Package 'Triangulation'

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Type Package

Title Triangulation in 2D domain

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Imports pracma, tripack

Depends R (>= 2.10)

Description This package can help create triangles mesh by using Delaunay triangulation.

License GPL (>= 2)

Encoding UTF-8

LazyData true

RoxygenNote 6.1.1

R topics documented:

BMP *Bandiagara Domain Boundary Data*

Description

A list of coordinates of the boundary vertices of Bandiagara

Usage

```
data('BMP')
```

Format

BMP is a list of three dataframes including vertices information of external and internal boundaries of Bandiagara.

bound The coordinates of external boundaries.

H1 The coordinates of an internal hole in the region.

H2 The coordinates of an internal hole in the region.

References

Data courtesy by Jean Gaudart, 2012.

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shape *Example from Distmesh (MATLAB)*

Description

A dataframe of coordinates of the external boundary of a polygon region developed.

Usage

```
data('shape')
```

Format

shape is a dataframe with vertices of the boundary of a polygon region.

v1 The latitudes of the external boundary.

v2 The longtitudes of the external boundary.

References

This example is from a triangulation software called distmesh.

TriMesh *Create Triangles Mesh in 2D Domains*

Description

This function triangulates the polygonal domain by using Delaunay Triangulation.

Usage

```
TriMesh(Pt, n, H = NULL)
```

Arguments

Pt	A two by N matrix which indicates the outer boundry points of a 2D region.
n	An integer parameter controlling the fineness of the triangulation and subsequent triangulation. As n increases the fineness increases. Usually, n = 8 seems to be a good choice.
H	A list of vertices that are the inner boundary points, default set to 'NULL' if there is no holes.

Details

In the function, we firstly get grid points inside and on the boundary of the polygon with extreme points Pt and interior holes defined by H. Then delaunay triangulation is used to generate triangulations by using the grid points. And lastly we delete triangles within the holes or outside the boundary of the region.

Value

V	an N by two matrix that lists vertices with the ith row storing in Cartesian coordinates for the ith vertex. N is the number of vertices.
Tr	a K by three matrix that each row represents one triangle. All the elements are the integers that stand for the indices of vertices in V.

Examples

```
# rectangular domain
bb=rbind(c(0,0),c(1,0),c(1,1),c(0,1))
VT=TriMesh(bb,2)

# irregular domain
data("horseshoe")
VT=TriMesh(horseshoe,n=8)

data('shape')
VT=TriMesh(shape,15)

data('weird')
VT=TriMesh(weird,25)

# region with holes
data("BMP")
VT=TriMesh(BMP$bound,25,list(as.matrix(BMP$H1),as.matrix(BMP$H2)))

data("mymontreal")
VT=TriMesh(mymontreal$bound,25,list(mymontreal$H1,mymontreal$H2))
```

TriPlot *Triangulation Plot*

Description

This function plots a 2D triangulation.

Usage

```
TriPlot(V, Tr, col = 1, lwd = 1)
```

Arguments

V	an N by two matrix that lists vertices with the ith row storing in Cartesian coordinates for the ith vertex. N is the number of vertices.
Tr	a K by three matrix that each row represents one triangle. All the elements are the integers that stand for the indices of vertices in V.
col	A specification for the plotting color, defaulting to 1.
lwd	The line width, a positive number, defaulting to 1. The interpretation is device-specific, and some devices do not implement line widths less than one.

Value

A triangulation plot of a 2D region.

Examples

```
# rectangular domain
bb=rbind(c(0,0),c(1,0),c(1,1),c(0,1))
VT=TriMesh(bb,2)
TriPlot(VT$V,VT$Tr)

# irregular domains
data("horseshoe")
VT=TriMesh(horseshoe,n=8)
TriPlot(VT$V,VT$Tr)

data('shape')
VT=TriMesh(shape,15)
TriPlot(VT$V,VT$Tr)

data('weird')
VT=TriMesh(weird,25)
TriPlot(VT$V,VT$Tr)

# region with holes
data("BMP")
VT=TriMesh(BMP$bound,25,list(as.matrix(BMP$H1),as.matrix(BMP$H2)))
TriPlot(VT$V,VT$Tr)

data("mymontreal")
VT=TriMesh(mymontreal$bound,25,list(mymontreal$H1,mymontreal$H2))
TriPlot(VT$V,VT$Tr)
```

weird *weird*

Description

A dataframe of coordinates of an external boundary of a spiral region.

Usage

```
data('weird')
```

Format

`weird` is a dataframe with vertices of the boundary of a spiral region.

v1 The latitudes of the external boundary.

v2 The longtitudes of the external boundary.

References

This example is courtesy by Phong Luu during class.

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