# Package 'mvngGrAd'

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**Type** Package

**Title** Moving Grid Adjustment in Plant Breeding Field Trials

**Version** 0.1.5

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**Depends** methods, stats

**Author** Frank Technow

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**Description** Package for moving grid adjustment
in plant breeding field trials.

**License** GPL (>= 2)

**LazyLoad** TRUE

**Collate** movG-class.R circularExtension.R entryData.R
entryDataMethods.R extendHorVer.R fittedMethods.R movingGrid.R
movingMean.R residualsMethods.R showMethods.R sketchGrid.R
sketchGridMethods.R summaryMethods.R movingMeanMethods.R

**NeedsCompilation** no

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## R topics documented:

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mvngGrAd-package          *R Package mvngGrAd: Moving Grid Adjustment In Plant Breeding*
                          *Field Trials*

---

### Description

The **mvngGrAd** package allows to perform a moving grid adjustment in plant breeding field trials. Please see the included vignette for a more detailed description of the package and the rational behind moving grid adjustment.

### Details

| | |
|---|---|
| Package: | mvngGrAd |
| Type: | Package |
| Version: | 0.1.5 |
| Date: | 2015-04-04 |
| License: | GNU General Public License Version 2, June 1991 |
| LazyLoad: | no |

The main function, movingGrid, performs the adjustment with a user designed grid. The function sketchGrid helps with designing the grid by plotting its shape. The functions fitted, movingMean and entryData are convenience functions to extract the most relevant information from the object created by movingGrid. The package defines one new class, movG, and provides methods for it for the functions, movingMean, entryData, fitted, summary, show and residuals.

### Rdversion

1.1

### Author(s)

Frank Technow

Maintainer: Frank Technow < Frank.Technow@gmx.net >

---

circularExtension *Circular extension of the grid*

---

## Description

The function finds the subscripts of the cells that extend the grid in layers that extend from the center in all directions other than 0, 90, 180 and 270 degree. The function is not intended to be called by the user.

## Usage

```
circularExtension(i, j, layers, rowLimit, colLimit)
```

## Arguments

| | |
|---|---|
| i | "integer", row subscript of center cell |
| j | "integer", column subscript of center cell |
| layers | "integer", vector giving the layers to be included in the grid that extents from the center cell in all other directions than 0, 90, 180 and 270 degree. Can be NULL ( no extension) and must not contain '0', negative or duplicated values. |
| rowLimit | "integer", row limit (= number of rows) of the field layout |
| colLimit | "integer", column limit (= number of columns) of the field layout |

## Details

This function is called by the function movingGrid and is not intended to be called by the user.

## Value

A matrix with the row subscripts of the cells in column one and the column subscripts in column two.

## Rdversion

1.1

## Author(s)

Frank Technow

## Examples

```
circularExtension(i = 1,
                  j = 10,
                  rowLimit = 50,
                  colLimit = 50,
                  layers = c(1,2,3))
```

---

entryData                        *Function to extract entry information*

---

## Description

Generic function to extract the most relevant information from the adjustment procedure for each entry included in the trial.

## Usage

```
entryData(object,...)
```

## Arguments

| | |
|---|---|
| object | an object from the context of moving grid adjustment |
| ... | possible other arguments to methods |

## Value

returned is a data.frame with the following content

| | |
|---|---|
| row | the row of the entry |
| column | the column of the entry |
| column | the column of the entry |
| adjustedPhe | the adjusted phenotypic value |
| observedPhe | the observed phenotypic value |
| movingMean | the moving mean |
| nValues | the number of values to calculate the moving mean |

... and possibly more

## Rdversion

1.1

## Author(s)

Frank Technow

## See Also

[movingGrid](#) (includes example of entryData)

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entryData-methods          *Methods for Function entryData*

---

## Description

Methods for function `entryData`

## Methods

**object = "movG"** returned is a `data.frame` with: row, column, adj. phenotypic value, obs. phenotypic value, moving mean, number of values

---

extendHorVer          *Vertical and horizontal extension of the grid ('cross shape')*

---

## Description

The function finds the subscripts of the cells that extend from the center in 0, 90, 180 and 270 degree direction ('cross shape'). The function is not intended to be called by the user.

## Usage

```
extendHorVer(i, j, shapeCross, rowLimit, colLimit)
```

## Arguments

| | |
|---|---|
| i | `"integer"`, row subscript of center cell |
| j | `"integer"`, column subscript of center cell |
| shapeCross | `"list"` of length 4, each element contains the cells that are to be included in the grid that extends from the center in 0, 90, 180 and 270 degree direction. |
| | Elements can be NULL (no extension in this direction) and must contain no '0', duplicated or negative values. |
| | shapeCross[[1]]DOWN (180 degree) from the center cell (same column) |
| | shapeCross[[2]]UP (0 degree) from the center cell (same column) |
| | shapeCross[[3]]LEFT (270 degree) from the center cell (same row) |
| | shapeCross[[4]]RIGHT (90 degree) from the center cell (same row) |
| rowLimit | `"integer"`, row limit (= number of rows) of the field layout |
| colLimit | `"integer"`, column limit (= number of columns) of the field layout |

## Details

This function is called by the function `movingGrid` and is not intended to be called by the user.

## Value

A matrix with the row subscripts of the cells in column one and the column subscripts in column two.

## Rdversion

1.1

## Author(s)

Frank Technow

## Examples

```
shape <- list(c(1,2,3),
              c(1,2,3),
              c(1:5),
              c(1:5))

extendHorVer(i = 25,
             j = 25,
             shapeCross = shape,
             rowLimit = 50,
             colLimit = 50)
```

---

 fitted-methods          *Methods for Function fitted in Package "stats"*

---

## Description

Methods for function `fitted` in Package "stats"

## Methods

**object = "ANY"** default method, the S3 generic

**object = "movG"** Returns a vector with the adjusted values.

---

movG-class                    *Class "movG"*

---

**Description**

The "movG" Class Represents Objects From A Moving Grid Adjustment Using A Designed Grid

**Rdversion**

1.1

**Objects from the Class**

Objects can be created by calls of the form new("movG", ...) or by a call to function movingGrid.

**Slots**

movingMeanMap: Object of class "matrix" for the moving mean of the cell in the ith row and jth column.

row: Object of class "integer" for the row subscripts.

col: Object of class "integer" for the column subscripts.

observedPhe: Object of class "numeric" for the observed phenotypic values.

adjustedPhe: Object of class "numeric" for the adjusted phenotypic values.

movingMean: Object of class "numeric" for the moving means.

nValues: Object of class "integer" for the number of non-NA values used for calculating the moving mean.

adjModel: Object of class "lm" for the model used for covariate adjustment.

correlation: Object of class "numeric" for the coefficient of correlation between the moving means and the observed phenotypic values.

maxValues: Object of class "integer" for the maximum number of values possible given the design of the grid or the number of nearest neighbors.

FunCall: Object of class "call" for the function call.

**Methods**

**entryData** signature(object = "movG"): extract all relevant information on each entry from the object

**movingMean** signature(object = "movG"): extract only the moving means from the object

**fitted** signature(object = "movG"): extract only the adjusted phenotypical values

**residuals** signature(object = "movG"): extract the residuals from the model for calculation of the regression coefficient

**show** signature(object = "movG"): show some summary statistics and informations

**summary** signature(object = "movG"): same as show, but with a list of the summarized values invisibly returned

## Note

The data in the slots `observedPhe`, `adjustedPhe`, `movingMean`, and `nValues` must correspond.

## Author(s)

Frank Technow

## See Also

[movingGrid](movingGrid)

## Examples

```
showClass("movG")
```

---

movingGrid                                *Moving Grid Adjustment In Plant Breeding Field Trials*

---

## Description

The function uses the phenotypic information from plants or plots (entries) in a designed grid to obtain an adjusted (for environmental variation) phenotypic value of the entry in the center of the grid. The adjustment is done by calculating the mean of all the entries included and using it as a covariate.

## Usage

```
movingGrid(rows, columns, obsPhe, shapeCross, layers, excludeCenter = TRUE)
```

## Arguments

| | |
|---|---|
| rows | An integer vector with the row subscripts of the phenotypic values to be adjusted. |
| columns | An integer vector with the column subscripts of the phenotypic values to be adjusted. |
| obsPhe | A numeric vector with the observed phenotypic values of the entries that are to be adjusted. The arguments to `rows`, `columns` and `obsPhe` must, of course, correspond. |
| shapeCross | `"list"` of length 4, each element contains the cells that are to be included in the grid that extends from the center in 0, 90, 180 and 270 degree direction. |
| | Elements can be NULL (no extension in this direction) and must contain no '0', duplicated or negative values. |
| | shapeCross[[1]]DOWN (180 degree) from the center cell (same column) |
| | shapeCross[[2]]UP (0 degree) from the center cell (same column) |
| | shapeCross[[3]]LEFT (270 degree) from the center cell (same row) |
| | shapeCross[[4]]RIGHT (90 degree) from the center cell (same row) |

| layers | "integer", vector giving the layers to be included in the grid that extents from the center cell in all directions other than 0, 90, 180 and 270 degree. Can be NULL ( no extension) and must not contain '0', negative or duplicated values. |
|---|---|
| excludeCenter | Should the center entry (the one which is adjusted) be excluded from the calculation of the moving mean, logical TRUE (default) or FALSE. |

### Details

Please see the included vignette for a more detailed description of the rational underlining the adjustment procedure and usage of the function.

The function movingGrid calls the functions extendHorVer and extendCircular to form the grid (i.e. determine the row and column subscripts of the cells included). These two functions are not intended to be called by the user.

### Value

An object of class "movG". See movG-class for details.

### Rdversion

1.1

### Note

The field layout is always assumed to be a rectangular matrix with max(rows) * max(columns) cells! All of the cells that were not mentioned in arguments rows and columns are NA.

If, for example, the last row was only planted with half the number of entries as the other rows, the other half of the row will consist of cells with NA values.

These NA values are ignored by movingGrid and the various extractor functions. They do not influence the results of movingGrid.

The general linear model, that is part of the adjustment procedure, is fit via the function lm.

### Author(s)

Frank Technow

### See Also

[sketchGrid](), [entryData](), [movG](), [mvngGrAd-package]()

### Examples

```
### data creation ###
#####################


### The field plan consists of 50 rows and 50 columns
### (= 2500 cells = 2500 entries)
```

```
## row vector

rows <- rep(1:50,each=50)


## column vector
cols <- rep(1:50,50)

## simulation of growing conditions with a horizontal gradient between
## the rows and some random noise within

set.seed(666)
growingCond <- rep(1:50,each=50) + rnorm(2500)

## simulation of the genotypic effects
gEffects <- rnorm(2500,mean=0,sd=5)

## observed phenotypic values
yield <- growingCond + gEffects

## adjustment with movingGrid

cross <- list(c(1),
              c(1),
              c(1:4),
              c(1:4))

exampleResults <- movingGrid(rows = rows,
                             columns = cols,
                             obsPhe = yield,
                             shapeCross = cross,
                             layers = c(1,2),
                             excludeCenter = TRUE)

## a summary

summary(exampleResults)

## the adjusted phenotypic values of the first 25 entries

fitted(exampleResults)[1:25]

## all information on entry, for the first 25

entryData(exampleResults)[1:25,]

## moving means for the first 25

movingMean(exampleResults)[1:25]
```

---

movingMean          *Function to extract the moving means from the object*

---

### Description

Generic function to extract the moving means, which are used as covariates, from the object.

### Usage

```
movingMean(object,...)
```

### Arguments

object            an object from the context of moving grid adjustment

...               possible other arguments to methods

### Value

returned is a vector with the moving means

### Rdversion

1.1

### Author(s)

Frank Technow

### See Also

[movingGrid](#) (includes example of movingMean)

---

movingMean-methods          *Methods for Function movingMean*

---

### Description

Methods for function movingMean

### Methods

**object = "movG"** returns a vector with the moving means

---

residuals-methods          *Methods for Function residuals in Package 'stats'*

---

## Description

Methods for function `residuals` in Package 'stats'

## Methods

**object = "ANY"** default method, the S3 generic

**object = "movG"** Residuals from the model to calculate the regression coefficient for adjustment by the covariate

---

show-methods              *Methods for Function show in Package 'methods'*

---

## Description

Methods for function `show` in Package 'methods'

## Methods

**object = "movG"** Some summary statistics and informations are calculated from the object and printed.

---

sketchGrid                *Function to aid with grid design*

---

## Description

The function aids with grid design by plotting the designed grid.

## Usage

```
sketchGrid(i, j, rowLimit, colLimit, layers, shapeCross, excludeCenter,...)
```

## Arguments

| | |
|---|---|
| i | "integer", row subscript of center cell |
| j | integer value, giving the column of the center cell |
| rowLimit | "integer", row limit (= number of rows) of the field layout |
| colLimit | "integer", column limit (= number of columns) of the field layout |
| layers | "integer", vector giving the layers to be included in the grid that extents from the center cell in all other directions than 0, 90, 180 and 270 degree. Can be NULL ( no extension) and must not contain '0', negative or duplicated values. |
| shapeCross | "list" of length 4, each element contains the cells that are to be included in the grid that extends from the center in 0, 90, 180 and 270 degree direction. |
| | Elements can be NULL (no extension in this direction) and must contain no '0', duplicated or negative values. |
| | shapeCross[[1]]DOWN (180 degree) from the center cell (same column) |
| | shapeCross[[2]]UP (0 degree) from the center cell (same column) |
| | shapeCross[[3]]LEFT (270 degree) from the center cell (same row) |
| | shapeCross[[4]]RIGHT (90 degree) from the center cell (same row) |
| excludeCenter | Should the center entry (the one which is adjusted) be included in the calculation of the moving mean, logical TRUE (default) or FALSE. |
| ... | further arguments passed to or from other methods |

## Details

When using the function movingGrid, this function can be used to look at different designs, to see how many and which cells are included when the center cell is close to the edge of the field layout, and for verifying that the actual arguments to shapeCross and layers really specify the intended design.

sketchGrid is a generic function with currently one method for sketching a designed grid (as needed for function movingGrid). The method is dispatched when the arguments shapeCross and layers are given (with class "ANY").

## Value

A plot is created (via a call to function plot from the traditional R graphics system).

## Rdversion

1.1

## Author(s)

Frank Technow

## See Also

[movingGrid](movingGrid)

## Examples

```
## with method for designed grid

sketchGrid(25,
           25,
           shapeCross = list(c(1:4,7),
             c(1:4,7),
             c(1:4,7),
             c(1:4,7)),
           layers = c(1,2,3,5,6),
           excludeCenter = TRUE,
           rowLimit = 50,
           colLimit = 50)
```

---

sketchGrid-methods          *Methods for Function sketchGrid in Package "mvngGrAd"*

---

## Description

Methods for function sketchGrid in Package "mvngGrAd"

## Methods

**objects:** i = "ANY", j = "ANY", rowLimit = "ANY",colLimit = "ANY",
   layers = "ANY", shapeCross = "ANY",
   excludeCenter = "ANY"
   Method to sketch designed grid, for example for usage with function movingGrid.

---

summary-methods             *Methods for Function summary in Package "base"*

---

## Description

Methods for function summary in Package "base"

## Methods

**object = "ANY"**  default method, the S3 generic

**object = "movG"**  Identical to method for function show, except that a list with the summarized
   values is invisibly returned. An additional argument (showSummary with default value TRUE)
   is added. If set to FALSE, the summary is not printed, only the list is invisibly returned.

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