classification • prop_typo: proportional symbols maps with symbols colors based on qualitative data • symb_choro: symbols maps with symbols colors based on a quantitative data classification

breaks	either a numeric vector with the actual breaks, or a classification method name (see mf_get_breaks and Details)
nbreaks	number of classes
pal	a set of colors or a palette name (from hcl.colors)
alpha	if pal is a hcl.colors palette name, the alpha-transparency level in the range [0,1]
rev	if pal is a hcl.colors palette name, whether the ordering of the colors should be reversed (TRUE) or not (FALSE)
inches	size of the biggest symbol (radius for circles, half width for squares) in inches.
val_max	maximum value used for proportional symbols
symbol	type of symbols, 'circle' or 'square'
col	color
lwd_max	line width of the largest line
val_order	values order, a character vector that matches var modalities
pch	point type
cex	point size
border	border color
lwd	border width
col_na	color for missing values
cex_na	cex (point size) for NA values
pch_na	pch (point type) for NA values
expandBB	fractional values to expand the bounding box with, in each direction (bottom, left, top, right)
add	whether to add the layer to an existing plot (TRUE) or not (FALSE)
leg_pos	position of the legend, one of 'topleft', 'top', 'topright', 'right', 'bottomright', 'bottom', 'bottomleft', 'left' or a vector of two coordinates in map units (c(x, y)). If leg_pos = NA then the legend is not plotted. If leg_pos = 'interactive' click on the map to choose the legend position.
leg_title	legend title
leg_title_cex	size of the legend title
leg_val_cex	size of the values in the legend
leg_val_rnd	number of decimal places of the values in the legend
leg_no_data	label for missing values
leg_frame	whether to add a frame to the legend (TRUE) or not (FALSE)
leg_frame_border	border color of the legend frame
leg_horiz	display the legend horizontally (for proportional symbols and choropleth types)
leg_adj	adjust the position of the legend in x and y directions
leg_bg	color of the legend background
leg_fg	color of the legend foreground

leg_size	size of the legend; 2 means two times bigger
leg_border	symbol border color(s)
leg_box_border	border color of legend boxes
leg_box_cex	width and height size expansion of boxes
...	further parameters from plot for sfc objects

Details

Relevant arguments, default values and examples for each map types are detailed in specific functions:

- **base**: base maps - [mf_base](#)
- **prop**: proportional symbols maps - [mf_prop](#)
- **choro**: choropleth maps - [mf_choro](#)
- **typo**: typology maps - [mf_typo](#)
- **symb**: symbols maps - [mf_symb](#)
- **grad**: graduated symbols maps - [mf_grad](#)
- **prop_choro**: proportional symbols maps with symbols colors based on a quantitative data classification - [mf_prop_choro](#)
- **prop_typo**: proportional symbols maps with symbols colors based on qualitative data - [mf_prop_typo](#)
- **symb_choro**: symbols maps with symbols colors based on a quantitative data classification - [mf_symb_choro](#)

Breaks defined by a numeric vector or a classification method are left-closed: breaks defined by `c(2, 5, 10, 15, 20)` will be mapped as `[2 - 5[, [5 - 10[, [10 - 15[, [15 - 20]`. The "jenks" method is an exception and has to be right-closed. Jenks breaks computed as `c(2, 5, 10, 15, 20)` will be mapped as `[2 - 5],]5 - 10],]10 - 15],]15 - 20]`.

Value

`x` is (invisibly) returned.

Examples

```
mtq <- mf_get_mtq()
mf_map(mtq)
mf_map(mtq, var = "POP", type = "prop")
mf_map(mtq, var = "MED", type = "choro")
mf_map(mtq, var = "STATUS", type = "typo")
mf_map(mtq)
mf_map(mtq, var = "STATUS", type = "symb")
mf_map(mtq)
mf_map(mtq, var = "POP", type = "grad")
mf_map(mtq)
mf_map(mtq, var = c("POP", "MED"), type = "prop_choro")
mf_map(mtq)
mf_map(mtq, var = c("POP", "STATUS"), type = "prop_typo")
mf_map(mtq)
mf_map(mtq, var = c("STATUS", "MED"), type = "symb_choro")
```

mf_raster

*Plot a raster***Description**

Plot a raster object (SpatRaster from terra).

Usage

```
mf_raster(
  x,
  type,
  nbreaks,
  breaks = "equal",
  val_order,
  pal,
  expandBB = rep(0, 4),
  alpha = 1,
  rev = FALSE,
  leg_pos = "right",
  leg_title = names(x),
  leg_title_cex = 0.8,
  leg_val_cex = 0.6,
  leg_val_rnd = 1,
  leg_frame = FALSE,
  leg_frame_border = getOption("mapsf.fg"),
  leg_horiz = FALSE,
  leg_adj = c(0, 0),
  leg_box_border = "#333333",
  leg_box_cex = c(1, 1),
  leg_fg = getOption("mapsf.fg"),
  leg_bg = getOption("mapsf.bg"),
  leg_size = 1,
  add = FALSE,
  ...
)
```

Arguments

x	a SpatRaster
type	type of raster map, one of "continuous", "classes", or "interval". Default type for a numeric and categorial raster are "continuous" and "classes" respectively.
nbreaks	number of classes
breaks	either a numeric vector with the actual breaks (for type = "continuous" and type = "interval"), or a classification method name (for type = "interval" only; see mf_get_breaks for classification methods)

val_order	values order, a character vector that matches var modalities
pal	a set of colors or a palette name (from hcl.colors)
expandBB	fractional values to expand the bounding box with, in each direction (bottom, left, top, right)
alpha	if pal is a hcl.colors palette name, the alpha-transparency level in the range [0,1]
rev	if pal is a hcl.colors palette name, whether the ordering of the colors should be reversed (TRUE) or not (FALSE)
leg_pos	position of the legend, one of 'topleft', 'top', 'topright', 'right', 'bottomright', 'bottom', 'bottomleft', 'left' or a vector of two coordinates in map units (c(x, y)). If leg_pos = NA then the legend is not plotted. If leg_pos = 'interactive' click on the map to choose the legend position.
leg_title	legend title
leg_title_cex	size of the legend title
leg_val_cex	size of the values in the legend
leg_val_rnd	number of decimal places of the values in the legend
leg_frame	whether to add a frame to the legend (TRUE) or not (FALSE)
leg_frame_border	border color of the legend frame
leg_horiz	display the legend horizontally
leg_adj	adjust the position of the legend in x and y directions
leg_box_border	border color of legend boxes
leg_box_cex	width and height size expansion of boxes
leg_fg	color of the legend foreground
leg_bg	color of the legend background
leg_size	size of the legend; 2 means two times bigger
add	whether to add the layer to an existing plot (TRUE) or not (FALSE)
...	bgalpha, smooth, maxcell or other arguments passed to be passed to plotRGB or plot

Value

x is (invisibly) returned.

Examples

```
if (require("terra")) {
  # multi band
  logo <- rast(system.file("ex/logo.tif", package = "terra"))
  mf_raster(logo)

  # one band
  elev <- rast(system.file("ex/elev.tif", package = "terra"))

  ## continuous
```

```

mf_raster(elev)
mf_raster(elev,
  pal = "Burg", expandBB = c(.2, 0, 0, 0),
  leg_pos = "bottom", leg_horiz = TRUE
)

## continuous with colors and breaks
mf_raster(elev,
  type = "continuous",
  breaks = c(141, 400, 547),
  pal = c("darkseagreen1", "black", "red")
)

## interval
mf_raster(elev,
  type = "interval",
  nbreaks = 5, breaks = "equal", pal = "Teal"
)

## classes
elev2 <- classify(elev, c(140, 400, 450, 549))
lev_elev <- data.frame(ID = 0:2, elevation = c("Low", "High", "Super High"))
levels(elev2) <- lev_elev
mf_raster(elev2)
mf_raster(elev2,
  pal = c("salmon4", "olivedrab", "yellow3"),
  val_order = c("Super High", "High", "Low")
)
}

```

mf_scale

Plot a scale bar

Description

Plot a scale bar.

Usage

```

mf_scale(
  size,
  pos = "bottomright",
  lwd = 1.5,
  cex = 0.6,
  col,
  crs_units = "m",
  scale_units = "km",
  x,
  unit
)

```

Arguments

size	size of the scale bar in scale units (scale_units, default to km). If size is not set, an automatic size is used (1/10 of the map width).
pos	position. It can be one of 'bottomright', 'bottomleft', 'interactive' or a vector of two coordinates in map units (c(x, y)).
lwd	line width of the scale bar
cex	size of the scale bar text
col	color of the scale bar (line and text)
crs_units	units used in the CRS of the currently plotted layer. Possible values are "m" and "ft" (see Details).
scale_units	units used for the scale bar. Can be "mi" for miles, "ft" for feet, "m" for meters, or "km" for kilometers (default).
x	object of class crs, sf or sfc. If set, the CRS of x will be used instead of crs_units to define CRS units.
unit	deprecated, use scale_units instead

Details

Most CRS use the meter as unit. Some US CRS use feet or US survey feet. If unsure of the unit used in the CRS you can use the x argument of the function. Alternatively, you can use `sf::st_crs(zz, parameters = TRUE)$units_gdal` to see which units are used in the zz layer.

This scale bar does not work on unprojected (long/lat) maps.

Value

No return value, a scale bar is displayed.

Examples

```
mtq <- mf_get_mtg()
mf_map(mtq)
mf_scale()

library(sf)
nc <- st_read(system.file("shape/nc.shp", package = "sf"))[1, ]

nc_foot <- st_transform(nc, 2264) # NC state plane, US foot
mf_map(nc_foot)
mf_scale(size = 5, crs_units = "ft", scale_units = "mi")
mf_map(nc_foot)
mf_scale(size = 5, x = nc_foot, scale_units = "mi")

nc_meter <- st_transform(nc, 32119) # NC state plane, m
mf_map(nc_meter)
mf_scale(size = 5, crs_units = "m", scale_units = "mi")
mf_scale(size = 5, crs_units = "m", scale_units = "km", pos = "bottomleft")
```

mf_shadow	<i>Plot a shadow</i>
-----------	----------------------

Description

Plot the shadow of a polygon layer.

Usage

```
mf_shadow(x, col = "grey50", cex = 1, add = FALSE)
```

Arguments

x	an sf or sfc polygon object
col	shadow color
cex	shadow extent
add	whether to add the layer to an existing plot (TRUE) or not (FALSE)

Value

x is (invisibly) returned.

Examples

```
mtq <- mf_get_mtg()
mf_shadow(mtg)
mf_map(mtg, add = TRUE)
```

mf_theme	<i>Set a theme</i>
----------	--------------------

Description

This function set a map theme. The parameters set by this function are the figure margins, background and foreground colors and some [mf_title](#) options. Use `mf_theme(NULL)` or `mf_theme('default')` to reset to default theme settings.

Usage

```
mf_theme(x, bg, fg, mar, tab, pos, inner, line, cex, font)
```

Arguments

x	name of a map theme. One of "default", "brutal", "ink", "dark", "agolalight", "candy", "darkula", "iceberg", "green", "nevermind", "jsk", "barcelona".
bg	background color
fg	foreground color
mar	margins
tab	if TRUE the title is displayed as a 'tab'
pos	title position, one of 'left', 'center', 'right'
inner	if TRUE the title is displayed inside the plot area.
line	number of lines used for the title
cex	cex of the title
font	font of the title

Details

It is also possible to set a custom theme using a list of arguments (see Examples). `mf_theme()` returns the current theme settings.

Value

The (invisible) list of theme parameters is returned.

Examples

```
mtq <- mf_get_mtg()

# Choosing a theme by name:
mf_theme("default")
mf_map(mtq)
mf_title()

# Specifying some values directly:
mf_theme(bg = "darkslategrey", fg = "lightgrey")
mf_map(mtq)
mf_title()

# Using a mix of the above:
mf_theme("brutal", fg = "lightgreen", pos = "center", font = 2, tab = FALSE)
mf_map(mtq)
mf_title()

# Specifying a list with theme values:
theme <- mf_theme("default")
theme$mar <- c(1, 1, 3, 1)
theme$line <- 2
theme$cex <- 1.5
mf_theme(theme)
mf_map(mtq)
```

```

mf_title()

# or
theme <- list(
  bg = "green",
  fg = "red",
  mar = c(2, 2, 2, 2),
  tab = TRUE,
  pos = "center",
  inner = TRUE,
  line = 2,
  cex = 1.5,
  font = 3
)
mf_theme(theme)
mf_map(mtg)
mf_title()

# Obtaining a list of parameters for the current theme:
mf_theme()

# Removing the current theme:
mf_theme(NULL)
# or
mf_theme("default")

```

mf_title

Plot a title

Description

Plot a title

Usage

```
mf_title(txt = "Map Title", pos, tab, bg, fg, cex, line, font, inner)
```

Arguments

txt	title text
pos	position, one of 'left', 'center', 'right'
tab	if TRUE the title is displayed as a 'tab'
bg	background of the title
fg	foreground of the title
cex	cex of the title
line	number of lines used for the title
font	font of the title
inner	if TRUE the title is displayed inside the plot area.

Value

No return value, a title is displayed.

Examples

```
mtq <- mf_get_mtq()
mf_map(mtq)
mf_title()
```

mf_worldmap	<i>Plot a point on a world map</i>
-------------	------------------------------------

Description

Plot a point on a world map.

Usage

```
mf_worldmap(
  x,
  lon,
  lat,
  water_col = "lightblue",
  land_col = "grey60",
  border_col = "grey40",
  border_lwd = 0.8,
  ...
)
```

Arguments

x	object of class sf or sfc
lon	longitude
lat	latitude
water_col	color of the water
land_col	color of the land
border_col	color of the borders
border_lwd	width of the borders
...	further parameters related to the plotted point aspect (cex, pch, col...)

Value

No return value, a world map is displayed.

Note

The main part of the code is stolen from @fzenoni (<https://gist.github.com/fzenoni/ef23faf6d1ada5e4a91c9ef23b0>)

Examples

```
mtq <- mf_get_mtg()
mf_worldmap(mtg)
mf_worldmap(lon = 24, lat = 39)
mf_worldmap(
  lon = 106, lat = 26,
  pch = 4, lwd = 3, cex = 2, col = "tomato4",
  water_col = "#232525", land_col = "#A9B7C6",
  border_col = "white", border_lwd = 1
)
```

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