Package 'OWEA' November 3, 2018

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Type Package
Title Optimal Weight Exchange Algorithm for Optimal Designs for Three Models
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Description An implementation of optimal weight exchange algorithm Yang(2013) <doi:10.1080 01621459.2013.806268=""> for three models. They are Crossover model with subject dropout, crossover model with proportional first order residual effects and interference model. You can use it to find either A-opt or D-opt approximate designs. Exact designs can be automatically rounded from approximate designs and relative efficiency is provided as well.</doi:10.1080>
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design	Design Generator for Three Models	
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Description

Construct optimal approximate designs as well as efficient exact designs for crossover model with subject dropout, crossover model with proportional residual effect, and interference model.

Usage

```
design(model = c("dropout", "proportional", "interference"), n, opt, t,
  p, ..., max_iter = 40)
```

Arguments

model	an model indicator, must be one of 'dropout', 'proportional', or 'interference'.
n	Positive Integer, total number of observations needed.
opt	Integer. optimal criterion indicator, opt = 0 means D-opt, opt = 1 means A-opt
t	Positive interger, number or levels of treatment, the default coding is integer from 1 to t
p	Numeric, number of periods for crossover model or number of blocks for intereference model
	other necessary control parameters required by specific model For crossover with dropout, drop, a numeric vector of dropout mechanism For crossover proportional, lambda, value of proportion cofficient in proportional model and sigma, assumed covariance matrix. For interference model, sigma, assumed covariance matrix.
max_iter	a positive integer. Controls maximum iteration time of exchange. Default is 40.

Value

A S3 object of one of classes 'dropout', 'proportional' or 'interference'.

model	the model name
n	total number of observations of exact design
opt	optimal criterion
t	number of levels of treaments
р	number of periods or plots in a block
	other inputs
initial_design	a randomly chosen design as a starting point for newton's method
exact_design	an exact design rounded from approximate design
approx_design	optimal approximate design

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verify_equivalence

result of general equivalence theorem, the last entry is the value of directional

derivative

time

computing time for approximate design

See Also

```
eff, effLB, summary
```

Examples

```
# NOTE: max_iter is usually set to 40.
# Here max_iter = 5 is for demenstration only.
# crossover dropout model
## D-optimal
example1 <- design('dropout', 10,0,3,3,drop=c(0,0,0.5), max_iter = 5)
summary(example1)
eff(example1) # efficiency from rounding
effLB(example1) # obtain lower bound of efficiency
## A-optimal
design('dropout', 10, 1, 3, 3, drop=c(0, 0, 0.5), max_iter = 5)
# proportional model
## D-optimal
design('proportional',10,0,3,3, sigma = diag(1,3),tau = matrix(sqrt(1+3),
   nrow=3, ncol=1),lambda = 0.2, max_iter = 5)
## A-optimal
design('proportional',10,1,3,3, sigma = diag(1,3), tau = matrix(sqrt(1+3),
   nrow=3, ncol=1),lambda = 0.2, max_iter = 5)
# interference model
## D-optimal
design('interference',10,0,3,3, sigma = diag(1,3), max_iter = 5)
design('interference',10,1,3,3, sigma = diag(1,3), max_iter = 5)
```

design_app

Shiny App for design function

Description

A function to launch graphical interface to design function.

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Usage

```
design_app()
```

Examples

```
## Not run:
design_app() # lauching the app.
## End(Not run)
```

eff

Efficiency generic function

Description

A generic function that returns the effciency for either exact designs to approximate designs or exact design to a given design

Usage

```
eff(exact_design, ex = NULL)

## Default S3 method:
eff(exact_design, ex = NULL)

## S3 method for class 'dropout'
eff(exact_design, ex = NULL)

## S3 method for class 'proportional'
eff(exact_design, ex = NULL)

## S3 method for class 'interference'
eff(exact_design, ex = NULL)
```

Arguments

```
exact_design A S3 object returned by design function.

ex Matrix. Design to be compared to. Default is NULL.
```

Value

```
Numeric. Relatve Efficiency. If ex is given return relative effciency by \Phi_{example}/\Phi_{exact\_design}; If ex is missing return relative efficiency by \Phi_{approx\_design}/\Phi_{exact\_design}.
```

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See Also

see examples in design.

effLB

Lower Bound Efficiency for Crossover-Dropout Model

Description

The function take S3 object of class 'dropout' as input and return its lower bound of efficiency of exact design.

Usage

```
effLB(exact_design)
```

Arguments

exact_design

A object of class returned by design function.

Value

A list of relavent numerics.

optimal Optimal Criterion

lower.bound Lower Bound of the exact design

optimal.value The value of objective function at optimal approxiamte design

See Also

see examples in design.

infor_design

Generic function for information matrix.

Description

Returns a information matrix for a given design

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Usage

```
infor_design(design, t, ...)
## Default S3 method:
infor_design(design, t)

## S3 method for class 'dropout'
infor_design(design, t, ...)

## S3 method for class 'interference'
infor_design(design, t, ...)

## S3 method for class 'proportional'
infor_design(design, t, ...)
```

Arguments

design	Matrix. A design, each row is a design point with weight or repetition on the last entry.
t	Numeric. Number of levels of treatments.
	Other control parameter to be passed to methods

Value

An information matrix.

OWEA	OWEA: A package for optimal designs by implementing optimal weight exchange algorithm.

Description

The OWEA package provides relizations for three models: crossover with subject dropout, crossover with proportional first order residual, and interference model

Key functions

```
design, design_app, eff, effLB, summary
```

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summary.dropout

Summary method for S3 object

Description

Return summary info for S3 object return by design function.

Usage

```
## S3 method for class 'dropout'
summary(object, ...)
## S3 method for class 'proportional'
summary(object, ...)
## S3 method for class 'interference'
summary(object, ...)
```

Arguments

```
object A S3 object of class 'dropout', 'proportional', or 'interference'.
... other control parameters, but usually not necessary.
```

Value

```
A list of key info.

exact_design exact design and its repetitions
approximate_design
approximate design and its weights
computing_time computing time for approximate design
```

See Also

```
see examples in design.
```

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