Package 'pRepDesigns'

July 23, 2025

Type Package

Title Partially Replicated (p-Rep) Designs

Version 1.2.0

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Description Early generation breeding trials are to be conducted in multiple
environments where it may not be possible to replicate all the
lines in each environment due to scarcity of resources. For such
situations, partially replicated (p-Rep) designs have wide
application potential as only a proportion of the test lines are
replicated at each environment. A collection of several utility
functions related to p-Rep designs have been developed. Here, the
package contains six functions for a complete stepwise analytical
study of these designs. Five functions pRep1(), pRep2(), pRep3(),
pRep4() and pRep5(), are used to generate five new series of p-Rep
designs and also compute average variance factors and canonical
efficiency factors of generated designs. A fourth function NCEV()
is used to generate incidence matrix (N), information matrix (C),
canonical efficiency factor (E) and average variance factor (V).
This function is general in nature and can be used for studying the
characterization properties of any block design. A construction
procedure for p-Rep designs was given by Williams et al.(2011)
<doi:10.1002/bimj.201000102> which was tedious and time consuming.
Here, in this package, five different methods have been given to
generate p-Rep designs easily.

Suggests MASS

License GPL (>= 2)

Encoding UTF-8

Repository CRAN

RoxygenNote 7.3.1

NeedsCompilation no

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Contents

NCEV	*Incidence Matrix, Information Matrix, Canonical efficiency factor, Variance between associates and average variance*

Description

This function generates incidence matrix, information matrix, canonical efficiency factor,variance factor between associates and average variance for the input design

Usage

```
NCEV(design)
```

Arguments

design	p-rep design in matrix form considering rows as blocks

Value

This function generates incidence matrix, information matrix, canonical efficiency factor, variance factor between associates and average variance factor for the input design

References

Williams E, Piepho HP, Whitaker D (2011)<https://doi.org/10.1002/bimj.201000102>

Examples

```
library(pRepDesigns)
design=matrix(1:9, nrow = 3, ncol = 3)
NCEV(design)
```

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pRep1 *First series of p-rep designs*

Description

This function generates first series of p-rep designs for given values of v, m and s. The input should satisfy the condition $v=2*m*s*(s-1)$, $m>=1$ and $s>=3$.

Usage

```
pRep1(v, m, s)
```

Arguments

v	Total number of treatments or breeding lines or entries
m	positive integer (>=1)
s	positive integer (>=3)

Value

This function generates p-rep designs with parameters:

$v = 2ms(s-1)$: number of treatments,

$b\_1 = 2(s-1)$: first set of blocks of size $k\_1 = ms$,

$b\_2 = 2s$: second set of blocks of size $k\_2 = 2m(s-1)$ and

$r = 3$: number of replications.

$e = 2$: number of environments,

This function also generates incidence matrix, information matrix, canonical efficiency factor and average variance factor of the generated p-rep design.

References

Williams E, Piepho HP, Whitaker D (2011)<doi:10.1002/bimj.201000102>

Examples

```
library(pRepDesigns)
pRep1(24, 2, 3)
```

---

pRep2   *Second series of p-rep designs*

Description

For the specified values of v and p, this function generates the second series of p-rep designs. The input should meet the condition that v=10*p where, p>=2.

Usage

```
pRep2(v, p)
```

Arguments

v   Total number of treatments or breeding lines or entries

p   positive integer (>=2)

Value

This function generates a new series of p-rep designs with parameters:

v = 10p number of treatments,

e = 2 number of environments,

b = 10 blocks of size k = 3p and

r = 3 number of replications.

This function also generates canonical efficiency factor and average variance factor of the generated p-rep design.

References

Williams E, Piepho HP, Whitaker D (2011)<https://doi.org/10.1002/bimj.201000102>

Examples

```
library(pRepDesigns)
pRep2(20,2)
```

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pRep3   *Third series of p-rep designs*

Description

For the specified values of v and p, this function generates a series of p-rep designs. The input should meet the condition that v=6*p where, p>=2.

Usage

```
pRep3(v, p)
```

Arguments

v   Total number of treatments or breeding lines or entries

p   positive integer (>=2)

Value

This function generates a new series of p-rep designs with parameters:

v = 6p : number of treatments,

e = 2 : number of environments,

b = 6 : blocks of size k = 3p and

r = 3 : number of replications.

Canonical efficiency factor and average variance factor of the generated p-rep design.

References

Williams E, Piepho HP, Whitaker D (2011)<https://doi.org/10.1002/bimj.201000102>

Examples

```
library(pRepDesigns)
pRep3(18, 2)
```

---

pRep4   *p-rep designs with unequal block sizes*

Description

The first step of this function involves generating a higher associate PBIB (partially balanced incomplete block) design consisting of two sets of blocks. Subsequently, by creating various combinations of these two sets of blocks, it generates multiple p-rep designs in different environments with unequal block sizes.

Usage

```
pRep4(v, m, s, randomized_layout = FALSE)
```

Arguments

v	Total number of treatments (v = 2ms*(s-1))
m	Positive integer (m>=1)
s	Positive integer (s>=3)
randomized_layout	
	TRUE or FALSE. By default it is FALSE.

Value

This function calculates design parameters (v, b1, b2, r, k1, k2), average variance factors, and canonical efficiency factors of generated designs.

Examples

```
## Not run:
library(pRepDesigns)
pRep4(48, 2, 4)
## End(Not run)
```

---

pRep5   *p-rep designs with equal block sizes*

Description

The primary purpose of this function is to generate various proper p-rep designs for multi-environmental trials.

Usage

```
pRep5(v, m, s, randomized_layout = FALSE)
```

Arguments

v	Total number of treatments (v = 2ms^2)
m	Positive integer (m>=1)
s	Positive integer (s>=2)
randomized_layout	
	TRUE or FALSE. By default it is FALSE.

Value

This function calculates design parameters (v, b, r, k), average variance factors, and canonical efficiency factors of generated designs.

Examples

```
## Not run:
library(pRepDesigns)
pRep5(64, 2, 4)

## End(Not run)
```

Index