Package 'woylier'

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Title Alternative Tour Frame Interpolation Method

Version 0.0.9

Description This method generates a tour path by interpolating between d-D frames in p-D using Givens rotations. The algorithm arises from the problem of zeroing elements of a matrix. This interpolation method is useful for showing specific d-D frames in the tour, as opposed to d-D planes, as done by the geodesic interpolation. It is useful for projection pursuit indexes which are not s invariant. See more details in Buj, Cook, Asimov and Hurley (2005) <doi:10.1016/S0169-7161(04)24014-7> and Batsaikhan, Cook and Laa (2023) <doi:10.48550/arXiv.2311.08181>.

Depends R (>= 4.1)

Imports tourr, geozoo, dplyr, tibble

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Encoding UTF-8

RoxygenNote 7.3.2

Suggests knitr, rmarkdown, purrr, ggplot2, ash, testthat (>= 3.0.0)

Config/testthat/edition 3

URL https://numbats.github.io/woylier/,
https://github.com/numbats/woylier

BugReports https://github.com/numbats/woylier/issues

VignetteBuilder knitr

NeedsCompilation no

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Repository CRAN

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Contents

`add_path` *Overlay paths of interpolation on the sphere*

Description

Overlay paths of interpolation on the sphere

Usage

```
add_path(proj_space, path)
```

Arguments

`proj_space`	n number of points on the surface of sphere
`path`	interpolated path

Value

data frame with interpolated path and points on sphere surface

Examples

```
p <- 4
base1 <- tourr::basis_random(p, d=1)
base2 <- tourr::basis_random(p, d=1)
path <- woylier::givens_full_path(base1, base2, nsteps=10)
sp <- woylier::generate_space_view(p=p)
sp_path <- woylier::add_path(sp, path)
tourr::animate_xy(sp_path[,1:4], col=sp_path$type)
```

generate_space_view *Generate the background sphere or torus*

Description

Generate the background sphere or torus

Usage

```
generate_space_view(n = 1000, p = 3, d = 1)
```

Arguments

n	number of points on the sphere
p	dimension of data
d	dimension of projection

Value

n number of points on the surface of sphere

Examples

```
p <- 4
sp <- generate_space_view(p=p)
```

givens_full_path *Construct full interpolated frames*

Description

Construct full interpolated frames

Usage

```
givens_full_path(Fa, Fz, nsteps)
```

Arguments

Fa	starting pxd frame
Fz	target pxd frame
nsteps	number of steps of interpolation

Value

array with nsteps+1 matrices. Each matrix is interpolated frame in between starting and target frames.

Examples

```
p <- 4
base1 <- tourr::orthonormalise(tourr::basis_random(p, d=1))
base2 <- tourr::orthonormalise(tourr::basis_random(p, d=1))
path <- woylier::givens_full_path(base1, base2, nsteps=10)
```

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grand_tour_givens *Create a grand tour with Givens interpolation*

Description

Create a grand tour with Givens interpolation

Usage

```
grand_tour_givens(d = 2, ...)
```

Arguments

d	dimension of projection
...	additional parameters to pass through

Value

creates grand tour

Examples

```
data(sine_curve)
tourr::animate(sine_curve, woylier::grand_tour_givens(), tourr::display_xy())
```

guided_tour_givens *Create a guided tour with Givens interpolation*

Description

Create a guided tour with Givens interpolation

Usage

```
guided_tour_givens(
  index_f,
  d = 2,
  alpha = 0.5,
  cooling = 0.99,
  max.tries = 25,
  max.i = Inf,
  optim = "search_geodesic",
  n_sample = 100,
  ...
)
```

Arguments

index_f	the index function to optimize.
d	target dimensionality
alpha	the initial size of the search window, in radians
cooling	the amount the size of the search window should be adjusted by after each step
max.tries	the maximum number of unsuccessful attempts to find a better projection before giving up
max.i	the maximum index value, stop search if a larger value is found
optim	character indicating the search strategy to use: search_geodesic, search_better, search_better_random, search_polish. Default is search_geodesic.
n_sample	number of samples to generate if search_f is search_polish
...	arguments sent to the search_f

Value

creates guided tour

Examples

```
data(sine_curve)
tourr::animate_xy(sine_curve, guided_tour_givens(tourr::splines2d()), sphere=FALSE)
```

`planned_tour_givens` *A planned tour path using frame-to-frame interpolation.*

Description

The planned tour takes you from one basis to the next in a set order. Once you have visited all the planned bases, you either stop or start from the beginning once more (if `cycle = TRUE`).

Usage

```
planned_tour_givens(basis_set, cycle = FALSE)
```

Arguments

`basis_set`	the set of bases as a list of projection matrices or a 3d array
`cycle`	cycle through continuously (`TRUE`) or stop after first pass (`FALSE`)

Details

Usually, you will not call this function directly, but will pass it to a method that works with tour paths like `tour::animate()`, `tourr::save_history()` or `tourr::render()`.

Value

creates planned tour path

See Also

The `tourr::little_tour()`, a special type of planned tour which cycles between all axis parallel projections.

Examples

```
library(tourr)
twod <- save_history(flea[, 1:3], max = 5)
str(twod)
tourr::animate_xy(flea[, 1:3], woylier::planned_tour_givens(twod))
tourr::animate_xy(flea[, 1:3], woylier::planned_tour_givens(twod, TRUE))
oned <- tourr::save_history(flea[, 1:6], tourr::grand_tour(1), max = 3)
tourr::animate_dist(flea[, 1:6], woylier::planned_tour_givens(oned))
```

`sine_curve measurements` *Simulated 6D data with a sine curve*

Description

The data has 6 columns, labelled V1-V6, where the sine curve is in V5, V6. The other columns are normal samples.

Format

A 500x6 data frame

Examples

```
library(woylier)
data(sine_curve)
plot(sine_curve$V5, sine_curve$V6)
```

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