Package 'rsdNE'

June 25, 2025

Type Package

Title Response Surface Designs with Neighbour Effects (rsdNE)

Version 1.2.0

Maintainer Ashutosh Dalal <ashutosh.dalal97@gmail.com>

Description Response surface designs with neighbour effects are suitable for experimental situations where it is expected that the treatment combination administered to one experimental unit may affect the response on neighboring units as well as the response on the unit to which it is applied (Dalal et al.,2025 <doi:10.57805/revstat.v23i2.513>).
Integrating these effects in the response surface model improves the experiment's precision (Jaggi, S., Sarika and Sharma, V.K. (2010)<doi:10.5555/20103265373>;
Verma A., Jaggi S., Varghese, E.,Varghese, C.,Bhowmik, A., Datta, A. and Hemavathi M. (2021)<doi:10.1080/03610918.2021.1890123>).
This package includes sym(), asym1(), asym2(), asym3() and asym4() functions that generates response surface designs which are rotatable under a
polynomial model of a given order without interaction term incorporating neighbour effects.

License GPL (>= 2)

Encoding UTF-8

Repository CRAN

RoxygenNote 7.3.2

NeedsCompilation no

Author Ashutosh Dalal [aut, cre],
Seema Jaggi [aut, ctb],
Eldho Varghese [aut, ctb],
Subhasish Sarkar [aut],
Arpan Bhowmik [aut],
Cini Varghese [aut],
Anindita Datta [aut],
Soumen Pal [aut]

Date/Publication 2025-06-25 15:00:07 UTC

Contents

`asym1` *This generates a class of asymmetric rotatable response surface designs with neighbour effects under a second order model*

Description

This function generates asymmetrical rotatable response surface designs in the presence of neighbour effects for 2n factors, n factors at 2 levels and another n factors at 3 levels.

Usage

```
asym1(n1, n2, c)
```

Arguments

`n1`	n1 factors having 2 levels, 1<=n1<=5
`n2`	n2 factors having 3 levels, 1<=n2<=5
`c`	Value of alpha (Coefficient of neighbour effects), 0<=c<=1

Value

This function generates rotatable designs as well as Z_prime_Z matrix, inv(Z_primeZ) matrix and variance estimated response for the (2^n1 * 3^n2) factorial combination.

Note

Here 3 types of cases have been considered: (2^n1*3^n2), where, n1=n2=n; (2^n1*3), where, n1=n and n2=1; (2*3^n2), where, n1=1 and n2=n.

Author(s)

Ashutosh Dalal, Division of Design of Experiments,ICAR-IASRI, New Delhi. Seema Jaggi, Education Division, ICAR, Krishi Anusandhan Bhawan - II, Pusa, New Delhi. Eldho Varghese,Fishery Resources Assessment Division,ICAR-CMFRI, Kochi. Subhasish Sarkar, Division of Computer Application,ICAR-IASRI, New Delhi. Arpan Bhowmik, Division of Design of Experiments,ICAR-IASRI, New Delhi. Cini Varghese, Division of Design of Experiments,ICAR-IASRI, New Delhi. Anindita Datta, Division of Design of Experiments,ICAR-IASRI, New Delhi. Soumen Pal, Division of Computer Application,ICAR-IASRI, New Delhi.

References

Verma et al.2021, Communication in Statistics – Simulation and Computation

Examples

```
library(rsdNE)
asym1(1,1,0.5)
```

---

asym2 — *This generates a class of asymmetric rotatable response surface designs with neighbour effects under a polynomial model of order max(s1,s2)-1*

Description

This function generates asymmetrical rotatable response surface designs in the presence of neighbour effects for (n1 + n2) factors, n1 factors at s1 levels and another n2 factors at s2 levels.

Usage

```
asym2(s1, n1, s2, n2, c)
```

Arguments

s1	Number of levels of n1 factors, 1<s1<=8
n1	Number of factors, 1<=n1<=4
s2	Number of levels of n2 factors, 1<s2<=8
n2	Number of factors, 1<=n2<=4
c	Value of alpha (Coefficient of neighbour effects), 0<=c<=1

Value

his function generates rotatable designs as well as Z_prime_Z matrix, inv(Z_primeZ) matrix and variance estimated response for the (s1^n1 * s2^n2) factorial combination.

Note

Here s1 and s2 both not even at the same time and s1 not equal to s2.

Author(s)

Ashutosh Dalal, Division of Design of Experiments,ICAR-IASRI, New Delhi. Seema Jaggi, Education Division, ICAR, Krishi Anusandhan Bhawan - II, Pusa, New Delhi. Eldho Varghese,Fishery Resources Assessment Division,ICAR-CMFRI, Kochi. Subhasish Sarkar, Division of Computer Application,ICAR-IASRI, New Delhi. Arpan Bhowmik, Division of Design of Experiments,ICAR-IASRI, New Delhi. Cini Varghese, Division of Design of Experiments,ICAR-IASRI, New Delhi. Anindita Datta, Division of Design of Experiments,ICAR-IASRI, New Delhi. Soumen Pal, Division of Computer Application,ICAR-IASRI, New Delhi.

References

Dalal, 2021, Unpublished M.Sc. Thesis, IARI, New Delhi

Examples

```
library(rsdNE)
asym2(2,2,5,2,0.7)
```

`asym3` *This generates a class of asymmetric rotatable response surface designs with neighbour effects under a polynomial model of order max(s1,s2)-1*

Description

This function generates asymmetrical rotatable response surface designs in the presence of neighbour effects for (n1 + n2) factors, n1 factors at s1 levels and another n2 factors at s2 levels.

Usage

```
asym3(s1, n1, s2, n2, s3, c)
```

Arguments

`s1`	Number of levels of n1 factors, 1<s1<=8
`n1`	Number of factors possesses s1 levels, 1<=n1<=4
`s2`	Number of levels of n2 factors, 1<s2<=8
`n2`	Number of factors possesses s2 levels, 1<=n2<=4
`s3`	Number of levels of one factor, 1<s3<=8
`c`	Value of alpha (Coefficient of neighbour effects), 0<=c<=1

Value

his function generates rotatable designs as well as Z_prime_Z matrix, inv(Z_primeZ) matrix and variance estimated response for the (s1^n1 * s2^n2) factorial combination.

Note

Here s1 and s2 should not be multiple of each other.

Author(s)

Ashutosh Dalal, Division of Design of Experiments,ICAR-IASRI, New Delhi. Seema Jaggi, Education Division, ICAR, Krishi Anusandhan Bhawan - II, Pusa, New Delhi. Eldho Varghese,Fishery Resources Assessment Division,ICAR-CMFRI, Kochi. Subhasish Sarkar, Division of Computer Application,ICAR-IASRI, New Delhi. Arpan Bhowmik, Division of Design of Experiments,ICAR-IASRI, New Delhi. Cini Varghese, Division of Design of Experiments,ICAR-IASRI, New Delhi. Anindita Datta, Division of Design of Experiments,ICAR-IASRI, New Delhi. Soumen Pal, Division of Computer Application,ICAR-IASRI, New Delhi.

References

Dalal, 2021, Unpublished M.Sc. Thesis, IARI, New Delhi

Examples

```
library(rsdNE)
asym3(2,2,3,2,5,0.5)
```

`asym4` *This generates a class of asymmetric rotatable response surface designs with neighbour effects under a polynomial model of order max(s1,s2)-1*

Description

This function generates asymmetrical rotatable response surface designs in the presence of neighbour effects for (n1 + n2) factors, n1 factors at s1 levels and another n2 factors at s2 levels.

Usage

```
asym4(s1, n1, s2, n2, s3, n3, c = 0.1)
```

Arguments

`s1`	Number of levels of n1 factors, 1<s1<=8
`n1`	Number of factors possesses s1 levels, 1<=n1<=4
`s2`	Number of levels of n2 factors, 1<s2<=8
`n2`	Number of factors possesses s2 levels, 1<=n2<=4
`s3`	Number of levels of n3 factors, 1<s3<=8
`n3`	Number of factors possesses s3 levels, 1<s3<=8
`c`	Value of alpha (Coefficient of neighbour effects), 0<=c<=1

Value

his function generates rotatable designs as well as Z_prime_Z matrix, inv(Z_primeZ) matrix and variance estimated response for the (s1^n1 * s2^n2) factorial combination.

Note

Here any two of s1, s2 and s3 should not be multiple of each other.

Author(s)

Ashutosh Dalal, Division of Design of Experiments,ICAR-IASRI, New Delhi. Seema Jaggi, Education Division, ICAR, Krishi Anusandhan Bhawan - II, Pusa, New Delhi. Eldho Varghese,Fishery Resources Assessment Division,ICAR-CMFRI, Kochi. Subhasish Sarkar, Division of Computer Application,ICAR-IASRI, New Delhi. Arpan Bhowmik, Division of Design of Experiments,ICAR-IASRI, New Delhi. Cini Varghese, Division of Design of Experiments,ICAR-IASRI, New Delhi. Anindita Datta, Division of Design of Experiments,ICAR-IASRI, New Delhi. Soumen Pal, Division of Computer Application,ICAR-IASRI, New Delhi.

References

Dalal, 2021, Unpublished M.Sc. Thesis, IARI, New Delhi Rotatable Response Surface Designs for S1^n1 x S2^n2 Incorporating Neighbour Effects by Dalal et al. 2025(<doi:https://doi.org/10.57805/revstat.v23i2.513>).

Examples

```
## Not run:
library(rsdNE)
asym4(2,2,3,2,5,2,0.1)

## End(Not run)
```

`sym` *This generates a class of symmetric rotatable response surface designs with neighbour effects under a polynomial model of order (s1-1)*

Description

This function generates symmetrical rotatable response surface designs in the presence of neighbour effects for n1 factors each at s1 levels.

Usage

```
sym(s1, n1, c)
```

Arguments

`s1`	Number of levels of n1 factors, 1<s1<=6
`n1`	Number of factors, 1<n1<=4
`c`	Value of alpha (Coefficient of neighbour effects), 0<=c<=1

Value

his function generates rotatable designs as well as Z_prime_Z matrix, inv(Z_primeZ) matrix and variance estimated response for the (s1^n1) factorial combination.

Author(s)

Ashutosh Dalal, Division of Design of Experiments,ICAR-IASRI, New Delhi. Seema Jaggi, Education Division, ICAR, Krishi Anusandhan Bhawan - II, Pusa, New Delhi. Eldho Varghese,Fishery Resources Assessment Division,ICAR-CMFRI, Kochi. Subhasish Sarkar, Division of Computer Application,ICAR-IASRI, New Delhi. Arpan Bhowmik, Division of Design of Experiments,ICAR-IASRI, New Delhi. Cini Varghese, Division of Design of Experiments,ICAR-IASRI, New Delhi. Anindita Datta, Division of Design of Experiments,ICAR-IASRI, New Delhi. Soumen Pal, Division of Computer Application,ICAR-IASRI, New Delhi.

References

Sarika et al.2009, Communications in Statistics-Theory and Methods; Sarika et al.2013, Ars Combinatoria

Examples

```
library(rsdNE)
sym(2,2,0.3)
```

Index