Package 'sspline'

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Title Smoothing Splines on the Sphere

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Depends R (>= 0.99)

Description R package for Computing the Spherical Smoothing Splines

License GPL (>= 2)

URL http://www.stat.wisc.edu/~xie

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R topics documented:

gwm *Internal Data Used by map.world Function*

Description

It stores longitudes and latitudes used for drawing the world map.

Usage

```
data(gwm)
```

Format

A data frame with 6920 observations on the following 2 variables.

lon longitudes on earth

lat latitudes on earth

Source

S Archive under http://lib.stat.cmu.edu

Examples

```
data(gwm)
```

map.world *World Map*

Description

Sketch the continental boundary to give a rough idea of the position on the world.

Usage

```
map.world(add=FALSE, main="", ...)
```

Arguments

add	a logical scalar, if TRUE, add a map to the existing plot; otherwise, plot a new world map
main	a character vector, the main title of the plot
...	other parameters needed to pass to the lines function

Value

NULL

Author(s)

Original in S by Steve Wofsy <⟨scw@io.harward.edu⟩>,
ported to R by Xianhong Xie <⟨xie@stat.wisc.edu⟩>.

References

S Archive under http://lib.stat.cmu.edu

Examples

```
map.world(main = "The World Map")
```

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plot.smooth.sspline

Plot a Smooth.sspline Object

Description

Plot a smoothing spherical spline using color to represent the function value.

Usage

```
plot.smooth.sspline(x, lon, lat, main="", xlab="Longitude",
    ylab="Latitude", key.title="Temp\n(deg)", ...)
```

Arguments

x	a smooth.sspline object
lon	the longitudes on which the function values will be calculated
lat	the latitudes on which the function values will be calculated
main	the main title of the plot
xlab	the x-axis label of the main plot
ylab	the y-axis label of the main plot
key.title	the title for the colored key
...	other plotting parameters, such as *lwd*, *asp*, and ...

Details

It calls predict.smooth.sspline and filled.contour.

Value

NULL

Note

The longitudes and latitudes are measured in degrees.

Author(s)

Xianhong Xie

See Also

predict.smooth.sspline

Examples

```
data(WTdiff)

subdat <- WTdiff[sample(nrow(WTdiff), 200), 2:4]
attach(subdat)

splobj <- smooth.sspline(lon, lat, avgd)

plot(splobj, lon=seq(-180, 180, len=50), lat=seq(-90, 90, len=25),
     main="World Average Temperature Change")

detach(subdat)
```

---

predict.smooth.sspline

Spherical Smoothing Spline Prediction

Description

Make prediction on the sphere using the information got from a smooth.sspline object.

Usage

```
predict.smooth.sspline(object, lon, lat, grid=FALSE, ...)
```

Arguments

object	a smooth.sspline object
lon	the longitudes on which the prediction is to be made
lat	the latitudes on which the prediction is to be made
grid	whether the prediction is on a grid
...	other parameters, not used

Details

It calls Fortran subroutine with the .Fortran interface.

Value

If grid = TRUE, return a matrix with dimension (length(lon), length(lat)); otherwise, return a vector of length = length(lon).

Note

The longitudes and latitudes are measured in degrees.

Author(s)

Xianhong Xie

References

Grace Wahba (1981), *Spline Interpolation and Smoothing on the Sphere*, SIAM J. SCI. STAT. COMPUT.

See Also

`smooth.sspline`

Examples

```
data(WT9397)

subdat <- WT9397[sample(nrow(WT9397), 200), 2:4]
attach(subdat)

splobj <- smooth.sspline(lon, lat, avgt)

predict(splobj, lon=seq(-180,180,len=50), lat=seq(-90,90,len=25), grid=TRUE)

detach(subdat)
```

---

print.smooth.sspline

Display a Smooth.sspline Object

Description

The print and summary methods for `smooth.sspline` object.

Usage

```
print.smooth.sspline(x, ...)
summary.smooth.sspline(object, ...)
```

Arguments

x	smooth.sspline objects
object	smooth.sspline objects
...	other parameters, not used

Value

For print.smooth.sspline, a smooth.sspline object; for summary.smooth.sspline, NULL.

Author(s)

Xianhong Xie

Examples

```
data(WT6367)

subdat <- WT6367[sample(nrow(WT6367), 200), 2:4]
attach(subdat)

splobj <- smooth.sspline(lon, lat, avgt)

print(splobj)
summary(splobj)

detach(subdat)
```

---

rmp *Internal Data Used by map.world Function*

Description

It stores vertex index info used for drawing the world map.

Usage

```
data(rmp)
```

Format

A data frame with 54 observations on the following variable.

inc a numeric vector

Source

S Archive under http://lib.stat.cmu.edu

Examples

```
data(rmp)
```

`smooth.sspline` *Smoothing Spline on the Sphere*

Description

It fits a smoothing splines on the sphere with the smoothing parameter chosen by the generalized cross validation (GCV) criteria or given by the user.

Usage

```
smooth.sspline(lon, lat, y, m = 2, smth = 0, lambda = 0)
```

Arguments

`lon`	numeric vector, the longitudes
`lat`	numeric vector, the latitudes
`y`	numeric vector, the observations at (lon, lat)
`m`	integer, order of smoothing, takes value from 1 to 10. Default to 2
`smth`	method for choosing the smoothing parameter: 0, gcv method; 1, user specified. Default to 0
`lambda`	used only when smth = 1.

Details

It calls Fortran subroutine with the .Fortran interface.

Value

A `smooth.sspline` object with the components

`lon`	the original longitude
`lat`	the original latitude
`obs`	the original observation
`lambda`	the lambda that minimizes the gcv score
`gcv`	the corresponding gcv value at lambda
`varhat`	the estimated variance
`c`	the coefficient vector c for the estimated function
`d`	the coefficient d for the estimated function
`yhat`	the estimated (smoothed) observation
`call`	the call to `smooth.sspline`

Note

The longitudes and latitudes are measured in degrees.

Author(s)

Xianhong Xie

References

Grace Wahba (1981), *Spline Interpolation and Smoothing on the Sphere*, SIAM J. SCI. STAT. COMPUT.

Examples

```
data(WTdiff)

subdat <- WTdiff[sample(nrow(WTdiff), 200), 2:4]
attach(subdat)

smooth.sspline(lon, lat, avgd)

detach(subdat)
```

---

station *Distribution of the Stations on the World*

Description

It gives a simple illumination on how the given (lon, lat) pairs distributes on the world.

Usage

```
station(lon=NULL, lat=NULL, pch=24, col="blue", bg="red", ...)
```

Arguments

lon	numeric, the longitudes
lat	numeric, the latitudes
pch	the plotting symbol
col	color value or name, the color used to draw the symbol
bg	color value or name, the color used to fill the sumbol
...	other plotting parameters

Details

It calls the map.world to draw a world map.

Value

NULL

Note

The longitudes and latitudes are measured in degrees.

Author(s)

Xianhong Xie <⟨xie@stat.wisc.edu⟩>

See Also

map.world

Examples

```
data(WTdiff)
subdat <- WTdiff[sample(nrow(WTdiff), 200), 2:3]
attach(subdat)

station(lon, lat)

detach(subdat)
```

WT6367 *World Average Winter Temperature from 1963-1967*

Description

The WT6367 data frame has 1391 rows and 4 columns. It contains the average temperature from 1963 to 1967 for those stations having non-missing observations on the winter (Dec-Feb) for ten years (1963-1967 and 1993-1997).

Format

This data frame contains the following columns:

recid a numeric vector containing the coded information of the stations (length 11). The first three digits represent the country code; the next five digits, the station number; the last three digits, whether a station is a WMO staion or close to one.

lon a numeric vector containing the longitudes (in degrees) of the stations.

lat a numeric vector containing the latitudes (in degrees) of the stations.

avgt a numeric vector containing the average temperatures for the stations (rounded to the second decimal point).

Source

The Global Historical Climatology Network (GHCN)
http://www.ncdc.noaa.gov/cgi-bin/res40.pl?page=ghcn.html

Examples

```
data(WT6367)

## Fit a smoothing spherical spline with part of the data
subdat <- WT6367[sample(nrow(WT6367), 200), 2:4]
attach(subdat)

smooth.sspline(lon, lat, avgt)

detach(subdat)
```

WT9397 *World Average Winter Temperature from 1993-1997*

Description

The WT9397 data frame has 1391 rows and 4 columns. It contains the average temperature from 1993 to 1997 for those stations having non-missing observations on the winter (Dec-Feb) for ten years (1963-1967 and 1993-1997).

Format

This data frame contains the following columns:

recid a numeric vector containing the coded information of the stations (length 11). The first three digits represent the country code; the next five digits, the station number; the last three digits, whether a station is a WMO staion or close to one.

lon a numeric vector containing the longitudes (in degrees) of the stations.

lat a numeric vector containing the latitudes (in degrees) of the stations.

avgt a numeric vector containing the average temperatures for the stations (rounded to the second decimal point).

Source

The Global Historical Climatology Network (GHCN)
http://www.ncdc.noaa.gov/cgi-bin/res40.pl?page=ghcn.html

Examples

```
data(WT9397)

## Fit a smoothing spherical spline with part of the data
subdat <- WT9397[sample(nrow(WT9397), 200), 2:4]
attach(subdat)

smooth.sspline(lon, lat, avgt)

detach(subdat)
```

`WTdiff` *World Average Winter Temperature Change (1963-1967 Vs 1993-1997)*

Description

The `WTdiff` data frame has 1391 rows and 4 columns. It contains the average temperature change from 1963-1967 to 1993-1997 for those stations having non-missing observations on the winter (Dec-Feb) for ten years (1963-1967 and 1993-1997).

Format

This data frame contains the following columns:

recid a numeric vector containing the coded information of the stations (length 11). The first three digits represent the country code; the next five digits, the station number; the last three digits, whether a station is a WMO staion or close to one.

lon a numeric vector containing the longitudes (in degrees) of the stations.

lat a numeric vector containing the latitudes (in degrees) of the stations.

avgd a numeric vector containing the average temperature change from 1963-1967 to 1993-1997 for the stations.

Source

The Global Historical Climatology Network (GHCN)
http://www.ncdc.noaa.gov/cgi-bin/res40.pl?page=ghcn.html

Examples

```
data(WTdiff)

## Fit a smoothing spherical spline with part of the data
subdat <- WTdiff[sample(nrow(WTdiff), 200), 2:4]
attach(subdat)

smooth.sspline(lon, lat, avgd)

detach(subdat)
```

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