Package 'hgmFB'

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Type Package

Depends R (>= 2.6.0)

Title Fisher-Bingham Distribution by HGM

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Description This package evaluates the normalizing constant for the Fisher-Bingham distributions and solves MLE problems by utilizing the holonomic gradient method (HGM)

License GPL-2

LazyLoad yes

URL http://www.openxm.org

R topics documented:

`hgmFB-package` *HGM*

Description

This package evaluates the normalizing constant for the Fisher-Bingham distributions and solves MLE problems by utilizing the holonomic gradient method.

Details

Package:	hgm_fb
Type:	Package
License:	GPL-2
LazyLoad:	yes

This package evaluates the normalizing constant for the Fisher-Bingham distributions and solves MLE problems by utilizing the holonomic gradient method. The HGM and HGD are proposed in the paper below. This method based on the fact that a broad class of normalizing constants of unnormalized probability distributions belongs to the class of holonomic functions, which are solutions of holonomic systems of linear partial differential equations.

References

N3OST2 Hiromasa Nakayama, Kenta Nishiyama, Masayuki Noro, Katsuyoshi Ohara, Tomonari Sei, Nobuki Takayama, Akimichi Takemura, Holonomic Gradient Descent and its Application to Fisher-Bingham Integral, Advances in Applied Mathematics 47 (2011), 639–658, http://dx.doi.org/10.1016/j.aam.2011.03.001

dojo Edited by T.Hibi, Groebner Bases: Statistics and Software Systems, Springer, 2013, http://dx.doi.org/10.1007/978-4-431-54574-3

- http://www.openxm.org

See Also

hgm.z.mleFBByOptim,

`hgm.z.mleFBByOptim` *MLE of Fisher-Bingham distribution by optim and HGM.*

Description

It makes the maximal likelihood estimate (MLE) for the Fisher-Bingham distribution on S^d.

Usage

```
hgm.z.mleFBByOptim(d=0,ss=NULL,data=NULL,start=NULL,lb=NULL,ub=NULL,bigValue=10000)
```

Arguments

`d`	The dimension of the sphere
`ss`	Sufficient statistics
`data`	The argument data is a set of data on the d-dimensional sphere. Its format is an n by (d+1) matrix where n is the number of data. When data is given, ss must be NULL and ss is calculated from data by hgm.ssFB(data).
`start`	Starting point for the function optim. The default value is a random vector.

lb	An array of length sslen = (d+1)*(d+2)/2 + (d+1), each of which is the lower bound of the parameter. The default value is -100.
ub	An array of length sslen = (d+1)*(d+2)/2 + (d+1), each of which is the upper bound of the parameter. The default value is 100.
bigValue	It is used as a value wall to avoid that the evaluation point is out of the search domain defined by lb and ub.

Details

It solves the MLE for the Fisher-Bingham distribution. The normalizing constant is evaluated by hgm_ko_ncfb (external program, which should in the path). The function

optim is used for the optimization. The output is used as a starting point for the holonomic gradient method. See nk_fb_gen_c.rr of http://www.math.kobe-u.ac.jp/Asir. This function generates temporary work files whose names start with tmp. `data <- read.table(fileName,sep=",")` can be used to read CSV data from a file.

Value

The output format is that of the function optim().

Author(s)

T.Koyama, H.Nakayama, K.Nishiyama, N.Takayama.

References

T. Koyama, H. Nakayama, K. Nishiyama, N. Takayama, Holonomic Gradient Descent for the Fisher-Bingham Distribution on the d-dimensional Sphere, Computational Statistics (2013) http://dx.doi.org/10.1007/s00180-013-0456-z

See Also

optim

Examples

```
## =====================================================
## Example 1. Asteroid data in [N3OST2]
## =====================================================
## Not run:
  d <- 2
  ss <- c(0.3119,0.0292,0.0707,
               0.3605,0.0462,
                  0.3276,
          0.0063,0.0054,0.0762)
  start <- c(0.1,0.1,1,1,1,-1,-1,-1,-1)
  hgm.z.mleFBByOptim(d=d,ss=ss,start=start)

## End(Not run)
```

Index