Package 'MinkowskiSum'

October 28, 2022

Type Package

Title Minkowski Addition Between 3D Meshes

Version 1.0.0

Maintainer Stéphane Laurent <laurent_step@outlook.fr>

Description Computes the Minkowski sum of two 3D meshes, resulting in a new 3D mesh. The Minkowski addition has applications in mathematical morphology and 3D computer graphics. The computations are performed by the 'C++' library 'CGAL' (<https://www.cgal.org/>).

License GPL-3

URL https://github.com/stla/MinkowskiSum

BugReports https://github.com/stla/MinkowskiSum/issues

Depends R (>= 2.10)

Imports data.table, gmp, PolygonSoup, Rcpp (>= 1.0.9)

Suggests rgl

LinkingTo BH, Rcpp, RcppCGAL, RcppEigen

Encoding UTF-8

LazyData true

RoxygenNote 7.2.1

SystemRequirements C++ 17, gmp, mpfr

NeedsCompilation yes

Author Stéphane Laurent [aut, cre]

Repository CRAN

Date/Publication 2022-10-28 16:32:36 UTC

R topics documented:

`MinkowskiSum` *Minkowski sum of two meshes*

Description

Returns the mesh defined as the Minkowski sum of the two input meshes.

Usage

```
MinkowskiSum(mesh1, mesh2, triangulate = TRUE, normals = FALSE)
```

Arguments

`mesh1`, `mesh2`	two meshes, each one given either as a list containing (at least) the two fields `vertices` (numeric matrix with three columns) and `faces` (integer matrix or list of integer vectors), otherwise a **rgl** mesh (i.e. a `mesh3d` object)
`triangulate`	Boolean, whether to triangulate the output mesh (note that it is not necessarily triangle when the two input meshes are triangle)
`normals`	Boolean, whether to return the vertex normals of the output mesh

Value

A mesh of class `cgalMesh` (list with `vertices`, `faces`, and more; see `Mesh`).

Examples

```
# example 1: octahedron + icosahedron
library(MinkowskiSum)
library(rgl)
mesh1 <- octahedron3d()
mesh2 <- icosahedron3d()
mesh <- MinkowskiSum(mesh1, mesh2, normals = FALSE)
rglmesh <- toRGL(mesh)
open3d(windowRect = c(50, 50, 562, 562))
view3d(30, 30, zoom = 0.8)
shade3d(rglmesh, color = "maroon")
plotEdges(mesh[["vertices"]], mesh[["edges0"]], color = "darkred")

# example2: truncated icosahedron + tetrahedron
library(MinkowskiSum)
library(rgl)
# mesh 1
data(truncatedIcosahedron, package = "PolygonSoup")
mesh1 <- truncatedIcosahedron
# mesh 2: regular tetrahedron
a <- 1 / sqrt(3)
vertices <- rbind(
c( a, -a, -a),
c( a,  a,  a),
```

```
c(-a, -a,  a),
c(-a,  a, -a)
)
faces <- rbind(
c(1L, 2L, 3L),
c(3L, 2L, 4L),
c(4L, 2L, 1L),
c(1L, 3L, 4L)
)
mesh2 <- list(vertices = vertices, faces = faces)
# sum
mesh <- MinkowskiSum(mesh1, mesh2, normals = FALSE)
# plot
rglmesh <- toRGL(mesh)
open3d(windowRect = c(50, 50, 562, 562))
view3d(30, 30, zoom = 0.8)
shade3d(rglmesh, color = "navy")
plotEdges(mesh[["vertices"]], mesh[["edges0"]], color = "yellow")
```

`MinkowskiSum-imports` *Objects imported from other packages*

Description

These objects are imported from other packages. Follow the links to their documentation: `toRGL`, `plotEdges`.

`septuaginta` *Septuaginta*

Description

A mesh of the Septuaginta, also known as Leonardo da Vinci's 72-sided sphere or Campanus's sphere. This is a convex polyhedra with 62 vertices and 72 faces.

Usage

```
septuaginta
```

Format

A list with two fields: `vertices` and `faces`.

Index