Package 'volesti'

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Type Package

License GPL (>= 2)

Title Volume approximation using VolEsti and CV algorithms.

Description Package provides C++ code and a Rcpp interface for volume approxiation.
The main function takes as input a H-polytope or a V-polytope and apply
VolEsti or CV algorithm.

Maintainer Fisikopoulos Vissarion <vissarion.fysikopoulos@oracle.com>, Chalkis Apostolos <tolis.chal@gmail.com>

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BugReports https://github.com/vissarion/volume_approximation/issues

SystemRequirements C++11

Depends Rcpp (>= 0.12.17), RcppEigen, lpSolveAPI, BH

Imports Rcpp (>= 0.12.17)

LinkingTo Rcpp, RcppEigen, BH

RoxygenNote 6.0.1

Author Fisikopoulos Vissarion [cph, cre, aut],
Chalkis Apostolos [cph, ctb, aut] (Contribution and development, as
part of Google Summer of Code 2018 program)

R topics documented:

CheBall *Compute the Chebychev ball of a H-polytope, P:= Ax<=b*

Description

Compute the Chebychev ball of a H-polytope, P:= Ax<=b

Usage

```
CheBall(A, b)
```

Arguments

A	the matrix of the H-polytope
b	the vector with the constants of the hyperplanes

Value

The Chebychev center of the Polytope discribed by the matrix A and the vector b

Examples

```
CheBall(A,b)
```

demoVolume *Run some experiments*

Description

Run volesti or CV algorithm to approximate the volume of some cubes, simplices, skinny_cubes, cross polytopes, birkhoff polytopes.

Usage

```
demoVolume(algo)
```

Value

Print the computed volumes and the total time

Examples

```
#test volesti
demoVolume("volesti")
#test CV
demoVolume("CV")
```

`ineToMatrix` *functiion to get a ine file and return matrix A in ine format for VolEsti()*

Description

functiion to get a ine file and return matrix A in ine format for VolEsti()

Usage

```
ineToMatrix(P)
```

Arguments

`P`	It is in format, read.cs('path/to/file.ine'). The ine file desrcibies the H-polytope

Value

The numerical matrix in ine format of `read.cs('path/to/file.ine')`

Examples

```
ineToMatrix(read.cs('path/to/data/cube40.ine'))
```

`modifyMat` *takes a numerical matrix in ine format and return numerical matrix A and vector b: Ax<=b*

Description

takes a numerical matrix in ine format and return numerical matrix A and vector b: Ax<=b

Usage

```
modifyMat(A)
```

Arguments

`A`	the numerical matrix in ine format of the H-polytope

Value

numerical matrix A and vector b: Ax<=b

Examples

```
modifyMat(A)
```

volume *The main R function for volume approximation of a convex H-Polytope*

Description

The main R function for volume approximation of a convex H-Polytope

Usage

```
volume(Inputs)
```

Arguments

list("argument"=value)	A list that includes alla the parameters of the algorithm
path	The path to an ine or ext file that describes the H-polytope. If path is given then "matrix" and "vector" inputs are not needed
matrix	The matrix A of the polytope. If it is in ine format then the input "vector" is not needed
vector	The vector b that containes the constants of the hyperplanes
Walk_length	Optional. Declare the number of the steps for the random walk, default is 10+d/10
error	Optional. Declare the goal for the approximation error. Default is 1 for volesti and 0.2 for CV.
Chebychev	Optional. A d+1 vector that containes the chebychev center in the first d coordinates and the radius of the chebychev ball in the last coordinate
annealing	Optional. A boolean parameter to use CV algorithm. Default value is false.
win_len	Optional. The size of the window for the ratios' approximation in CV algorithm. Default value is win_len=4*(dimension^2)+500
C	Optional. a constant for the upper boud of variance/mean^2 in schedule annealing
N	optional. The number of points we sample in each step of schedule annealing in CV algorithm. Default value is N=500*C+(dimension^2)/2
ratio	Optional. parameter of schedule annealing, larger ratio means larger steps in schedule annealing. Default value is ratio=1-1/dimension
frac	Optional. the fraction of the total error to spend in the first gaussian. Default value is frac=0.1
ball_walk	Optional. Boolean parameter to use ball walk, only for CV algorithm .Default value is False
delta	Optional. The radius for the ball walk
verbose	Optional. A boolean parameter for printing. Default is False
vpoly	A boolean parameter, has to be true when a V-polytope is given as input

`coordinate`	Optional. A boolean parameter for the hit-and-run. True for Coordinate Directions HnR, false for Random Directions HnR. Default value is True
`rounding`	Optional. A boolean parameter to activate the rounding option. Default value is False
`test`	Optional. A boolean parameter. Declare if the current excecution is a test or not. Default value is False

Value

The approximation of the volume of an H-polytope

Examples

```
VolEsti(list("path"=/path/to/ine/file, "verbose"=TRUE))
```

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