Package ‘mvngGrAd’

December 5, 2016

Type Package

Title Moving Grid Adjustment in Plant Breeding Field Trials

Version 0.1.5

Date 2015-04-04

Depends methods, stats

Author Frank Technow

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

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

License GPL (>= 2)

LazyLoad TRUE

Collate movG-class.R circularExtension.R entryData.R

NeedsCompilation no

Repository CRAN

Date/Publication 2016-12-05 18:28:47

R topics documented:

mvngGrAd-package .................................................. 2
CircularExtension .................................................. 3
entryData ........................................................... 4
entryData-methods .................................................. 5
extendHorVer ......................................................... 5
fitted-methods ....................................................... 6
movG-class ........................................................... 7
movingGrid ........................................................... 8
movingMean .......................................................... 11
movingMean-methods ............................................... 11
### mvngGrAd-package

<table>
<thead>
<tr>
<th>Function</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>residuals-methods</td>
<td>12</td>
</tr>
<tr>
<td>show-methods</td>
<td>12</td>
</tr>
<tr>
<td>sketchGrid</td>
<td>12</td>
</tr>
<tr>
<td>sketchGrid-methods</td>
<td>14</td>
</tr>
<tr>
<td>summary-methods</td>
<td>14</td>
</tr>
</tbody>
</table>

### Index

<table>
<thead>
<tr>
<th>Package</th>
<th>R Package mvngGrAd: Moving Grid Adjustment In Plant Breeding Field Trials</th>
</tr>
</thead>
<tbody>
<tr>
<td>mvngGrAd-package</td>
<td></td>
</tr>
</tbody>
</table>

### 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 rationale 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, `mvg`, 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
entryData-methods

Author(s)
Frank Technow

See Also
movingGrid (includes example of entryData)

Methods

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
fitted-methods

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

```r
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)
```

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

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

Author(s)
Frank Technow

See Also
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.

  \[\text{shapeCross}[[1]]=\text{DOWN} (180 \text{ degree}) \text{ from the center cell (same column)}\]

  \[\text{shapeCross}[[2]]=\text{UP} (0 \text{ degree}) \text{ from the center cell (same column)}\]

  \[\text{shapeCross}[[3]]=\text{LEFT} (270 \text{ degree}) \text{ from the center cell (same row)}\]

  \[\text{shapeCross}[[4]]=\text{RIGHT} (90 \text{ degree}) \text{ from the center cell (same row)}\]
movingGrid

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, mvngRd-package

Examples

### data creation ###

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

```r
cols <- rep(1:50,50)
```

## column vector

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

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

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

## simulation of the genotypic effects

```r
gEffects <- rnorm(2500,mean=0,sd=5)
```

## observed phenotypic values

```r
yield <- growingCond + gEffects
```

## adjustment with movingGrid

```r
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

```r
summary(exampleresults)
```

## the adjusted phenotypic values of the first 25 entries

```r
fitted(exampleresults)[1:25]
```

## all information on entry, for the first 25

```r
entryData(exampleresults)[1:25,]
```

## moving means for the first 25

```r
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

Value
returned is a vector with the moving means

Rdversion
1.1

Author(s)
Frank Technow

See Also
movingGrid (includes example of movingMean)

Methods
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
- \(\text{rowLimit}\) "integer", row limit (= number of rows) of the field layout
- \(\text{colLimit}\) "integer", column limit (= number of columns) of the field layout
- \(\text{layers}\) "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 contain '0', negative or duplicated values.
- \(\text{shapeCross}\) "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.
- \(\text{excludeCenter}\) Should the center entry (the one which is adjusted) be included in the calculation of the moving mean, logical TRUE (default) or FALSE.

Details

When using the function \texttt{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 \texttt{shapeCross} and \texttt{layers} really specify the intended design.

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

Value

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

Rdversion

1.1

Author(s)

Frank Technow

See Also

\texttt{movingGrid}
Examples

```r
## 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)
```

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`.

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.
Index

*Topic classes
  movG-class, 7

*Topic design
  circularExtension, 3
  entryData, 4
  extendHorVer, 5
  movingGrid, 8
  movingMean, 11
  sketchGrid, 12

*Topic methods
  entryData-methods, 5
  fitted-methods, 6
  movingMean-methods, 11
  residuals-methods, 12
  show-methods, 12
  sketchGrid-methods, 14
  summary-methods, 14

*Topic package
  mvngGrad-package, 2

  circularExtension, 3
  entryData, 4, 9
  entryData, movG-method (entryData-methods), 5
  entryData-methods, 5
  extendHorVer, 5
  fitted, movG-method (fitted-methods), 6
  fitted-methods, 6
  movG, 9
  movG-class, 7
  movingGrid, 5, 8, 8, 11, 13
  movingMean, 11
  movingMean, movG-method (movingMean-methods), 11
  movingMean-methods, 11
  mvngGrad (mvngGrad-package), 2
  mvngGrad-package, 2
  residuals, movG-method (residuals-methods), 12
  residuals-methods, 12
  show, movG-method (show-methods), 12
  show-methods, 12
  sketchGrid, 9, 12
  sketchGrid, ANY-method (sketchGrid-methods), 14
  sketchGrid-methods, 14
  summary, movG-method (summary-methods), 14
  summary-methods, 14