Package ‘sphereplot’

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Title Spherical Plotting
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Description Various functions for creating spherical coordinate system plots via extensions to rgl.
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Spherical plotting routines

Description
Various low level and high level routines for generate spherical plots. Includes celestial sphere style 3D grid and routines for overlaying additional points and text. Requires rgl.

Details

| Package:  | sphereplot |
| Type:     | Package    |
| Version:  | 1.5        |
| Date:     | 2013-09-22 |
| License:  | GPL-2      |

Standard usage is to run rgl.sphgrid to make the 3D coordinate grid, then add points using rgl.sphpoints.

Author(s)
Aaron Robotham
Maintainer: Aaron Robotham <aaron.robotham@uwa.edu.au>

car2sph  

Transforms 3D cartesian coordinates to spherical coordinates

Description
Transforms 3D cartesian coordinates to spherical coordinates. The user can choose to return the spherical coordinates in degrees or radians.

Usage
car2sph(x, y, z, deg = TRUE)

Arguments
x  x values, can also contain a matrix of x, y and z (in that order).
y  y values.
z  z values
deg Should degrees be returned (default) or radians.
**pointsphere**

**Details**
This is a low level function that is used for plot transformations.

**Value**
A data.frame is returned containing the columns long (longitude), lat (latitude) and radius.

**Author(s)**
Aaron Robotham

**See Also**
`rgl.sphgrid`, `rgl.sphcirc`, `rgl.sphpoints`, `rgl.sphtext`, `rgl.sphsun`, `rgl.sphMW`, `pointsphere`, `sph2car`

**Examples**

```
print(car2sph(x=1,y=1,z=0,deg=TRUE))
```

---

**Description**
Randomly generates data points within a sphere that are uniformly distributed.

**Usage**
```
pointsphere(N = 100, longlim = c(0, 360), latlim = c(-90, 90), rlim = c(0, 1))
```

**Arguments**

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Number of random points.</td>
</tr>
<tr>
<td>longlim</td>
<td>Limits of longitude in degrees.</td>
</tr>
<tr>
<td>latlim</td>
<td>Limits of latitude in degrees.</td>
</tr>
<tr>
<td>rlim</td>
<td>Limits of radius.</td>
</tr>
</tbody>
</table>

**Details**
This function randomly generates data points within a sphere that are uniformly distributed. 3D pointing is based in efficient inversion of random uniform distributions, rather than a Monte-Carlo approach.

**Value**
Returns a data.frame containing the longitude, latitude and radius of the random points generated.
Author(s)
Aaron Robotham

See Also
rgl.sphgrid, rgl.sphcirc, rgl.sphpoints, rgl.sphtext, rgl.sphsun, rgl.sphMW, sph2car, car2sph

Examples
rgl.sphgrid()
rgl.sphpoints(pointsphere(100, c(0, 90), c(0, 45), c(0.25, 0.8)), deg=TRUE)

rgl.sphcirc  Great circle generator

Description
Function to generate a new great circle with arbitrary inclinations and radius.

Usage
rgl.sphcirc(CrossEq = 0, PeakDec = 0, radius = 1, deg = TRUE, col = "black", ...)

Arguments
CrossEq The right ascension where the new circle crosses the equator. This should be the crossing before the Declination values of the new great circle become positive.
PeakDec The peak declination the new great circle will reach.
radius The radius of the new great circle.
deg Specifies if input is in degrees (default) or radians.
col The colour of the new great circle line.
... Other arguments carried to lines3d.

Details
See rgl.sphsun and rgl.sphMW for examples of rgl.sphcirc in use.

Value
No value, used for plotting side effect.

Author(s)
Aaron Robotham
See Also

rgl.sphgrid, rgl.sphpoints, rgl.sphtext, rgl.sphsun, rgl.sphMW, pointsphere, sph2car, car2sph

Examples

rgl.sphgrid()
rgl.sphcirc(radius=0.5, col='blue')

rgl.sphgrid
Create a spherical plotting grid

Description

Creates a spherical plotting grid, within which further points can be added. Useful for astronomical plotting in particular, where this becomes the celestial sphere.

Usage

rgl.sphgrid(radius = 1, col.long='red', col.lat='blue', deggap = 15, longtype = "H", add = FALSE, radaxis=TRUE, radlab='Radius')

Arguments

radius The radial extent of the spherical grid.
deggap The attempted separation between spherical grid lines in degrees.
col.long The colour for longitude labels.
col.lat The colour for latitude labels.
longtype Specifies if longitudes should be labelled in hours (H- default) or degrees (D).
add Should the grid be added to the current plot, or if FALSE a new rgl device is launched.
radaxis Logical determining whether the sphere radius vector is drawn and labeled (default is TRUE). Pretty labeling is used to choose the location of ticks and labels.
radlab If 'radaxis' is TRUE then the 'radlab' parameter determines the name of the label.

Details

This function should be called first, and can generally be used with only the declaration of radius to good effect.

Value

No value, used for plotting side effect.
Author(s)

Aaron Robotham

Examples

rgl.sphgrid()

rgl.sphMW

Plot Galactic plane + Galactic centre

Description

This function overplots the Galactic plane on the default Equatorial coordinates, and optionally will add the Galactic centre.

Usage

rgl.sphMW(radius = 1, col = "purple", type = "s", MWcenrad = 0.02, addMWplane = TRUE)

Arguments

radius The radius at which to draw the Galactic plane and Galactic centre.

col The colour of the Galactic plane line and the Galactic centre.

type Rgl plot type for the Galactic centre, default is to draw it as a 3D sphere, i.e. type 's'.

MWcenrad The radius of the Galactic centre if plotted as a sphere.

addMWplane Should the Galactic plane be drawn.

Value

No value, used for plotting side effect.

Author(s)

Aaron Robotham

See Also

rgl.sphgrid, rgl.sphcirc, rgl.sphpoints, rgl.sphtext, rgl.sphsun, pointsphere, sph2car, car2sph

Examples

rgl.sphgrid()

rgl.sphMW()
rgl.sphpoints

Add points to spherical plots

Description

This function allows the native plotting of spherical coordinates (in degrees of radians) and is expected to be used in conjunction with rgl.sphgrid, which produces the spherical grid.

Usage

rgl.sphpoints(long, lat, radius, deg = TRUE, col = 'black', ...)

Arguments

long longitude values, can also contain a matrix of long, lat and radius (in that order).
lat latitude values.
radius radius values.
deg Specifies if input is in degrees (default) or radians.
col Specifies point colour.
... Other arguments carried to points3d.

Details

This function uses sph2car in conjunction with points3d to plot points on a spherical coordinate system.

Value

No value, used for plotting side effect.

Author(s)

Aaron Robotham

See Also

rgl.sphgrid, rgl.sphcirc, rgl.sphpoints, rgl.sphtext, rgl.sphsun, rgl.sphMW, pointsphere, sph2car, car2sph

Examples

rgl.sphgrid()
rgl.sphpoints(40, 50, 0.5, deg = TRUE, col = 'red', cex = 2)
rgl.sphsun  

Plot ecliptic + Sun

Description

This function overplots the ecliptic plane on the default Equatorial coordinates, and optionally will add the Sun either for a desired date, or for today.

Usage

```r
glr.sphsun(Ydate = c(3, 21), radius = 1, col = "yellow", type = "s", sunrad = 0.02,
addeclip = TRUE, addsun=TRUE)
```

Arguments

- **Ydate**: The date for the location of the Sun on the spherical grid. Vector in c(M,D) format. If set to 'get' then the function will return the Sun’s location for today.
- **radius**: The radius at which to draw the ecliptic plane and Sun.
- **col**: The colour of the ecliptic line and for the Sun.
- **type**: Rgl plot type for the Sun, default is to draw it as a 3D sphere, i.e. type ‘s’.
- **sunrad**: The radius of the Sun if plotted as a sphere.
- **addeclip**: Should the ecliptic plane be drawn.
- **addsun**: Should the location of the Sun be plotted.

Value

No value, used for plotting side effect.

Author(s)

Aaron Robotham

See Also

- `rgl.sphgrid`
- `rgl.sphcirc`
- `rgl.sphpoints`
- `rgl.sphtext`
- `rgl.sphMW`
- `pointsphere`
- `sph2car`
- `car2sph`

Examples

```r
rgl.sphgrid()
rgl.sphsun()

rgl.sphgrid()
rgl.sphsun("get",radius=2,col="red")

open3d()
```
rgl.sphtext

Add text to spherical plot

Description

Adds generic text to a spherical coordinate plot.

Usage

rgl.sphtext(long, lat, radius, text, deg = TRUE, col = 'black', ...)

Arguments

long      longitude values, can also contain a matrix of long, lat and radius (in that order).
lat       latitude values.
radius    radius values.
text      text values to be plotted.
deg       Specifies if input is in degrees (default) or radians.
col       Specifies text colour.
...       Other arguments carried to points3d.

Details

This function uses sph2car in conjunction with text3d to plot text on a spherical coordinate system.

Value

No value, used for plotting side effect.

Author(s)

Aaron Robotham

See Also

rgl.sphgrid, rgl.sphcirc, rgl.sphpoints, rgl.sphsun, rgl.sphMW, pointsphere, sph2car, car2sph

Examples

rgl.sphgrid()
rgl.sphtext(40, 50, 0.5, 'HI!', deg = TRUE, col = 'red', cex = 2)
sph2car  
Transforms 3D spherical coordinates to cartesian coordinates

Description
Transforms 3D spherical coordinates to cartesian coordinates. The user can choose to input the spherical coordinates in degrees or radians.

Usage
sph2car(long, lat, radius = 1, deg = TRUE)

Arguments
long  longitude values, can also contain a matrix of long, lat and radius (in that order).
lattitude values.
radius  radius values.
deg  Specifies if input is in degrees (default) or radians.

Details
This is a low level function that is used for plot transformations.

Value
A data.frame is returned containing the columns x, y and z.

Author(s)
Aaron Robotham

See Also
rgl.sphgrid, rgl.sphcirc, rgl.sphpoints, rgl.sphtext, rgl.sphsun, rgl.sphMW, pointsphere, car2sph

Examples
print(sph2car(45,0,sqrt(2),deg=TRUE))
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