Package ‘Aoptbdtvc’

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Title A-Optimal Block Designs for Comparing Test Treatments with Controls

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Description A collection of functions to construct A-optimal block designs for comparing test treatments with one or more control(s). Mainly A-optimal balanced treatment incomplete block designs, weighted A-optimal balanced treatment incomplete block designs, A-optimal group divisible treatment designs and A-optimal balanced bipartite block designs can be constructed using the package. The designs are constructed using algorithms based on linear integer programming. To the best of our knowledge, these facilities to construct A-optimal block designs for comparing test treatments with one or more controls are not available in the existing R packages. For more details on designs for tests versus control(s) comparisons, please see Hedayat, A. S. and Majumdar, D. (1984) <doi:10.1080/00401706.1984.10487989> A-Optimal Incomplete Block Designs for Control-Test Treatment Comparisons, Technometrics, 26, 363-370 and Mandal, B. N., Gupta, V. K., Parsad, Rajender. (2017) <doi:10.1080/03610926.2015.1071394> Balanced treatment incomplete block designs through integer programming. Communications in Statistics - Theory and Methods 46(8), 3728-3737.

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R topics documented:

aoptbbpb ................................................................. 2
aoptgdtd ................................................................. 3
wtaoptbtib ............................................................... 5

Index 7
Description

This function generates A-optimal balanced bipartite block (BBPB) designs for tests vs controls comparisons with specified parameters.

Usage

`aoptbbpb(v1, v2, b, k, ntrial)`

Arguments

- `v1`: number of test treatments
- `v2`: number of controls
- `b`: number of blocks
- `k`: block size
- `ntrial`: number of trials, default is 5

Value

It either returns a message that "Design not found" or "BBPB Design does not exist for these parameters" or a design. If a design is found, it returns a list with following components

- `parameters`: parameters of the design
- `design`: generated A-optimal BFBP design
- `N`: incidence matrix of the generated A-optimal BFBP design
- `NNP`: concurrence matrix of the generated design
- `Aeff`: A-efficiency of the design
- `type`: R- type or S- type design

Note

The function is useful to construct A-optimal BFBP designs for `v1+v2 <= 30` and up to block size 10. May not be very useful beyond `v1+v2 > 30`. For `k<=3`, designs with larger `v1+v2` may be obtained.

Author(s)

Baidya Nath Mandal <mandal.stat@gmail.com>
References


Mandal, B. N., Parsad, R. and Dash, S. (2017). A-optimal block designs for comparing test treatments with control treatment(s) - an algorithmic approach, upcoming project report, ICAR-Indian Agricultural Statistics Research Institute, New Delhi, India.

Examples

```r
# construct an A-optimal BBPb design with 5 test treatments and 3 control treatments in
# 12 blocks each of size 5
aoptbbpb(v1=5,v2=3,b=12,k=5)

# construct an A-optimal BBPb design with 6 test treatments and 3 control treatments in
# 6 blocks each of size 8
aoptbbpb(v1=6,v2=3,b=6,k=8)

# Design does not exist
aoptbbpb(3,2,9,3)
aoptbbpb(6,3,9,4)
# Design not found
# Not run: aoptbbpb(3,3,12,4)
```

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**aoptgdtd**

*A-optimal group divisible treatment designs*

**Description**

This function generates A-optimal group divisible treatment (GDT) designs for test vs control comparisons with specified parameters.

**Usage**

```r
aoptgdtd(m,n,b,k,ntrial)
```

**Arguments**

- `m`: number of rows such that m*n = number of test treatments
- `n`: number of columns such that m*n = number of test treatments
- `b`: number of blocks
- `k`: block size
- `ntrial`: number of trials, default is 5
Value

It either returns a message that "Design not found" or "A-optimal Design does not exist for these parameters" or a design. If a design is found, it returns a list with following components:

- **parameters**: parameters of the design
- **design**: generated A-optimal GDT design
- **N**: incidence matrix of the generated A-optimal GDT design
- **NMP**: concurrence matrix of the generated design

Note

The function is useful to construct A-optimal GDT designs for number of test treatments <= 30 and up to block size 10. May not be very useful for m*n > 30. For k<=3, designs with larger number of test treatment may be obtained.

Author(s)

Baidya Nath Mandal <mandal.stat@gmail.com>

References


Mandal, B. N., Parsad, R. and Dash, S. (2017). A-optimal block designs for comparing test treatments with control treatment(s) - an algorithmic approach, upcoming project report, ICAR-Indian Agricultural Statistics Research Institute, New Delhi, India.

Examples

```r
## construct an A-optimal GDT design with 12 (= 4 x 3) test treatments
## in 12 blocks each of size 6
aoptgdtd(m=4,n=3,b=12,k=6)
## construct an A-optimal GDT design with 8 (= 4 x 2) test treatments
## in 8 blocks each of size 4
aoptgdtd(m=4,n=2,b=8,k=4)
## design does not exist
aoptgdtd(4,2,8,2)
## Design not found
## Not run: aoptgdtd(3,3,15,3)
```
**wtaoptbtib**

**Weighted A-optimal balanced treatment incomplete block designs**

**Description**

This function generates weighted A-optimal balanced treatment incomplete block design for test vs control comparisons with specified parameters.

**Usage**

\[
\text{wtaoptbtib}(v, b, k, \alpha, \rho=0, ntrial=5)
\]

**Arguments**

- **v**: number of test treatments
- **b**: number of blocks
- **k**: block size
- **\alpha**: Weight for test versus test comparisons. Should be between 0 to 1
- **\rho**
  - **\rho=0**
- **ntrial**: number of trials, default is 5

**Value**

It either returns a message that "Design not found" or "BTIB design does not exist for these parameters" or "Certain conditions are not satisfied" or a design. If a design is found, it returns a list with the following components:

- **parameters**: parameters of the design
- **design**: generated weighted A-optimal BTIB design
- **\(N\)**: incidence matrix of the generated weighted A-optimal BTIB design
- **\(NNP\)**: concurrence matrix of the generated design

**Note**

The function is useful to construct weighted A-optimal BTIB designs up to 30 test treatments and up to block size 10. May not be very useful beyond 30 test treatments. For \(k\leq3\), designs with larger number of test treatments may be obtained.

**Author(s)**

Baidya Nath Mandal <mandal.stat@gmail.com>
References


Mandal, B. N., Parsad, R. and Dash, S. (2017). A-optimal block designs for comparing test treatments with control treatment(s) - an algorithmic approach, upcoming project report, ICAR-Indian Agricultural Statistics Research Institute, New Delhi, India.

Examples

```r
## construct a weighted A-optimal BTIB design with 4 test treatments in 6 blocks each of size 4
## with weights to test vs test treatments comparisons as 0.6
wtaoptbtib(v=4,b=6,k=4,alpha=0.6,rho=0)

## construct an A-optimal BTIB design with 9 test treatments in 12 blocks each of size 4
## with weights to test vs test treatments comparisons as 0
wtaoptbtib(v=9,b=12,k=4,alpha=0,rho=0)

## design not found
## Not run: wtaoptbtib(v=3,b=6,k=5,alpha=0.2,rho=0)
## BTIB design does not exist for these parameters
## Not run
wtaoptbtib(3,4,3,0.2,0)
```
Index

*Topic **A-optimal**
  aoptbbpb, 2
  aoptgdtd, 3

*Topic **balanced bipartite block designs**
  aoptbbpb, 2

*Topic **balanced treatment incomplete block design**
  wtaoptbtib, 5

*Topic **group divisible treatment design**
  aoptgdtd, 3

*Topic **weighted A-optimal**
  wtaoptbtib, 5

aoptbbpb, 2
aoptgdtd, 3
wtaoptbtib, 5