

Package ‘Guerry’

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Type Package

Title Guerry: maps, data and methods related to Guerry (1833) ‘‘Moral Statistics of France’’

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Description This package comprises maps of France in 1830, data from A.-M. Guerry and others and statistical and graphic methods related to Guerry’s ‘‘Moral Statistics of France’’.

License GPL

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Guerry-package	<i>Guerry: maps, data and methods related to A.-M. Guerry's "Moral Statistics of France" (1833)</i>
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Description

Andre-Michel Guerry (1833) was the first to systematically collect and analyze social data on such things as crime, literacy and suicide with the view to determining social laws and the relations among these variables. He provided the first essentially multivariate and georeferenced spatial data on socially important questions, e.g., Is the rate of crime related to education or literacy? How does this vary over the departments of France? Are the rates of crime or suicide within departments stable over time?

In an age well before the idea of correlation had been invented, Guerry used graphics and statistical maps to try to shed light on such questions. In a later work (Guerry, 1864), he explicitly tried to entertain larger questions, but with still-limited statistical tools: Can rates of various crimes be related to multiple causes or predictors? Are the rates and ascribable causes in France similar or different to those found in England?

The **Guerry** package comprises maps of France in 1830, data from A.-M. Guerry and others, and statistical and graphic methods related to Guerry's *Moral Statistics of France*. The goal of providing these as an R package is to facilitate the exploration and development of statistical and graphic methods for multivariate data in a geo-spatial context.

Details

Package:	Guerry
Type:	Package
Version:	1.3
Date:	2009-11-19
License:	GPL
LazyLoad:	yes

Data from Guerry and others is contained in the data frame [Guerry](#). Because Corsica is often considered an outlier both spatially and statistically, the map of France circa 1830, together with the Guerry data is provided as `SpatialPolygonsDataFrames` in two forms: [gfrance](#) for all 86 departments, and [gfrance85](#), for the 85 departments excluding Corsica.

Author(s)

Michael Friendly and Stephane Dray

Maintainer: Michael Friendly <friendly AT yorku.ca>

References

- Dray, S. and Jombart, T. (2009). A Revisit Of Guerry's Data: Introducing Spatial Constraints In Multivariate Analysis. Unpublished manuscript.
- Brunsdon, C. and Dykes, J. (2007). Geographically weighted visualization: interactive graphics for scale-varying exploratory analysis. Geographical Information Science Research Conference (GIS-RUK 2007). NUI Maynooth, Ireland, April, 2007. <http://ncg.nuim.ie/gisruk/materials/proceedings/PDF/3C1.pdf>.
- Friendly, M. (2007). A.-M. Guerry's Moral Statistics of France: Challenges for Multivariable Spatial Analysis. *Statistical Science*, 22, 368-399.
- Friendly, M. (2007). Supplementary materials for André-Michel Guerry's Moral Statistics of France: Challenges for Multivariate Spatial Analysis, <http://www.math.yorku.ca/SCS/Gallery/guerry/>.
- Guerry, A.-M. (1833). *Essai sur la statistique morale de la France* Paris: Crochard. English translation: Hugh P. Whitt and Victor W. Reinking, Lewiston, N.Y.: Edwin Mellen Press, 2002.
- Guerry, A.-M. (1864). *Statistique morale de l'Angleterre comparée avec la statistique morale de la France, d'après les comptes de l'administration de la justice criminelle en Angleterre et en France, etc.* Paris: J.-B. Baillière et fils.

Examples

```
#~~ simple examples of the most important functions ~~
```

Angeville

Data from d'Angeville (1836) on the population of France

Description

Adolph d'Angeville (1836) presented a comprehensive statistical summary of nearly every known measurable characteristic of the French population (by department) in his *Essai sur la Statistique de la Population française*. Using the graphic method of shaded (choropleth) maps invented by Baron Charles Dupin and applied to significant social questions by Guerry, Angeville's *Essai* became the first broad and general application of principles of graphic representation to national industrial and population data.

The collection of variables in the data frame `Angeville` is a small subset of over 120 columns presented in 8 tables and many graphic maps.

Usage

```
data(Angeville)
```

Format

A data frame with 86 observations on the following 16 variables.

`dept` a numeric vector

Department Department name: a factor with levels Ain Aisne ... Vosges Yonne

Mortality Mortality: Number of births to give 100 people at age 21 (T1:13)
 Marriages Number of marriages per 1000 men aged 21 (T1:15)
 Legit_births Annual no. of legitimate births (T2:17)
 Illeg_births Annual no. of illegitimate births (T2:18)
 Recruits Number of people registered for military recruitment from 1825-1833 (T3:32)
 Conscripts Number of inhabitants per military conscript (T3:33)
 Exemptions Number of military exemptions per 1000 all of physical causes (T3:47)
 Farmers Number of farmers during the census in 1831 (T4:65)
 Recruits_ignorant Average number of ignorant recruits per 1000 (T5:69)
 Schoolchildren Number of schoolchildren per 1000 inhabitants (T5:71)
 Windows_doors Number of windows & doors in houses per 100 inhabitants (T5:72). This is some-
 times taken as an indicator of household wealth.
 Primary_schools "Number of primary schools (T5:74)
 Life_exp Life expectancy in years (T1:9a,9b)
 Pop1831 Population in 1831

Details

ID codes for dept were modified from those in Angeville's tables to match those used in [Guerry](#).
 Angeville's variables are recorded in a variety of different ways and some of these were calculated from other columns in his tables not included here. As well, the variable names and labels used here were often shortened from the more complete descriptions given by d'Angeville. The notation "(Tn:k)" indicates that the variable used here came from Table n, Column k.

Source

Angeville, A. d' (1836). *Essai sur la Statistique de la Population francaise*, Paris: F. Darfour.

The data was digitally scanned from Angeville's tables using OCR software, then extensively edited to correct obvious errors and finally subjected to some consistency checks using the column totals and ranked values he provided.

References

Whitt, H. P. (2007). Modernism, internal colonialism, and the direction of violence: suicide and crimes against persons in France, 1825-1830. Unpublished ms.

Examples

```

data(Angeville)
## maybe str(Angeville) ; plot(Angeville) ...

```

gfrance

Map of France in 1830 with the Guerry data

Description

gfrance is a SpatialPolygonsDataFrame object created with the sp package, containing the polygon boundaries of the map of France as it was in 1830, together with the [Guerry](#) data frame.

Usage

```
data(gfrance)
```

Format

The format is: Formal class 'SpatialPolygonsDataFrame' [package "sp"] with 5 slots: gfrance@data, gfrance@polygons, gfrance@plotOrder, gfrance@bbox, gfrance@proj4string. See: [SpatialPolygonsDataFrame](#) for descriptions of some components.

The analysis variables are described in [Guerry](#).

Details

In the present version, the PROJ4 projection is not specified.

Source

Friendly, M. (2007). Supplementary materials for André-Michel Guerry's Moral Statistics of France: Challenges for Multivariate Spatial Analysis, <http://www.math.yorku.ca/SCS/Gallery/guerry/>.

References

Friendly, M. (2007). A.-M. Guerry's Moral Statistics of France: Challenges for Multivariable Spatial Analysis. *Statistical Science*, 22, 368-399.

See Also

[Guerry](#) for description of the analysis variables [Angeville](#) for other analysis variables

Examples

```
data(gfrance)
names(gfrance) ## list @data variables
plot(gfrance) ## just show the map outline

# Show basic choropleth plots of some of the variables
splot(gfrance, "Crime_pers")
splot(gfrance, "Crime_prop")

# Note that splot assumes all variables are on the same scale for comparative plots
```

```
# transform variables to ranks (as Guerry did)

local({
  gfrance$Crime_pers <- rank(gfrance$Crime_pers)
  gfrance$Crime_prop <- rank(gfrance$Crime_prop)
  gfrance$Literacy <- rank(gfrance$Literacy)
  gfrance$Donations <- rank(gfrance$Donations)
  gfrance$Infants <- rank(gfrance$Infants)
  gfrance$Suicides <- rank(gfrance$Suicides)

  spplot(gfrance, c("Crime_pers", "Crime_prop", "Literacy", "Donations", "Infants", "Suicides"),
    layout=c(3,2), as.table=TRUE, main="Guerry's main moral variables")
})
```

gfrance85

Map of France in 1830 with the Guerry data, excluding Corsica

Description

gfrance85 is a `SpatialPolygonsDataFrame` object created with the `sp` package, containing the polygon boundaries of the map of France as it was in 1830, together with the `Guerry` data frame. This version excludes Corsica, which is an outlier both in the map and in many analyses.

Usage

```
data(gfrance85)
```

Format

The format is: Formal class 'SpatialPolygonsDataFrame' [package "sp"] with 5 slots: gfrance85@data, gfrance85@polygons, gfrance85@plotOrder, gfrance85@bbox, gfrance85@proj4string. See: [SpatialPolygonsDataFrame](#) for descriptions of some components.

The analysis variables are described in [Guerry](#).

Details

In the present version, the PROJ4 projection is not specified.

Source

Friendly, M. (2007). Supplementary materials for André-Michel Guerry's Moral Statistics of France: Challenges for Multivariate Spatial Analysis, <http://www.math.yorku.ca/SCS/Gallery/guerry/>.

References

- Dray, S. and Jombart, T. (2009). A Revisit Of Guerry's Data: Introducing Spatial Constraints In Multivariate Analysis. Unpublished manuscript.
- Friendly, M. (2007). A.-M. Guerry's Moral Statistics of France: Challenges for Multivariable Spatial Analysis. *Statistical Science*, 22, 368-399.

Examples

```

data(gfrance85)
plot(gfrance85) # plot the empty outline map

# extract some useful components
df <- data.frame(gfrance85)[,7:12] # main moral variables
xy <- coordinates(gfrance85) # department centroids
dep.names <- data.frame(gfrance85)[,6]
region.names <- data.frame(gfrance85)[,5]
col.region <- colors()[c(149,254,468,552,26)]

if (require(spdep)) {
  lw <- nb2listw(poly2nb(gfrance85)) # neighbors list
}

# plot the map showing regions by color with department labels
op <- par(mar=rep(0.1,4))
plot(gfrance85,col=col.region[region.names])
text(xy, labels=dep.names, cex=0.4)
par(op)

```

Guerry

Data from A.-M. Guerry, "Essay on the Moral Statistics of France"

Description

Andre-Michel Guerry (1833) was the first to systematically collect and analyze social data on such things as crime, literacy and suicide with the view to determining social laws and the relations among these variables.

The Guerry data frame comprises a collection of 'moral variables' on the 86 departments of France around 1830. A few additional variables have been added from other sources.

Usage

```
data(Guerry)
```

Format

A data frame with 86 observations (the departments of France) on the following 23 variables.

dept Department ID: Standard numbers for the departments, except for Corsica (200)

Region Region of France ('N'='North', 'S'='South', 'E'='East', 'W'='West', 'C'='Central'). Corsica is coded as NA

Department Department name: Departments are named according to usage in 1830, but without accents. A factor with levels Ain Aisne Allier ... Vosges Yonne

Crime_pers Population per Crime against persons. Source: A2 (Compte général, 1825-1830)

- Crime_prop Population per Crime against property. Source: A2 (Compte général, 1825-1830)
- Literacy Percent Read & Write: Percent of military conscripts who can read and write. Source: A2
- Donations Donations to the poor. Source: A2 (Bulletin des lois)
- Infants Population per illegitimate birth. Source: A2 (Bureau des Longitudes, 1817-1821)
- Suicides Population per suicide. Source: A2 (Compte général, 1827-1830)
- MainCity Size of principal city ('1:Sm', '2:Med', '3:Lg'), used as a surrogate for population density. Large refers to the top 10, small to the bottom 10; all the rest are classed Medium. Source: A1. An ordered factor with levels 1:Sm < 2:Med < 3:Lg
- Wealth Per capita tax on personal property. A ranked index based on taxes on personal and movable property per inhabitant. Source: A1
- Commerce Commerce and Industry, measured by the rank of the number of patents / population. Source: A1
- Clergy Distribution of clergy, measured by the rank of the number of Catholic priests in active service / population. Source: A1 (Almanach officiel du clergy, 1829)
- Crime_parents Crimes against parents, measured by the rank of the ratio of crimes against parents to all crimes— Average for the years 1825-1830. Source: A1 (Compte général)
- Infanticide Infanticides per capita. A ranked ratio of number of infanticides to population— Average for the years 1825-1830. Source: A1 (Compte général)
- Donation_clergy Donations to the clergy. A ranked ratio of the number of bequests and donations inter vivos to population— Average for the years 1815-1824. Source: A1 (Bull. des lois, ordonn. d'autorisation)
- Lottery Per capita wager on Royal Lottery. Ranked ratio of the proceeds bet on the royal lottery to population— Average for the years 1822-1826. Source: A1 (Compte rendus par le ministre des finances)
- Desertion Military desertion, ratio of the number of young soldiers accused of desertion to the force of the military contingent, minus the deficit produced by the insufficiency of available billets— Average of the years 1825-1827. Source: A1 (Compte du ministère de la guerre, 1829 etat V)
- Instruction Instruction. Ranks recorded from Guerry's map of Instruction. Note: this is inversely related to Literacy (as defined here)
- Prostitutes Prostitutes in Paris. Number of prostitutes registered in Paris from 1816 to 1834, classified by the department of their birth Source: Parent-Duchatelet (1836), *De la prostitution en Paris*
- Distance Distance to Paris (km). Distance of each department centroid to the centroid of the Seine (Paris) Source: calculated from department centroids
- Area Area (1000 km²). Source: Angeville (1836)
- Pop1831 1831 population. Population in 1831, taken from Angeville (1836), *Essai sur la Statistique de la Population française*, in 1000s

Details

Note that most of the variables (e.g., Crime_pers) are scaled so that 'more is better' morally.

Values for the quantitative variables displayed on Guerry's maps were taken from Table A2 in the English translation of Guerry (1833) by Whitt and Reinking. Values for the ranked variables were taken from Table A1, with some corrections applied. The maximum is indicated by rank 1, and the minimum by rank 86.

Source

Angeville, A. (1836). *Essai sur la Statistique de la Population française* Paris: F. Doufour.

Guerry, A.-M. (1833). *Essai sur la statistique morale de la France* Paris: Crochard. English translation: Hugh P. Whitt and Victor W. Reinking, Lewiston, N.Y. : Edwin Mellen Press, 2002.

Parent-Duchatelet, A. (1836). *De la prostitution dans la ville de Paris*, 3rd ed, 1857, p. 32, 36

References

Dray, S. and Jombart, T. (2009). A Revisit Of Guerry's Data: Introducing Spatial Constraints In Multivariate Analysis. Unpublished manuscript.

Brunsdon, C. and Dykes, J. (2007). Geographically weighted visualization: interactive graphics for scale-varying exploratory analysis. Geographical Information Science Research Conference (GISRUK 07), NUI Maynooth, Ireland, April, 2007.

Friendly, M. (2007). A.-M. Guerry's Moral Statistics of France: Challenges for Multivariable Spatial Analysis. *Statistical Science*, 22, 368-399.

Friendly, M. (2007). Data from A.-M. Guerry, Essay on the Moral Statistics of France (1833), <http://www.math.yorku.ca/SCS/Gallery/guerry/guerrydat.html>.

See Also

[Angeville](#) for other analysis variables

Examples

```
data(Guerry)
## maybe str(Guerry) ; plot(Guerry) ...
```

thinnedSpatialPoly	<i>Thin a SpatialPolygons* object using the Douglas-Peucker polyLine simplification algorithm</i>
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Description

The function "thins" a SpatialPolygons or SpatialPolygonsDataFrame object, by reducing the number of points required to represent each line in the spatial polygons defining the map.

For map-based graphics using complex maps (such as [gfrance](#)) and rendered using vector graphics devices (pdf, postscript), thinning the base map can vastly reduce the size of the resulting graphic output files.

Usage

```
thinnedSpatialPoly(SP, tolerance, minarea=0)
```

Arguments

SP	A SpatialPolygons or SpatialPolygonsDataFrame object
tolerance	tolerance used by the dp function. The scale used for tolerance corresponds to the range of map coordinates, but is not documented precisely. If not supplied, the function uses the minimum range of the bounding box of the map / 100.
minarea	The minimum area of polygons to keep in the resulting object. The default, minarea=0 means that all polygons, even tiny bits and slivers are retained. Typically, you will want to set this to something larger.

Value

Returns an object of the same class as the input, SP.

Warning

The [dp](#) function used here is not topology-preserving and may create visual artifacts (slivers, overlapping boundaries).

Author(s)

Roger Bivand, packaged by Michael Friendly

References

Douglas, D. and Peucker, T. (1973). Algorithms for the reduction of the number of points required to represent a digitized line or its caricature. *The Canadian Cartographer*, 10(2). 112-122

See Also

[dp](#)

Examples

```
object.size(gfrance)
## not run, because shapefiles::dp uses T and F, causing R CMD check to fail
## Not run:
gfrance_dp <- thinnedSpatialPoly(gfrance, tolerance=2500, minarea=500000)
object.size(gfrance_dp)

## End(Not run)
```

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