Package ‘sfd’

January 8, 2024

**Title**  Space-Filling Design Library

**Version**  0.1.0

**Description**  A collection of pre-optimized space-filling designs, for up to ten parameters, is contained here. Functions are provided to access designs described by Husslage et al (2011) <doi:10.1007/s11081-010-9129-8> and Wang and Fang (2005) <doi:10.1142/9789812701190_0040>. The design types included are Audze-Eglais, MaxiMin, and uniform.

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**Depends**  R (>= 2.10), tibble

**Imports**  cli, rlang

**Suggests**  ggplot2, spelling, testthat (>= 3.0.0)

**Config/testthat/edition**  3

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**Language**  en-US

**LazyData**  true

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get_design

Retrieve a Space-Filling Design

Description

Obtain a space-filling design (if possible) based on how many characteristics (i.e. parameters) and size (i.e., number of grid points).

Usage

get_design(num_param, num_points, type = "any")

Arguments

num_param An integer between two and ten for the number of characteristics/factors/parameters in the design.
num_points An integer for the number of grid points requested. If there is no corresponding design, an error is given (when using get_design())
type A character string with possible values>"any","audze_eglais","max_min_l1","max_min_l2", and "uniform". A value of "any" will choose the first design available (in alphabetical order).

Details

The "audze_eglais","max_min_l1", and "max_min_l2" designs are from https://www.spacefillingdesigns.nl/.

The uniform designs were pre-computed using mixto::unidTab() using the method of Wang and Fang (2005) using the C2 criterion.

Value

A tibble (data frame) with columns named X1 to X{num_param}. Each column is an integer for the ordered value of the real parameter values.

References

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Examples

if (rlang::is_installed("ggplot2")) {
  library(ggplot2)

  two_param_l2 <- get_design(2, 100, type = "audze_eglais")

  ggplot(two_param_l2, aes(X1, X2)) +
  geom_point() +
  coord_equal()
}

no_design <- try(get_design(2, 1000), silent = TRUE)
cat(as.character(no_design))

---

sfd_available

Is a Space-Filling Design Available?

Description

Determine if a design from [https://www.spacefillingdesigns.nl/](https://www.spacefillingdesigns.nl/) is available in this package based on how many characteristics (i.e. parameters), size (i.e., number of grid points), and type.

Usage

sfd_available(num_param, num_points, type = "any")

Arguments

- **num_param**: An integer between two and ten for the number of characteristics/factors/parameters in the design.
- **num_points**: An integer for the number of grid points requested. If there is no corresponding design, an error is given (when using `get_design()`)
- **type**: A character string with possible values: "any", "audze_eglais", "max_min_l1", "max_min_l2", and "uniform". A value of "any" will choose the first design available (in alphabetical order).

Value

A logical

Examples

sfd_available(2, 10)
sfd_available(2, 10^5)
Description
This data object is a list of designs originating from [https://www.spacefillingdesigns.nl/](https://www.spacefillingdesigns.nl/). While the original website offers no guarantee or license, they do state that "All these designs have been compared and the best designs are collected on this website. They can be downloaded for free and used in your specific simulation environment".

Details
The available designs in this package are for experiments where the number of parameters ranges from two to ten of types "audze_eglais", "max_min_l1", or "max_min_l2". See Husslage et al (2011).

The format is a list with nine elements for dimensions of two to ten experimental factors/parameters. The designs are concatenated with columns of design type and number of points. The values are integers between one and the number of design points.

Value
- **sfd_lib** - a list of tibble

Source

Examples
```r
data(sfd_lib)
if (rlang::is_installed("ggplot2")) {
  library(ggplot2)

  two_params <- sfd_lib[[1]]
  two_params <- two_params[two_params$num_points == 25,

  ggplot(two_params, aes(X1, X2, col = type)) +
  geom_point() +
  facet_wrap(~ type, nrow = 1) +
  coord_equal()
}
}
**update_values**

*Update the Values of a Design*

**Description**

For a set of values, this function inserts the actual values of the design produced by `get_design()`.

**Usage**

`update_values(design, values)`

**Arguments**

- `design` A tibble produced by `get_design()`. The column values should be unmodified.
- `values` A list of vectors containing the possible values for each parameter. There should be as many values (of any type) as there are rows in `design`. For numeric data, it is preferable that the values are equally spaced.

**Value**

An updated tibble.

**Examples**

```r
des <- get_design(3, 6)
des

vals <- list(1:6, letters[1:6], seq(20, 21, length.out = 6))

des_2 <- update_values(design, values)
des_2
```
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