

# Package ‘TORDs’

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**Type** Package

**Title** Third Order Rotatable Designs (TORDs)

**Version** 1.0.0

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**Description** Third order response surface designs (M. Hemavathi, Shashi Shekhar, Eldho Varghese, Seema Jaggi, Bikas Sinha & Nripes Kumar Mandal (2022) <[DOI:10.1080/03610926.2021.1944213](https://doi.org/10.1080/03610926.2021.1944213)>. ``Theoretical developments in response surface designs: an informative review and further thoughts") are classified into two types viz., designs which are suitable for sequential experimentation and designs for non-sequential experimentation (M. Hemavathi, Eldho Varghese, Shashi Shekhar & Seema Jaggi (2022) <[DOI:10.1080/02664763.2020.1864817](https://doi.org/10.1080/02664763.2020.1864817)>. ``Sequential asymmetric third order rotatable designs (SATORDs)"). The sequential experimentation approach involves conducting the trials step by step whereas, in the non-sequential experimentation approach, the entire runs are executed in one go. This package contains functions named STORDs() and NSTORDs() for generating sequential/non-sequential TORDs given in Das, M. N., and V. L. Narasimham (1962). <[DOI:10.1214/aoms/1177704374](https://doi.org/10.1214/aoms/1177704374)>. ``Construction of rotatable designs through balanced incomplete block designs" along with the randomized layout. It also contains another function named Pred3.var() for generating the variance of predicted response as well as the moment matrix based on a third order response surface model.

**License** GPL (>= 2)

**Encoding** UTF-8

**LazyData** TRUE

**Repository** CRAN

**RoxygenNote** 7.2.0

**Depends** R (>= 2.10)

**NeedsCompilation** no

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## Contents

NSTORDs . . . . .	2
Pred3.var . . . . .	3
STORDs . . . . .	4
<b>Index</b>	<b>5</b>

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NSTORDs	<i>Non-Sequential Third Order Rotatable Designs</i>
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### Description

This function generates non sequential third order rotatable designs given in Das and Narasimham (1962) for a given number of input factors,  $v$  ( $3 \leq v \leq 15$ ) with coded levels of the factors. It also gives the randomized layout of the design.

### Usage

```
NSTORDs(v, randomization = FALSE)
```

### Arguments

<code>v</code>	Number of input factors, $v$ ( $3 \leq v \leq 15$ )
<code>randomization</code>	It is for generating the randomized layout of the design. It takes either TRUE or FALSE and by default, it is set to FALSE

### Value

Non-Sequential Third Order Rotatable Designs (NSTORDs) for a given  $v$ .

### References

- 1) Das, M. N., and V. L. Narasimham (1962). <DOI:10.1214/aoms/1177704374>. "Construction of rotatable designs through balanced incomplete block designs".
- 2)M. Hemavathi, Eldho Varghese, Shashi Shekhar & Seema Jaggi (2022)<DOI:10.1080/02664763.2020.1864817>." Sequential asymmetric third order rotatable designs (SATORDs)".
- 3) M. Hemavathi, Shashi Shekhar, Eldho Varghese, Seema Jaggi, Bikas Sinha & Nripes Kumar Mandal (2022)<DOI: 10.1080/03610926.2021.1944213>." Theoretical developments in response surface designs: an informative review and further thoughts".

### Examples

```
library(TORDs)
NSTORDs(4, FALSE)
```

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Pred3.var	<i>Function for generating the moment matrix and variance of the predicted response</i>
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### Description

This function generates the moment matrix and variance of the predicted response for a given design based on a third-order model, for measuring the rotatability of the design. The input should be the specified form of a design matrix with the coefficients of the corresponding input factors. A minimum number of centre points is to be used to ensure the non-singularity of  $X'X$ .

### Usage

```
Pred3.var(matrix)
```

### Arguments

matrix            Design matrix with the coefficients of the corresponding input factors

### Value

The moment matrix and the prediction variance for a given design based on a third-order model It gives unique prediction variance along with its frequencies.

### References

M. Hemavathi, Shashi Shekhar, Eldho Varghese, Seema Jaggi, Bikas Sinha & Nripes Kumar Mandal (2022)<DOI:10.1080/03610926.2021.1944213>." Theoretical developments in response surface designs: an informative review and further thoughts".

### Examples

```
## Not run:  
library(TORDs)  
library(TORDs)  
Pred3.var(matrix)  
  
## End(Not run)
```

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STORDs

*Sequential Third Order Rotatable Designs*

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### Description

This function generates sequential third order rotatable designs given in Das and Narasimham (1962) for a given number of input factors,  $v$  ( $3 \leq v \leq 15$ ) with coded levels of the factors. It gives the randomized layout of the design in two blocks viz., block1 and block2.

### Usage

```
STORDs(v, randomization = FALSE)
```

### Arguments

<code>v</code>	Number of input factors, $v(3 \leq v \leq 15)$
<code>randomization</code>	It is for generating the randomized layout of the design. It takes either TRUE or FALSE and by default, it is set to FALSE

### Value

Sequential Third Order Rotatable Designs (STORDs) for a given  $v$ .

### References

- 1) Das, M. N., and V. L. Narasimham (1962). <DOI:10.1214/aoms/1177704374>. "Construction of rotatable designs through balanced incomplete block designs".
- 2) M. Hemavathi, Eldho Varghese, Shashi Shekhar & Seema Jaggi (2022)<DOI:10.1080/02664763.2020.1864817>." Sequential asymmetric third order rotatable designs (SATORDs)".
- 3) M. Hemavathi, Shashi Shekhar, Eldho Varghese, Seema Jaggi, Bikas Sinha & Nripes Kumar Mandal (2022)<DOI:10.1080/03610926.2021.1944213>." Theoretical developments in response surface designs: an informative review and further thoughts".

### Examples

```
library(TORDs)
STORDs(5, FALSE)
```

# Index

NSTORDs, [2](#)

Pred3.var, [3](#)

STORDs, [4](#)