Package 'min2HalfFFD'

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Type Package

Title Minimally Changed Two-Level Half-Fractional Factorial Designs

Version 0.1.0

Maintainer Bijoy Chanda <bijoychanda08@gmail.com>

Description

In many agricultural, engineering, industrial, post-harvest and processing experiments, the number of factor level changes and hence the total number of changes is of serious concern as such experiments may consists of hard-to-change factors where it is physically very difficult to change levels of some factors or sometime such experiments may require normalization time to obtain adequate operating condition. For this reason, run orders that offer the minimum number of factor level changes and at the same time minimize the possible influence of systematic trend effects on the experimentation have been sought. Factorial designs with minimum changes in factors level may be preferred for such situations as these minimally changed run orders will minimize the cost of the experiments. This technique can be employed to any half replicate of two level factorial run order where the number of factors are greater than two. For method details see, Bhowmik, A., Varghese, E., Jaggi, S. and Varghese, C. (2017) <doi:10.1080/03610926.2016.1152490>. This package generates all possible minimally changed two-level half-fractional factorial designs for different experimental setups along with various statistical criteria to measure the performance of these designs through a user-friendly interface. It consist of the function minimal.2halfFFD() which launches the application interface.

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Encoding UTF-8

Imports shiny, hrtlFMC, shinybusy

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VignetteBuilder knitr

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Author Bijoy Chanda [aut, cre, ctb],
Arpan Bhowmik [aut, ctb],
Seema Jaggi [aut],
Eldho Varghese [aut, ctb],

Cini Varghese [aut],
Anindita Datta [aut],
Dibyendu Deb [aut]

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Contents

`minimal.2halfFFD` *Construct All Possible Minimally Changed Two-Level Half-Fractional Factorial Designs*

Description

In Design of Experiments (DOE) theory, the two levels of a factor are commonly represented as integers, for example, -1 for the low level and +1 for the high level. The 'minimal.2halfFFD()' function launches an interactive shiny application that enables users to construct and explore all possible minimally changed two-level half-fractional factorial designs. These designs are particularly useful in experiments involving hard-to-change factors or situations where frequent factor-level changes are costly or time-consuming.

Usage

```
minimal.2halfFFD()
```

Details

The shiny application provides an intuitive and visually organized interface for constructing and analyzing all possible minimally changed two-level half-fractional factorial designs. It is particularly suited for experiments where some factors are difficult or costly to change between runs.

The interface is divided into two main sections:

1. Input Panel (Left Side):

- *Enter Number of Factors* - Specify the number of two-level factors. The number must be greater than two.
- *Trend Factor Range* - Enter the lower and upper bounds (values between 0 and 1) The upper bound must be greater than the lower bound.
- *Generate Button* - Initiates the computation and triggers the generation of all possible minimally changed designs.

2. Results Panel (Right Side): After clicking the *Generate* button, results are displayed in a structured, color-coded layout. A dropdown menu titled 'Select Result to Display' allows users to choose what to view:

- *Total Change* - Displays the sum of per-factor level changes of a run order.
- *Total Number of Minimally Changed Designs* - Displays total number of all the minimally changed two-level half-fractional factorial designs.
- *All Minimally Changed Designs* - Shows all the minimally changed two-level half-fractional factorial designs.
- *All Minimally Changed Designs with D, Dt, Trend Factor* - Presents designs with corresponding D, Dt and Trend Factor values.
- *Maximum D Value* - Maximum D-value within the generated minimally changed designs.
- *D-Optimal Designs* - Designs with the Maximum D-value within the generated minimally changed designs.
- *Maximum Dt Value* - Maximum Dt-value within the generated minimally changed designs.
- *Dt-Optimal Designs* - Designs with the Maximum Dt-value within the generated minimally changed designs.
- *Maximum Trend Factor* - Displays the Maximum Trend Factor Value for the generated minimally changed designs.
- *Number of Minimally Changed Designs with Maximum Trend Factor Value* - Shows Number of minimally changed designs with Maximum Trend Factor value
- *Minimally Changed Designs in Trend Factor Range* - Shows Minimally changed designs within the specified range of trend factor

Value

Opens a user-friendly interactive shiny application for generating minimally changed two-level half-fractional factorial designs

References

Bhowmik, A., Varghese, E., Jaggi, S., and Varghese, C. (2015). Factorial experiments with minimum changes in run sequences. *Journal of the Indian Society of Agricultural Statistics*, 69(3), 243-255.

Bhowmik, A., Varghese, E., Jaggi, S., and Varghese, C. (2017). Minimally changed run sequences in factorial experiments. *Communications in Statistics-Theory and Methods*, 46(15), 7444-7459.

Bhowmik, A., Varghese, E., Jaggi, S., and Varghese, C. (2020). On the generation of factorial designs with minimum level changes. *Communications in Statistics-Simulation and Computation*, 51(6), 3400-3409.

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Tack, L., and Vandebroek, M. (2001). (Dt, C)-optimal run orders. *Journal of Statistical Planning and Inference*, 98, 293-310.

Examples

```
if (interactive()) {
  minimal.2halfFFD()
}
```

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