

Package ‘TCpRepDesigns’

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Type Package

Title Partially Replicated Test-Control Designs for Early Generation Varietal Trials

Version 0.0.2

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Description Provides functions for generating partially replicated (p-rep) test-control designs for early generation varietal trials conducted across multiple environments. The package implements three construction methods for obtaining p-rep test-control designs with one or more control treatments. The package extends the partially replicated design framework of Vinaykumar et al. (2026) <[doi:10.1007/s12355-025-01684-1](https://doi.org/10.1007/s12355-025-01684-1)> to accommodate test-control comparisons in breeding trials. Functions are provided for generating randomized and non-randomized layouts and for displaying the design parameters and treatment allocations for each environment. The proposed designs are useful for large-scale varietal evaluation trials where a large number of test lines are assessed under limited experimental resources.

License GPL (>= 3)

Encoding UTF-8

Imports MASS

RoxygenNote 7.3.3

NeedsCompilation no

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print.pRep3	<i>Print p-Rep Test-Control Design: Method III</i>
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Description

Print p-Rep Test-Control Design: Method III

Usage

```
## S3 method for class 'pRep3'  
print(x, ...)
```

Arguments

- x An object of class "pRep3".
- ... Further arguments.

Value

The input object invisibly.

print.TCpRep	<i>Print p-Rep Test-Control Design</i>
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Description

Print p-Rep Test-Control Design

Usage

```
## S3 method for class 'TCpRep'  
print(x, ...)
```

Arguments

x An object of class "TCpRep".
 ... Further arguments.

Value

The input object invisibly.

print.TCpRep2	<i>Print p-Rep Test-Control Designs: Method II</i>
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Description

Print p-Rep Test-Control Designs: Method II

Usage

```
## S3 method for class 'TCpRep2'
print(x, ...)
```

Arguments

x An object of class "TCpRep2".
 ... Further arguments.

Value

The input object invisibly.

TCpRep1	<i>Generate p-Rep Test-Control Designs: Method I</i>
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Description

Constructs a partially replicated (p-rep) test-control design with one fixed control treatment. The total number of test lines must be a perfect square.

Usage

```
TCpRep1(v)
```

Arguments

v Total number of test lines. Must be a perfect square greater than or equal to 9; for example, 9, 16, 25, 36, or 49.

Value

A list containing design parameters, non-randomized layouts, and randomized layouts.

TCpRep2	<i>Generate p-Rep Test-Control Designs: Method II</i>
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Description

Constructs partially replicated (p-rep) test-control designs for multiple environments using an affine resolvable partially balanced incomplete block design framework.

Usage

TCpRep2(v)

Arguments

v Total number of test lines. It must satisfy $v = p(p - 1)$ for an integer $p \geq 3$; for example: 6, 12, 20, 30, 42, or 56.

Value

A list of p-rep test-control designs for all admissible numbers of environments.

TCpRep3	<i>Generate p-Rep Test-Control Designs: Method III</i>
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Description

Constructs partially replicated (p-rep) test-control designs for multiple environments using arrays derived from mutually orthogonal Latin squares.

Usage

TCpRep3(v)

Arguments

v Total number of test lines. It must satisfy $v = s(s - 1) - 3$ for an odd integer $s \geq 5$; for example: 17, 39, 69, or 117.

Value

A list containing design parameters, non-randomized layouts, and randomized layouts.

Description

Computes efficiency measures for partially replicated test-control designs. Test treatments are identified from numeric labels such as 1, 2, and 3. Control treatments must use labels beginning with C, such as C1, C2, and so on.

Usage

```
TCpRepEfficiency(design)
```

Arguments

design A design matrix containing numeric test treatments and control labels such as C1, C2, etc.

Details

The function calculates average variance for test-versus-test comparisons, average variance for test-versus-control comparisons, and the canonical efficiency factor.

Blank or missing cells in the design matrix are ignored. The design must contain at least two numeric test treatments and at least one control treatment whose label starts with C.

Value

A data frame containing:

Number of Test Treatments Number of numeric test labels.

Number of Controls Number of controls labelled C1, C2, etc.

Average Variance (Test vs Test) Average variance of all test-treatment contrasts.

Average Variance (Test vs Control) Average variance of all test-versus-control contrasts.

Canonical Efficiency Factor Harmonic mean of the non-zero canonical efficiency factors.

Examples

```
design <- matrix(c(
  1, 6, 11, "C1",
  2, 5, 12, "C1",
  3, 8, 9, "C1",
  4, 7, 10, "C1",
  1, 7, 12, "C1",
  2, 8, 11, "C1",
  1, 8, 10, "C1",
  2, 7, 9, "C1",
  3, 6, 12, "C1",
```

```
4, 5, 11, "C1",  
3, 5, 10, "C1",  
4, 6, 9, "C1"  
) , ncol = 4, byrow = TRUE)  
  
TCpRepEfficiency(design)
```

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