Package 'OSMscale'

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Title Add a Scale Bar to 'OpenStreetMap' Plots

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Author Berry Boessenkool

Maintainer Berry Boessenkool <berry-b@gmx.de>

Description
Functionality to handle and project lat-long coordinates, easily download background maps and add a correct scale bar to 'OpenStreetMap' plots in any map projection.

Imports OpenStreetMap, berryFunctions (>= 1.15.0), sp

URL https://github.com/brry/OSMscale

License GPL (>= 2)

Encoding UTF-8

RoxygenNote 6.0.1

Suggests testthat

NeedsCompilation no

Repository CRAN

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R topics documented:

`OSMscale-package` *Add a Scalebar to OpenStreetMap Plots*

Description

Functionality to handle and project lat-long coordinates, easily download background maps and add a correct scale bar to 'OpenStreetMap' plots in any map projection. There are some other spatially related miscellaneous functions as well.

Note

Get the most recent code updates at https://github.com/brry/OSMscale

Author(s)

Berry Boessenkool, <berry-b@gmx.de>, June 2016

See Also

scaleBar, pointsMap, projectPoints, mapmisc article at https://journal.r-project.org/archive/2016-1/brown.pdf

Examples

```
 # Not tested on CRAN to avoid download time
d <- read.table(sep=",", header=TRUE, text=
"lat, long
55.685143, 12.580008
52.514464, 13.350137
50.106452, 14.419989
48.847003, 2.337213
51.505364, -0.164752")

# zoom set to 3 to speed up tests. automatic zoom determination is better.
map <- pointsMap(lat, long, data=d, type="maptoolkit-topo",
                 proj=putm(d$long), scale=FALSE, zoom=3, pch=16, col=2)
scaleBar(map, abslen=500, y=0.8, cex=0.8)
lines(projectPoints(d$lat, d$long), col="blue", lwd=2)
```

biketrack *GPS recorded bike track*

Description

My daily bike route, recorded with the app OSMtracker on my Samsung Galaxy S5

Format

'data.frame': 254 obs. of 4 variables:
$ lon : num 13 13 13 13 13 ...
$ lat : num 52.4 52.4 52.4 52.4 52.4 ...
$ time: POSIXct, format: "2016-05-18 07:53:22" "2016-05-18 07:53:23" ...
$ ele : num 66 66 66 67 67 67 68 69 69 69 ....

Source

GPS track export from OSMtracker App

Examples

```
data(biketrack)
plot(biketrack[,1:2])
# see equidistPoints
```

checkLL *lat-long coordinate check*

Description

check lat-long coordinates for plausibility

Usage

```
checkLL(lat, long, data, fun = stop, ...)
```

Arguments

`lat, long`	Latitude (North/South) and longitude (East/West) coordinates in decimal degrees
`data`	Optional: data.frame with the columns `lat` and `long`
`fun`	One of the functions `stop`, `warning`, or `message`. DEFAULT: stop
`...`	Further arguments passed to `fun`

Value

Invisible T/F vector showing which of the coordinates is violated in the order: minlat, maxlat, minlong, maxlong. Only returned if check is passed or fun != stop

Author(s)

Berry Boessenkool, <berry-b@gmx.de>, Aug 2016

See Also

pointsMap, putm, berryFunctions::checkFile

Examples

```
checkLL(lat=52, long=130)
checkLL(130, 52, fun=message)
checkLL(85:95, 0, fun=message)

d <- data.frame(x=0, y=0)
checkLL(y,x, d)

# informative errors:
library("berryFunctions")
is.error(   checkLL(85:95, 0, fun="message"),  tell=TRUE)
is.error(   checkLL(170,35),  tell=TRUE)

mustfail <- function(expr) stopifnot(berryFunctions::is.error(expr))
mustfail( checkLL(100)         )
mustfail( checkLL(100, 200)    )
mustfail( checkLL(-100, 200)   )
mustfail( checkLL(90.000001, 0)   )
```

---

degree *decimal degree coordinate conversion*

Description

Convert latitude-longitude coordinates between decimal representation and degree-minute-second notation

Usage

```
degree(lat, long, data, todms = !is.character(lat), digits = 1,
  drop = FALSE)
```

Arguments

lat, long	Latitude (North/South) and longitude (East/West) coordinates in decimal degrees
data	Optional: data.frame with the columns lat and long
todms	Logical specifying direction of conversion. If FALSE, converts to decimal degree notation, splitting coordinates at the symbols for degree, minute and second (\U00B0, ', "). DEFAULT: !is.character(lat)
digits	Number of digits the seconds are rounded to. DEFAULT: 1
drop	Drop to lowest dimension? DEFAULT: FALSE

Value

data.frame with x and y as character strings or numerical values, depending on conversion direction

Author(s)

Berry Boessenkool, <berry-b@gmx.de>, Aug 2016

See Also

earthDist, projectPoints for geographical reprojection, sp::char2dms

Examples

```
# DECIMAL to DMS notation: ------------------------------------------------
degree(52.366360, 13.024181)
degree(c(52.366360, -32.599203), c(13.024181,-55.809601))
degree(52.366360, 13.024181, drop=TRUE) # vector
degree(47.001, -13.325731, digits=5)

# Use table with values instead of single vectors:
d <- read.table(header=TRUE, sep=",", text="
lat, long
 52.366360,  13.024181
-32.599203, -55.809601")
degree(lat, long, data=d)

# DMS to DECIMAL notation: ------------------------------------------------
# You can use the degree symbol and escaped quotation mark (\") as well.
degree("52'21'58.9'N", "13'1'27.1'E")
print(degree("52'21'58.9'N", "13'1'27.1'E"), digits=15)

d2 <- read.table(header=TRUE, stringsAsFactors=FALSE, text="
lat long
52'21'58.9'N 13'01'27.1'E
32'35'57.1'S 55'48'34.6'W") # columns cannot be comma-separated!
degree(lat, long, data=d2)

# Rounding error checks: --------------------------------------------------
oo <- options(digits=15)
```

```
d
degree(lat, long, data=degree(lat, long, d))
degree(lat, long, data=degree(lat, long, d, digits=3))
options(oo)
stopifnot(all(degree(lat,long,data=degree(lat,long,d, digits=3))==d))
```

`earthDist` *distance between lat-long coordinates*

Description

Great-circle distance between points at lat-long coordinates. (The shortest distance over the earth's surface). The distance of all the entries is computed relative to the `i`th one.

Usage

```
earthDist(lat, long, data, r = 6371, i = 1L)
```

Arguments

`lat, long`	Latitude (North/South) and longitude (East/West) coordinates in decimal degrees
`data`	Optional: data.frame with the columns `lat` and `long`
`r`	radius of the earth. Could be given in miles. DEFAULT: 6371 (km)
`i`	Integer: Index element against which all coordinate pairs are computed. DEFAULT: 1

Value

Vector with distance(s) in km (or units of `r`, if `r` is changed)

Author(s)

Berry Boessenkool, <berry-b@gmx.de>, Aug 2016 + Jan 2017. Angle formula from Diercke Weltatlas 1996, Page 245

See Also

`degree` for pre-formatting, http://www.movable-type.co.uk/scripts/latlong.html

Examples

```
d <- read.table(header=TRUE, sep=",", text="
lat, long
52.514687,  13.350012   # Berlin
51.503162,  -0.131082   # London
35.685024, 139.753365") # Tokio
earthDist(lat, long, d)      # from Berlin to L and T: 928 and 8922 km
earthDist(lat, long, d, i=2) # from London to B and T: 928 and 9562 km

# slightly different with other formulas:
# install.packages("geosphere")
# geosphere::distHaversine(as.matrix(d[1,2:1]), as.matrix(d[2,2:1])) / 1000


# compare with UTM distance
set.seed(42)
d <- data.frame(lat=runif(100, 47,54), long=runif(100, 6, 15))
d2 <- projectPoints(d$lat, d$long)
d_utm <- berryFunctions::distance(d2$x[-1],d2$y[-1], d2$x[1],d2$y[1])/1000
d_earth <- earthDist(lat,long, d)[-1]
plot(d_utm, d_earth) # distances in km
hist(d_utm-d_earth) # UTM distance slightly larger than earth distance
plot(d_earth, d_utm-d_earth) # correlates with distance
berryFunctions::colPoints(d2$x[-1], d2$y[-1], d_utm-d_earth, add=FALSE)
points(d2$x[1],d2$y[1], pch=3, cex=2, lwd=2)
```

`equidistPoints` *Evenly spaced points along path*

Description

Compute waypoints with equal distance to each other along a (curved) path or track given by coordinates

Usage

```
equidistPoints(x, y, z, data, n, nint = 30, mid = FALSE, ...)
```

Arguments

`x, y, z`	Vectors with coordinates. z is optional and can be left empty
`data`	Optional: data.frame with the column names as given by x,y (and z)
`n`	Number of segments to create along the path (=number of points-1)
`nint`	Number of points to interpolate between original coordinates (with `approx2`). Larger numbers give more precisely equidistant points, but increase computing time. `int=1` to not do any interpolation. DEFAULT: 30

mid	Logical: Should centers of segments be returned instead of their ends?
...	Further arguments passed to approx

Value

Dataframe with the coordinates of the final points. ATTENTION: The columns are named x,y,z, not with the original names from the function call.

Author(s)

Berry Boessenkool, <berry-b@gmx.de>, May 2016

See Also

berryFunctions::distance and approx2

Examples

```
library(berryFunctions) # distance, colPoints etc
x <- c(2.7, 5, 7.8, 10.8, 13.7, 15.8, 17.4, 17.7, 16.2, 15.8, 15.1, 13.1, 9.3, 4.8, 6.8, 12.2)
y <- c(2.3, 2.1, 2.6, 3.3, 3.7, 4.7, 7.6, 11.7, 12.4, 12.3, 12.3, 12.3, 12, 12.1, 17.5, 19.6)
eP <- equidistPoints(x,y, n=10) ; eP
plot(x,y, type="o", pch=4)
points(equidistPoints(x,y, n=10), col=4, pch=16)
points(equidistPoints(x,y, n=10, nint=1), col=2) # from original point set
round(distance(eP$x, eP$y), 2) # the 2.69 instead of 4.50 is in the sharp curve
# These points are quidistant along the original track

plot(x,y, type="o", pch=16, col=2)
round(sort(distance(x,y)), 2)
xn <- equidistPoints(x,y, n=10)$x
yn <- equidistPoints(x,y, n=10)$y
lines(xn,yn, type="o", pch=16)
round(sort(distance(xn,yn)), 2)
for(i in 1:8)
{
xn <- equidistPoints(xn,yn, n=10)$x
yn <- equidistPoints(xn,yn, n=10)$y
lines(xn,yn, type="o", pch=16)
print(round(sort(distance(xn,yn)), 2))
} # We may recursively get closer to equidistant along track _and_ air,
# but never actually reach it.

# Real dataset:
data(biketrack)
colPoints(lon, lat, ele, data=biketrack, add=FALSE, asp=1, pch=4, lines=TRUE)
points(equidistPoints(lon, lat, data=biketrack, n=25), pch=3, lwd=3, col=2)
bt2 <- equidistPoints(lon, lat, ele, data=biketrack, n=25)
bt2$dist <- distance(bt2$x, bt2$y)*1000
colPoints(x, y, z, data=bt2, legend=FALSE)
# in curves, crow-distance is shorter sometimes
plot(lat~lon, data=biketrack, asp=1, type="l")
```

```
colPoints(x, y, dist, data=bt2, Range=c(2.5,4), add=TRUE, asp=1, pch=3, lwd=5)
lines(lat~lon, data=biketrack)
```

`maxEarthDist` *maximum distance between set of points*

Description

Maximum great-circle distance between points at lat-long coordinates. This is not computationally efficient. For large datasets, consider pages like http://stackoverflow.com/a/16870359.

Usage

```
maxEarthDist(lat, long, data, r = 6371)
```

Arguments

`lat, long, data`	Coordinates for `earthDist`
`r`	radius for `earthDist`

Value

Single number

Author(s)

Berry Boessenkool, <berry-b@gmx.de>, Jan 2017

See Also

`earthDist`

Examples

```
d <- read.table(header=TRUE, text="
    x     y
9.19 45.73
6.55 58.13
7.71 71.44")

plot(d, asp=1, pch=as.character(1:3))
earthDist(y,x,d, i=2)
earthDist(y,x,d, i=3)

maxEarthDist(y,x,d)
```

pointsMap *Get map for lat-long points*

Description

Download and plot map with the extend of a dataset with lat-long coordinates.

Usage

```
pointsMap(lat, long, data, ext = 0.07, fx = 0.05, fy = fx, type = "osm",
  zoom = NULL, minNumTiles = 9L, mergeTiles = TRUE, map = NULL,
  proj = NA, plot = TRUE, mar = c(0, 0, 0, 0), add = FALSE,
  scale = TRUE, quiet = FALSE, pch = 3, col = "red", cex = 1,
  pargs = NULL, ...)
```

Arguments

lat, long	Latitude (North/South) and longitude (East/West) coordinates in decimal degrees
data	Optional: data.frame with the columns lat and long
ext	Extension added in each direction if a single coordinate is given. DEFAULT: 0.07
fx, fy	Extend factors (additional map space around actual points) passed to custom version of extendrange. DEFAULT: 0.05
type	Tile server in OpenStreetMap::openmap. For an overview, see http://blog.fellstat.com/?p=356
zoom, minNumTiles, mergeTiles	Arguments passed to openmap
map	Optional map object. If given, it is not downloaded again. Useful to project maps in a second step. DEFAULT: NULL
proj	If you want to reproject the map (Consumes some extra time), the proj4 character string or CRS object to project to, e.g. putm(long=long). DEFAULT: NA (no conversion)
plot	Logical: Should map be plotted and points added? Plotting happens with OpenStreetMap::plot.OpenSt DEFAULT: TRUE
mar	Margins to be set first (and left unchanged). DEFAULT: c(0,0,0,0)
add	Logical: add points to existing map? DEFAULT: FALSE
scale	Logical: should scaleBar be added? DEFAULT: TRUE
quiet	Logical: suppress progress messages? DEFAULT: FALSE
pch, col, cex	Arguments passed to points. DEFAULT: 3, "red", 1
pargs	List of arguments passed to points like lwd, type, cex...
...	Further arguments passed to scaleBar like abslen, ndiv, ...

Value

Map returned by openmap

Author(s)

Berry Boessenkool, <berry-b@gmx.de>, Jun 2016

See Also

projectPoints, OpenStreetMap::openmap

Examples

```
if(interactive()){
d <- read.table(sep=",", header=TRUE, text=
"lat, long # could e.g. be copied from googleMaps, rightclick on What's here?
43.221028, -123.382998
43.215348, -123.353804
43.227785, -123.368694
43.232649, -123.355895")

map <- pointsMap(lat, long, data=d)
map_utm <- pointsMap(lat, long, d, map=map, proj=putm(d$long))
axis(1); axis(2) # now in meters
projectPoints(d$lat, d$long)
scaleBar(map_utm, x=0.2, y=0.8, unit="mi", type="line", col="red", length=0.25)
pointsMap(lat, long, d[1:2,], map=map_utm, add=TRUE, col="red", pch=3, pargs=list(lwd=3))

d <- data.frame(long=c(12.95, 12.98, 13.22, 13.11), lat=c(52.40,52.52, 52.36, 52.45))
map <- pointsMap(lat,long,d, type="bing") # aerial map
}
```

---

proj *CRS of various PROJ.4 projections*

Description

coordinate reference system (CRS) Object for several proj4 character strings. posm and pll are taken directly from OpenStreetMap::osm and longlat.

Usage

```
putm(long, zone = mean(long, na.rm = TRUE)%/%6 + 31)

posm()

pll()
```

Arguments

long	Vector of decimal longitude coordinates (East/West values). Not needed of zone is given.
zone	UTM (Universal Transverse Mercator) zone, see e.g. https://upload.wikimedia.org/wikipedia/commons/e/ed/Utm-zones.jpg. DEFAULT: UTM zone at mean of long

Value

sp::CRS objects for one of:
- UTM projection with given zone
- Open street map (and google) mercator projection
- Latitude Longitude projection

Author(s)

Berry Boessenkool, <berry-b@gmx.de>, Aug 2016

See Also

projectPoints, degree

Examples

```
posm()
str(posm())
posm()@projargs
pll()
putm(5:14) # Germany
putm(zone=33) # Berlin
```

---

projectPoints *Project lat-lon points*

Description

Project long lat points to e.g. UTM projection. Basics copied from OpenStreetMap::projectMercator

Usage

```
projectPoints(lat, long, data, from = pll(), to = putm(long = long),
  spout = FALSE, dfout = TRUE, drop = FALSE, quiet = FALSE)
```

Arguments

lat, long	Latitude (North/South) and longitude (East/West) coordinates in decimal degrees
data	Optional: data.frame with the columns lat and long
from	Original Projection CRS (do not change for latlong-coordinates). DEFAULT: pll() = sp::CRS("+proj=longlat +datum=WGS84")
to	target projection CRS (Coordinate Reference System) Object. Other projections can be specified as sp::CRS("your_proj4_character_string"). DEFAULT: putm(long=long)
spout	Return the original spTransform output instead of coordinates only? DEFAULT: FALSE
dfout	Convert output to data.frame to allow easier indexing? DEFAULT: TRUE
drop	Drop to lowest dimension? DEFAULT: FALSE (unlike projectMercator)
quiet	Suppress warning about NA coordinates? DEFAULT: FALSE

Value

data.frame (or matrix, if dfout=FALSE) with points in new projection

Author(s)

Berry Boessenkool, <berry-b@gmx.de>, Jun 2016

See Also

scaleBar, OpenStreetMap::projectMercator, http://gis.stackexchange.com/a/74723, http://spatialreference.org on proj4strings

Examples

```
library("OpenStreetMap")
lat <- runif(100, 6, 12)
lon <- runif(100, 48, 58)
plot(lat,lon)
plot(projectMercator(lat,lon), main="Mercator")
plot(projectPoints(lat,lon), main="UTM32")
stopifnot(all( projectPoints(lat,lon, to=posm()) == projectMercator(lat,lon) ))

projectPoints(c(52.4,NA),      c(13.6,12.9))
projectPoints(c(52.4,NA),      c(13.6,12.9), quiet=TRUE)
projectPoints(c(52.4,52.3,NA), c(13.6,12.9,13.1))
projectPoints(c(52.4,52.3,NA), c(13.6,NA  ,13.1))
projectPoints(c(52.4,52.3,NA), c(NA  ,12.9,13.1))

# Reference system ETRS89 with GRS80-Ellipsoid (common in Germany)
set.seed(42)
d <- data.frame(N=runif(50,5734000,6115000), E=runif(50, 33189000,33458000))
d$VALUES <- berryFunctions::rescale(d$N, 20,40) + rnorm(50, sd=5)
```

```
head(d)
c1 <- projectPoints(lat=d$N, long=d$E-33e6, to=pll(),
          from=sp::CRS("+proj=utm +zone=33 +ellps=GRS80 +units=m +no_defs") )
c2 <- projectPoints(y, x, data=c1, to=posm() )
head(c1)
head(c2)

## Not run:  # not checked on CRAN because of file opening
map <- pointsMap(y,x, c1, plot=FALSE)
pdf("ETRS89.pdf")
par(mar=c(0,0,0,0))
plot(map)
rect(par("usr")[1], par("usr")[3], par("usr")[2], par("usr")[4],
     col=berryFunctions::addAlpha("white", 0.7))
scaleBar(map, y=0.2, abslen=100)
points(c2)
berryFunctions::colPoints(c2$x, c2$y, d$VALUE )
dev.off()
system2("open", "ETRS89.pdf")  # on Linux, try "xdg-open"
#unlink("ETRS89.pdf")

## End(Not run)
```

`randomPoints` *Distanced random points*

Description

Arranges points in square randomly, but with certain minimal distance to each other

Usage

```
randomPoints(xmin, xmax, ymin, ymax, number, mindist, plot = TRUE, ...)
```

Arguments

`xmin`	Minimum x coordinate
`xmax`	Upper limit x values
`ymin`	Ditto for y
`ymax`	And yet again: Ditto.
`number`	How many points should be randomly + uniformly distributed
`mindist`	Minimum DIstance each point should have to others
`plot`	Plot the result? DEFAULT: TRUE
`...`	Further arguments passed to plot

Value

data.frame with x and y coordinates.

Author(s)

Berry Boessenkool, <berry-b@gmx.de>, 2011/2012

See Also

distance, the package RandomFields (https://cran.r-project.org/package=RandomFields)

Examples

```
P <- randomPoints(xmin=200,xmax=700, ymin=300,ymax=680, number=60,mindist=10, asp=1)
rect(xleft=200, ybottom=300, xright=700, ytop=680, col=NA, border=1)

format( round(P,4), trim=FALSE)

for(i in 1:10)
{
rp <- randomPoints(xmin=0,xmax=20, ymin=0,ymax=20, number=20, mindist=3, plot=FALSE)
plot(rp, las=1, asp=1, pch=16)
abline(h=0:30*2, v=0:30*2, col=8); box()
for(i in 1:nrow(rp))
    berryFunctions::circle(rp$x[i],rp$y[i], r=3, col=rgb(1,0,0,alpha=0.2), border=NA)
}
```

---

scaleBar *scalebar for OSM plots*

Description

Add a scalebar to default or (UTM)-projected OpenStreetMap plots

Usage

```
scaleBar(map, x = 0.1, y = 0.9, length = 0.4, abslen = NA,
  unit = c("km", "m", "mi", "ft", "yd"), label = unit, type = c("bar",
  "line"), ndiv = NA, field = "rect", fill = NA, adj = c(0.5, 1.5),
  cex = par("cex"), col = c("black", "white"), targs = NULL, lwd = 7,
  lend = 1, bg = "transparent", mar = c(2, 0.7, 0.2, 3), ...)
```

Arguments

map	Map object with map$tiles[[1]]$projection to get the projection from.
x, y	Relative position of left end of scalebar. DEFAULT: 0.1, 0.9
length	Approximate relative length of bar. DEFAULT: 0.4
abslen	Absolute length in units. DEFAULT: NA (computed internally from length)
unit	Unit for computation and label. Possible: kilometer, meter, miles, feet, yards. DEFAULT: "km"
label	Unit label in plot. DEFAULT: unit
type	Scalebar type: simple 'line' or classical black & white 'bar'. DEFAULT: "bar"
ndiv	Number of divisions if type="bar". DEFAULT: NA (computed internally) Internal selection of ndiv is based on divisibility of abslen (modulo) with 1:6. For ties, preferation order is 5>4>3>2>6>1.
field, fill, adj, cex	Arguments passed to textField
col	Vector of (possibly alternating) colors passed to segments or rect. DEFAULT: c("black","white")
targs	List of further arguments passed to textField like font, col (to differ from bar color), etc. DEFAULT: NULL
lwd, lend	Line width and end style passed to segments. DEFAULT: 5,1, which works well in pdf graphics.
bg	Background color, e.g. addAlpha(White). DEFAULT: "transparent" to suppress background.
mar	Background margins approximately in letter width/height. DEFAULT: c(2,0.7,0.2,3)
...	Further arguments passed to segments like lty. (Color for segments is the first value of col). Passed to rect if type="bar", like lwd.

Details

scaleBar gets the right distance in the default mercator projected maps. There, the axes are not in meters, but rather ca 0.7m units (for NW Germany area maps with 20km across). Accordingly, other packages plot wrong bars, see the last example section.

Value

invisible: coordinates of scalebar and label

Author(s)

Berry Boessenkool, <berry-b@gmx.de>, Jun 2016

See Also

pointsMap, projectPoints

Examples

```
if(interactive()){
d <- data.frame(long=c(12.95, 12.98, 13.22, 13.11), lat=c(52.40,52.52, 52.36, 52.45))
map <- pointsMap(lat,long,d, scale=FALSE, zoom=9)
coord <- scaleBar(map)  ; coord
scaleBar(map, bg=berryFunctions::addAlpha("white", 0.7))
scaleBar(map, 0.3, 0.05, unit="m", length=0.45, type="line")
scaleBar(map, 0.3, 0.5, unit="km", abslen=5, col=4:5, lwd=3)
scaleBar(map, 0.3, 0.8, unit="mi", col="red", targ=list(col="blue", font=2), type="line")

# I don't like subdivisions, but if you wanted them, you could use:
scaleBar(map, 0.12, 0.28, abslen=10, adj=c(0.5, -1.5)  )
scaleBar(map, 0.12, 0.28, abslen=4, adj=c(0.5, -1.5), targs=list(col="transparent"), label="" )
}

## Not run:  # don't download too many maps in R CMD check
d <- read.table(header=TRUE, sep=",", text="
lat, long
52.514687,  13.350012   # Berlin
51.503162,  -0.131082   # London
35.685024, 139.753365") # Tokio
map <- pointsMap(lat, long, d, zoom=2, abslen=5000, y=0.7)
scaleBar(map, y=0.5, abslen=5000)   # in mercator projections, scale bars are not
scaleBar(map, y=0.3, abslen=5000)   # transferable to other latitudes

map_utm <- pointsMap(lat, long, d[1:2,], proj=putm(long=d$long[1:2]),
                     zoom=4, y=0.7, abslen=500)
scaleBar(map_utm, y=0.5, abslen=500) # transferable in UTM projection
scaleBar(map_utm, y=0.3, abslen=500)

## End(Not run)

## Not run:  ## Too much downloading time, too error-prone
# Tests around the world
par(mfrow=c(1,2), mar=rep(1,4))
long <- runif(2, -180, 180) ;  lat <- runif(2, -90, 90)
long <- 0:50 ;  lat <- 0:50
map <- pointsMap(lat, long)
map2 <- pointsMap(lat, long, map=map, proj=putm(long=long))

## End(Not run)

## Not run:  ## excluded from tests to avoid package dependencies
berryFunctions::require2("SDMTools")
berryFunctions::require2("raster")
berryFunctions::require2("mapmisc")
par(mar=c(0,0,0,0))
map <- OSMscale::pointsMap(long=c(12.95, 13.22), lat=c(52.52, 52.36))
SDMTools::Scalebar(x=1443391,y=6889679,distance=10000)
raster::scalebar(d=10000, xy=c(1443391,6884254))
OSMscale::scaleBar(map, x=0.35, y=0.45, abslen=5)
library(mapmisc) # otherwise rbind for SpatialPoints is not found
```

```
mapmisc::scaleBar(map$tiles[[1]]$projection, seg.len=10, pos="center", bg="transparent")

## End(Not run)
```

`triangleArea` *Area of a triangle*

Description

calculate Area of a planar triangle

Usage

```
triangleArea(x, y, digits = 3)
```

Arguments

`x`	Vector with 3 values (x coordinates of triangle corners)
`y`	Ditto for y.
`digits`	Number of digits the result is rounded to. DEFAULT: 3)

Value

Numeric

Author(s)

Berry Boessenkool, <berry-b@gmx.de>, 2011

See Also

`berryFunctions::distance`

Examples

```
a <- c(1,5.387965,9); b <- c(1,1,5)
plot(a[c(1:3,1)], b[c(1:3,1)], type="l", asp=1)#; grid()

triangleArea(a,b)
#triangleArea(a,b[1:2])
```

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