

# Package ‘FactoInvestigate’

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**Type** Package

**Title** Automatic Description of Factorial Analysis

**Version** 1.8

**Author** Simon Thuleau, Francois Husson

**Maintainer** Francois Husson <husson@agrocampus-ouest.fr>

**Description** Brings a set of tools to help and automatically realise the description of principal component analyses (from 'FactoMineR' functions). Detection of existing outliers, identification of the informative components, graphical views and dimensions description are performed thre dedicated functions. The Investigate() function performs all these functions in one, and returns the result as a report document (Word, PDF or HTML).

**Depends** R (>= 4.0)

**URL** <http://factominer.free.fr/reporting/>

**Imports** FactoMineR, stats, methods, graphics, rmarkdown, parallel, ggplot2

**License** GPL (>= 2)

**Encoding** latin1

**LazyLoad** yes

**NeedsCompilation** no

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FactoInvestigate-package

*Automatic Description of Factorial Analysis*

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## Description

Brings a set of tools to help and automatically realise the description of principal component analyses (from 'FactoMineR' functions). Detection of existing outliers, identification of the informative components, graphical views and dimensions description are performed threw dedicated functions. The Investigate() function performs all these functions in one, and returns the result as a report document (Word, PDF or HTML).

## Details

The DESCRIPTION file:

```

Package:      FactoInvestigate
Type:         Package
Title:        Automatic Description of Factorial Analysis
Version:      1.8
Author:       Simon Thuleau, Francois Husson
Maintainer:   Francois Husson <husson@agrocampus-ouest.fr>
Description:  Brings a set of tools to help and automatically realise the description of principal component analyses (from 'F
Depends:      R (>= 4.0)
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Imports:      FactoMineR, stats, methods, graphics, rmarkdown, parallel, ggplot2
License:      GPL (>= 2)
Encoding:     latin1
LazyLoad:    yes

```

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outliers	Outliers detection
readRmd	Read Rmarkdown file
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selection	Graphical elements selection
whichFacto	Analysis class
writeRmd	Write Rmarkdown file

An overview of how to use the package, including the most important functions

### Author(s)

Simon Thuleau, Francois Husson

Maintainer: Francois Husson <husson@agrocampus-ouest.fr>

### See Also

[FactoMineR](#)

---

classif

*Classification description*

---

### Description

Realise the hierachical ascending classification (HCPC function) of the individuals (or rows) and describe the specifications of each cluster.

### Usage

```
classif(res, file = "", dim = 1:2, nclust = -1, selec = "contrib", coef = 1,
        mmax = 10, nmax = 10, figure.title = "Figure", graph = TRUE, options = NULL)
```

**Arguments**

<code>res</code>	an object of class PCA, CA or MCA.
<code>file</code>	the file path where to write the description in Rmarkdown langage. If not specified, the description is written in the console.
<code>dim</code>	a 2 dimensional numerical vector giving the factorial dimensions to describe (by default the first plane).
<code>nclust</code>	an integer forcing the number of clusters desired. The value -1 return the clustering evaluated as the most appropriate (default).
<code>selec</code>	the selection criterion of individuals to plot on the graph.
<code>coef</code>	a numerical coefficient to adjust the selection rule (exemple : if equals 2, the threshold is 2 times higher, and thus more restrictive)
<code>mmax</code>	an integer giving the maximum number of individuals to illustrate each cluster (by default 10).
<code>nmax</code>	an integer giving the maximum number of variables to illustrate each cluster (by default 10).
<code>figure.title</code>	the text label to add before graph title.
<code>graph</code>	a boolean : if TRUE, the graph is plotted into the console.
<code>options</code>	a character string that gives the output options for the figures. If NULL, <code>options="r, echo = FALSE, fig.align = 'center', fig.height = 3.5, fig.width = 5.5"</code> for linuw and Mac and <code>options="r, echo = FALSE, fig.height = 3.5, fig.width = 5.5"</code> for Windows

**Details**

The `selec` argument is used in order to select a part of the individuals that are drawn and described. For example, you can use either :

- `selec = 1:5` then the individuals numbered 1 to 5 are drawn.
- `selec = c("name1", "name5")` then the individuals named name1 and name5 are drawn.
- `selec = "contrib 10"` then the 10 active or illustrative individuals that have the highest contribution on the 2 dimensions of the plane are drawn.
- `selec = "contrib"` then the optimal number of active or illustrative individuals that have the highest contribution on the 2 dimensions of the plane are drawn.
- `selec = "cos2 5"` then the 5 active or illustrative individuals that have the highest `cos2` on the 2 dimensions of the plane are drawn.
- `selec = "cos2 0.8"` then the active or illustrative individuals that have a `cos2` higher to 0.8 on the plane are drawn.
- `selec = "cos2"` then the optimal number of active or illustrative individuals that have the highest `cos2` on the 2 dimensions of the plane are drawn.

The `coef` argument is used in order to adjust the selection of the individuals when based on `selec = "contrib"` or `selec = "cos2"`. For example :

- if `coef = 2`, the threshold is 2 times higher, and thus 2 times more restrictive.
- if `coef = 0.5`, the threshold is 2 times lower, and thus 2 times less restrictive.

**Value**

`res.hcpc` the result of the [HCPC](#) function on the dimensions specified.

**Author(s)**

Simon Thuleau and Francois Husson

**See Also**

[description](#)

**Examples**

```
## Not run:
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
classif(res.pca, file = "PCA.Rmd")

data(children)
res.ca = CA(children, row.sup = 15:18, col.sup = 6:8, graph = FALSE)
classif(res.ca, file = "CA.Rmd")

data(tea)
res.mca = MCA(tea, quanti.sup = 19, quali.sup = 20:36, graph = FALSE)
classif(res.mca, file = "MCA.Rmd")

## End(Not run)
```

---

createRmd

*Create Rmarkdown file*

---

**Description**

Intialise a Rmarkdown file in which to write the results of the package functions.

**Usage**

```
createRmd(res, analyse = "PCA", file = "",
          document = c("word_document", "pdf_document", "html_document"))
```

**Arguments**

res	an object of class PCA, CA or MCA.
analyse	A character string corresponding to the method for which the Rmd is created
file	the file path where to write the description in Rmarkdown langage. If the file already exists, its content is overwritten. If not specified, the description is written in the console.
document	a character vector giving the document format desired between "word_document", "pdf_document" and "html_document".

**Author(s)**

Simon Thuleau and Francois Husson

**See Also**

[writeRmd](#), [readRmd](#)

**Examples**

```
## Not run:
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
createRmd(res.pca, file = "PCA.Rmd", document = "pdf_document")

data(children)
res.ca = CA(children, row.sup = 15:18, col.sup = 6:8, graph = FALSE)
createRmd(res.ca, file = "CA.Rmd", document = "html_document")

data(tea)
res.mca = MCA(tea, quanti.sup = 19, quali.sup = 20:36, graph = FALSE)
createRmd(res.mca, file = "MCA.Rmd", document = c("word_document", "pdf_document"))

## End(Not run)
```

---

description

*Factorial dimensions description*

---

**Description**

Describe a couple of dimensions, giving the individuals specific to each dimension, and the variables that characterize each group of individuals.

**Usage**

```
description(res, file = "", dim = 1:2, desc = dim, Iselec = "contrib",
            Vselec = "cos2", Rselec = "cos2", Cselec = "cos2", Icoef = 1,
            Vcoef = 1, Rcoef = 1, Ccoef = 1, mmax = 10, nmax = 10)
```

**Arguments**

<code>res</code>	an object of class <code>PCA</code> , <code>CA</code> or <code>MCA</code> .
<code>file</code>	the file path where to write the description in Rmarkdown language. If not specified, the description is written in the console.
<code>dim</code>	a 2 dimensional numerical vector giving the factorial dimensions to use for the representation (by default the first plane).
<code>desc</code>	a 2 dimensional numerical vector giving the factorial dimensions to describe (by default the <code>dim</code> value).

Iselec	the individuals to select; see the details section.
Vselec	the variables to select; see the details section.
Rselec	the rows to select (for a CA res object); see the details section.
Cselec	the columns to select (for a CA res object); see the details section.
Icoef	a numerical coefficient to adjust the individuals selection rule; see the details section.
Vcoef	a numerical coefficient to adjust the variables selection rule; see the details section.
Rcoef	a numerical coefficient to adjust the rows selection rule (for a CA res object); see the details section.
Ccoef	a numerical coefficient to adjust the columns selection rule (for a CA res object); see the details section.
mmax	an integer giving the maximum number of individuals to illustrate each cluster (by default 10).
nmax	an integer giving the maximum number of variables to illustrate each cluster (by default 10).

### Details

The Iselec argument (respectively Vselec, Rselec or Cselec) is used in order to select a part of the elements that are drawn and described. For example, you can use either :

- Iselec = 1:5 then the individuals (respectively the variables, the rows or the columns) numbered 1 to 5 are drawn.
- Iselec = c("name1", "name5") then the individuals (respectively the variables, the rows or the columns) named name1 and name5 are drawn.
- Iselec = "contrib 10" then the 10 active or illustrative individuals (respectively the variables, the rows or the columns) that have the highest contribution on the 2 dimensions of the plane are drawn.
- Iselec = "contrib" then the optimal number of active or illustrative individuals (respectively the variables, the rows or the columns) that have the highest contribution on the 2 dimensions of the plane are drawn.
- Iselec = "cos2 5" then the 5 active or illustrative individuals (respectively the variables, the rows or the columns) that have the highest cos2 on the 2 dimensions of the plane are drawn.
- Iselec = "cos2 0.8" then the active or illustrative individuals (respectively the variables, the rows or the columns) that have a cos2 higher to 0.8 on the plane are drawn.
- Iselec = "cos2" then the optimal number of active or illustrative individuals (respectively the variables, the rows or the columns) that have the highest cos2 on the 2 dimensions of the plane are drawn.

The Icoef argument (respectively Vcoef, Rcoef or Ccoef) is used in order to adjust the selection of the elements when based on Iselec = "contrib" or Iselec = "cos2". For example :

- if Icoef = 2, the threshold is 2 times higher, and thus 2 times more restrictive.
- if Icoef = 0.5, the threshold is 2 times lower, and thus 2 times less restrictive.

### Author(s)

Simon Thuleau and Francois Husson

**See Also**[classif](#)**Examples**

```
## Not run:
require(FactoMineR)
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
description(res.pca, file = "PCA.Rmd", dim = 1:2)

## End(Not run)
```

---

dimActive

*Number of active dimensions*

---

**Description**

Give the number of active elements used to build the factorial analysis : individuals (or rows) and variables (or columns)

**Usage**

```
dimActive(res)
```

**Arguments**

res                    an object of class PCA, CA or MCA.

**Author(s)**

Simon Thuleau and Francois Husson

**Examples**

```
## Not run:
require(FactoMineR)
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
dimActive(res.pca)

## End(Not run)
```



---

dimRestrict	<i>Significant dimensions identification</i>
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---

### Description

Evaluate the number of significant dimensions in the data.

### Usage

```
dimRestrict(res, file = "", rand = NULL)
```

### Arguments

res	an object of class PCA, CA or MCA.
file	the file path where to write the function execution in Rmarkdown language. If not specified, the description is written in the console.
rand	an optional vector of eigenvalues to compare the observation with. If NULL, use the result of the <a href="#">eigenRef</a> function for comparison.

### Value

ncp	the number of significant dimensions.
-----	---------------------------------------

### Author(s)

Simon Thuleau and Francois Husson

### See Also

[eigenRef](#), [inertiaDistrib](#)

### Examples

```
## Not run:  
require(FactoMineR)  
data(decathlon)  
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)  
dimRestrict(res.pca, file = "PCA.Rmd")  
  
## End(Not run)
```

---

eigenRef	<i>Reference eigen value</i>
----------	------------------------------

---

**Description**

Compute the eigen values of random datasets, with the hypothesis of independence.

**Usage**

```
eigenRef(res, dim = NULL, q = 0.95, time = "10000L", parallel = TRUE)
```

**Arguments**

res	an object of class PCA, CA or MCA
dim	a numerical vector giving the factorial dimensions for with to compute the eigen-values calculation.
q	the quantile of computed values to use as reference value (ie. the confidence about the signification of dimensions)
time	a character indicating the loop condition. This string is made of a number and a letter coupled. The number X with letter L means to compute X datasets exactly. The number X with letter s means to compute as many datasets as possible during approximatively X seconds.
parallel	a boolean : if TRUE, the computation uses map reduce on the processor cores to increase the performance. Useful for huge datasets

**Value**

datasets	the number of random datasets simulated.
quantile	the quantile used for the reference definition.
inertia	the reference inertia for the dimensions declared.

**Author(s)**

Simon Thuleau and Francois Husson

**See Also**

[dimRestrict](#), [inertiaDistrib](#)

**Examples**

```
## Not run:
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
eigenRef(res.pca, q = 0.95, time = "10s")
```

```

data(children)
res.ca = CA(children, row.sup = 15:18, col.sup = 6:8, graph = FALSE)
eigenRef(res.ca, q = 0.99, time = "10000L")

data(tea)
res.mca = MCA(tea, quanti.sup = 19,quali.sup = 20:36, graph = FALSE)
eigenRef(res.mca, dim = 1:8, q = 0.90, time = "10s")

## End(Not run)

```

---

factoGraph

*Factorial graphs*


---

### Description

Realise all optimised factorial graphs

### Usage

```

factoGraph(res, file = "", dim = 1:2, hab = NULL, ellipse = TRUE, Iselec = "contrib",
           Vselec = "cos2", Rselec = "cos2", Cselec = "cos2", Mselec = "cos2",
           Icoef = 1, Vcoef = 1, Rcoef = 1, Ccoef = 1, Mcoef = 1,
           figure.title = "Figure", graph = TRUE, cex = 0.7,
           codeGraphInd = NULL, codeGraphVar = NULL ,codeGraphCA = NULL,
           options = NULL)

```

### Arguments

res	an object of class PCA, CA or MCA
file	the file path where to write the description in Rmarkdown language. If not specified, the description is written in the console.
dim	a 2 dimensional numerical vector giving the factorial dimensions to use for the representation (by default the first plane)
hab	a variable name or index to use to color the individuals (or rows) among the variable categories.
ellipse	a boolean : if TRUE, ellipses are plotted with the coloration of individuals (or rows).
Iselec	the individuals to select ; see the details section
Vselec	the variables to select ; see the details section
Rselec	the rows to select (for a CA res object) ; see the details section
Cselec	the columns to select (for a CA res object) ; see the details section
Mselec	the supplementary variables to select ; see the details section
Icoef	a numerical coefficient to adjust the individuals selection rule ; see the details section

Vcoef	a numerical coefficient to adjust the variables selection rule ; see the details section
Rcoef	a numerical coefficient to adjust the rows selection rule (for a CA res object) ; see the details section
Ccoef	a numerical coefficient to adjust the columns selection rule (for a CA res object) ; see the details section
Mcoef	a numerical coefficient to adjust the supplementary variables selection rule ; see the details section
figure.title	the text label to add before graph title
graph	a boolean : if TRUE, graphs are plotted.
cex	an optional argument for the generic plot functions, used to adjust the size of the elements plotted.
codeGraphInd	a character string corresponding to the code to use for the individuals graph.
codeGraphVar	a character string corresponding to the code to use for the variables graph.
codeGraphCA	a character string corresponding to the code to use for the CA graph.
options	a character string that gives the output options fir the figures. If NULL, options="r, echo = FALSE, fig.align = 'center', fig.height = 3.5, fig.width = 5.5" for linux and Mac and options="r, echo = FALSE, fig.height = 3.5, fig.width = 5.5" for Windows

## Details

The Iselec argument (respectively Vselec, Rselec or Cselec) is used in order to select a part of the elements that are drawn and described. For example, you can use either :

- Iselec = 1:5 then the individuals (respectively the variables, the rows or the columns) numbered 1 to 5 are drawn.
- Iselec = c("name1", "name5") then the individuals (respectively the variables, the rows or the columns) named name1 and name5 are drawn.
- Iselec = "contrib 10" then the 10 active or illustrative individuals (respectively the variables, the rows or the columns) that have the highest contribution on the 2 dimensions of the plane are drawn.
- Iselec = "contrib" then the optimal number of active or illustrative individuals (respectively the variables, the rows or the columns) that have the highest contribution on the 2 dimensions of the plane are drawn.
- Iselec = "cos2 5" then the 5 active or illustrative individuals (respectively the variables, the rows or the columns) that have the highest cos2 on the 2 dimensions of the plane are drawn.
- Iselec = "cos2 0.8" then the active or illustrative individuals (respectively the variables, the rows or the columns) that have a cos2 higher to 0.8 on the plane are drawn.
- Iselec = "cos2" then the optimal number of active or illustrative individuals (respectively the variables, the rows or the columns) that have the highest cos2 on the 2 dimensions of the plane are drawn.

The Icoef argument (respectively Vcoef, Rcoef or Ccoef) is used in order to adjust the selection of the elements when based on Iselec = "contrib" or Iselec = "cos2". For example :

- if Icoef = 2, the threshold is 2 times higher, and thus 2 times more restrictive.
- if Icoef = 0.5, the threshold is 2 times lower, and thus 2 times less restrictive.

**Author(s)**

Simon Thuleau and Francois Husson

**See Also**

[graphInd](#), [graphHab](#), [graphCA](#), [graphVar](#), [graphSup](#)

**Examples**

```
require(FactoMineR)
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
## Not run:
factoGraph(res.pca)

require(FactoMineR)
data(children)
res.ca = CA(children, row.sup = 15:18, col.sup = 6:8, graph = FALSE)
factoGraph(res.ca)

data(tea)
res.mca = MCA(tea, quanti.sup = 19, quali.sup = 20:36, graph = FALSE)
factoGraph(res.mca)

## End(Not run)
```

---

getParam

*Factorial parameters*

---

**Description**

Get all the factorial object parameters

**Usage**

```
getParam(res)
```

**Arguments**

res                    an object of class PCA, CA or MCA.

**Value**

data                    the dataset.  
ind                     the number of individuals.  
var                     the number of variables.  
row                     the number of rows (CA).

col	the number of columns (CA).
ind.sup	the number of supplementary individuals.
quanti.sup	the number of quantitative supplementary variables.
quali.sup	the number of qualitative supplementary variables.
row.sup	the number of supplementary rows (CA).
col.sup	the number of supplementary columns (CA).
row.w	the weights of each row.
col.w	the weights of each columns.
scale	a boolean indicating if the variables are scaled or not.
ncp.mod	the number of component kept in the analysis object.
modalites	the list of factors for each qualitative variables.

**Author(s)**

Simon Thuleau and Francois Husson

**See Also**

[whichFacto](#)

**Examples**

```
## Not run:
require(FactoMineR)
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
getParam(res.pca)

## End(Not run)
```

---

graphCA

*Correspondance Analysis factor map*

---

**Description**

Realise the Correspondence Analysis simultaneous graph

**Usage**

```
graphCA(res, file = "", dim = 1:2, Rselec = "cos2", Cselec = "cos2", Rcoef = 1,
        Ccoef = 1, figure.title = "Figure", graph = TRUE, cex = 0.7,
        codeGraphCA = NULL, options = NULL)
```

**Arguments**

res	an object of class CA.
file	the file path where to write the description in Rmarkdown language. If not specified, the description is written in the console.
dim	a 2 dimensional numerical vector giving the factorial dimensions to use for the representation (by default the first plane)
Rselect	the rows to select ; see the details section.
Cselect	the columns to select ; see the details section.
Rcoef	a numerical coefficient to adjust the rows selection rule ; see the details section.
Ccoef	a numerical coefficient to adjust the columns selection rule ; see the details section.
figure.title	the text label to add before graph title.
graph	a boolean : if TRUE, graphs are plotted.
cex	an optional argument for the generic plot functions, used to adjust the size of the elements plotted.
codeGraphCA	a character string corresponding to the code to use for the CA graph.
options	a character string that gives the output options fir the figures. If NULL, options="r, echo = FALSE, fig.align = 'center', fig.height = 3.5, fig.width = 5.5" for linux and Mac and options="r, echo = FALSE, fig.height = 3.5, fig.width = 5.5" for Windows

**Details**

The Rselect argument (respectively Cselect) is used in order to select a part of the elements that are drawn and described. For example, you can use either :

- Rselect = 1:5 then the rows (the columns) numbered 1 to 5 are drawn.
- Rselect = c("name1", "name5") and then the rows (the columns) named name1 and name5 are drawn.
- Rselect = "contrib 10" then the 10 active or illustrative rows (the columns) that have the highest contribution on the 2 dimensions of the plane are drawn.
- Rselect = "contrib" then the optimal number of active or illustrative rows (the columns) that have the highest contribution on the 2 dimensions of the plane are drawn.
- Rselect = "cos2 5" then the 5 active or illustrative rows (the columns) that have the highest cos2 on the 2 dimensions of the plane are drawn.
- Rselect = "cos2 0.8" then the active or illustrative rows (the columns) that have a cos2 higher to 0.8 on the plane are drawn.
- Rselect = "cos2" then the optimal number of active or illustrative rows (the columns) that have the highest cos2 on the 2 dimensions of the plane are drawn.

The Rcoef argument (respectively Ccoef) is used in order to adjust the selection of the elements when based on Rselect = "contrib" or Rselect = "cos2". For example :

- if Rcoef = 2, the threshold is 2 times higher, and thus 2 times more restrictive.
- if Rcoef = 0.5, the threshold is 2 times lower, and thus 2 times less restrictive.

**Author(s)**

Simon Thuleau and Francois Husson

**See Also**

[factoGraph](#), [graphInd](#), [graphHab](#), [graphVar](#), [graphSup](#)

**Examples**

```
require(FactoMineR)
data(children)
res.ca = CA(children, row.sup = 15:18, col.sup = 6:8, graph = FALSE)
## Not run:
graphCA(res.ca)

## End(Not run)
```

---

graphHab	<i>Colored factor graph</i>
----------	-----------------------------

---

**Description**

Realised the graph of individuals colored after a variable categories

**Usage**

```
graphHab(res, file = "", dim = 1:2, hab = NULL, ellipse = TRUE, Iselec = "contrib",
         Rselec = "cos2", Cselec = "contrib", Icoef = 1, Rcoef = 1, Ccoef = 1,
         figure.title = "Figure", graph = TRUE, cex = 0.7, options = NULL)
```

**Arguments**

res	an object of class PCA, CA or MCA.
file	the file path where to write the description in Rmarkdown language. If not specified, the description is written in the console.
dim	a 2 dimensional numerical vector giving the factorial dimensions to use for the representation (by default the first plane).
hab	a variable name or index to use to color the individuals (or rows) among the variable categories.
ellipse	a boolean : if TRUE, ellipses are plotted with the coloration of individuals (or rows).
Iselec	the individuals to select ; see the details section.
Rselec	the rows to select (for a CA res object) ; see the details section.
Cselec	the columns to select (for a CA res object) ; see the details section.



Icoef	a numerical coefficient to adjust the individuals selection rule ; see the details section.
Rcoef	a numerical coefficient to adjust the rows selection rule (for a CA res object) ; see the details section.
Ccoef	a numerical coefficient to adjust the columns selection rule (for a CA res object) ; see the details section.
figure.title	the text label to add before graph title.
graph	a boolean : if TRUE, graphs are plotted.
cex	an optional argument for the generic plot functions, used to adjust the size of the elements plotted.
options	a character string that gives the output options fir the figures. If NULL, options="r, echo = FALSE, fig.align = 'center', fig.height = 3.5, fig.width = 5.5" for linux and Mac and options="r, echo = FALSE, fig.height = 3.5, fig.width = 5.5" for Windows

### Details

The Iselec argument (respectively Rselec or Cselec) is used in order to select a part of the elements that are drawn and described. For example, you can use either :

- Iselec = 1:5 then the individuals (respectively the rows or the columns) numbered 1 to 5 are drawn.
- Iselec = c("name1", "name5") then the individuals (respectively the rows or the columns) named name1 and name5 are drawn.
- Iselec = "contrib 10" then the 10 active or illustrative individuals (respectively the rows or the columns) that have the highest contribution on the 2 dimensions of the plane are drawn.
- Iselec = "contrib" then the optimal number of active or illustrative individuals (respectively the rows or the columns) that have the highest contribution on the 2 dimensions of the plane are drawn.
- Iselec = "cos2 5" then the 5 active or illustrative individuals (respectively the rows or the columns) that have the highest cos2 on the 2 dimensions of the plane are drawn.
- Iselec = "cos2 0.8" then the active or illustrative individuals (respectively the rows or the columns) that have a cos2 higher to 0.8 on the plane are drawn.
- Iselec = "cos2" then the optimal number of active or illustrative individuals (respectively the rows or the columns) that have the highest cos2 on the 2 dimensions of the plane are drawn.

The Icoef argument (respectively Rcoef or Ccoef) is used in order to adjust the selection of the elements when based on Iselec = "contrib" or Iselec = "cos2". For example :

- if Icoef = 2, the threshold is 2 times higher, and thus 2 times more restrictive.
- if Icoef = 0.5, the threshold is 2 times lower, and thus 2 times less restrictive.

### Author(s)

Simon Thuleau and Francois Husson

### See Also

[factoGraph](#), [graphInd](#), [graphCA](#), [graphVar](#), [graphSup](#)

**Examples**

```
## Not run:
require(FactoMineR)
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
graphHab(res.pca)

## End(Not run)
```

---

graphInd	<i>Individuals factor map</i>
----------	-------------------------------

---

**Description**

Realise the optimised individuals graph

**Usage**

```
graphInd(res, file = "", dim = 1:2, Iselec = "contrib", Icoef = 1,
         figure.title = "Figure", graph = TRUE, cex = 0.7,
         codeGraphInd = NULL, options=NULL)
```

**Arguments**

<code>res</code>	an object of class PCA or MCA.
<code>file</code>	the file path where to write the description in Rmarkdown language. If not specified, the description is written in the console.
<code>dim</code>	a 2 dimensional numerical vector giving the factorial dimensions to use for the representation (by default the first plane).
<code>Iselec</code>	the individuals to select ; see the details section.
<code>Icoef</code>	a numerical coefficient to adjust the individuals selection rule ; see the details section.
<code>figure.title</code>	the text label to add before graph title.
<code>graph</code>	a boolean : if TRUE, graphs are plotted.
<code>cex</code>	an optional argument for the generic plot functions, used to adjust the size of the elements plotted.
<code>codeGraphInd</code>	a character string corresponding to the code to use for the individuals graph.
<code>options</code>	a character string that gives the output options fir the figures. If NULL, options="r, echo = FALSE, fig.align = 'center', fig.height = 3.5, fig.width = 5.5" for linux and Mac and options="r, echo = FALSE, fig.height = 3.5, fig.width = 5.5" for Windows

## Details

The Iselec argument is used in order to select a part of the individuals that are drawn and described. For example, you can use either :

- Iselec = 1:5 and then the individuals numbered 1 to 5 are drawn.
- Iselec = c("name1", "name5") then the individuals named name1 and name5 are drawn.
- Iselec = "contrib 10" then the 10 active or illustrative individuals that have the highest contribution on the 2 dimensions of the plane are drawn.
- Iselec = "contrib" then the optimal number of active or illustrative individuals (respectively the variables, the rows or the columns) that have the highest contribution on the 2 dimensions of the plane are drawn.
- Iselec = "cos2 5" then the 5 active or illustrative individuals that have the highest cos2 on the 2 dimensions of the plane are drawn.
- Iselec = "cos2 0.8" then the active or illustrative individuals that have a cos2 higher to 0.8 on the plane are drawn.
- Iselec = "cos2" then the optimal number of active or illustrative individuals that have the highest cos2 on the 2 dimensions of the plane are drawn.

The Icoef argument is used in order to adjust the selection of the individuals when based on Iselec = "contrib" or Iselec = "cos2". For example :

- if Icoef = 2, the threshold is 2 times higher, and thus 2 times more restrictive.
- if Icoef = 0.5, the threshold is 2 times lower, and thus 2 times less restrictive.

## Author(s)

Simon Thuleau and Francois Husson

## See Also

[factoGraph](#), [graphHab](#), [graphCA](#), [graphVar](#), [graphSup](#)

## Examples

```
## Not run:
require(FactoMineR)
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
graphInd(res.pca)

## End(Not run)
```

---

graphSup

*Supplementary variables factor map*

---

## Description

Realise the optimised graph of supplementary variables

**Usage**

```
graphSup(res, file = "", dim = 1:2, Mselec = "cos2", Mcoef = 1,
         figure.title = "Figure", graph = TRUE, cex = 0.7, options=NULL)
```

**Arguments**

res	an object of class PCA, CA or MCA.
file	the file path where to write the description in Rmarkdown language. If not specified, the description is written in the console.
dim	a 2 dimensional numerical vector giving the factorial dimensions to use for the representation (by default the first plane).
Mselec	the supplementary variables to select ; see the details section.
Mcoef	a numerical coefficient to adjust the supplementary variables selection rule ; see the details section.
figure.title	the text label to add before graph title.
graph	a boolean : if TRUE, graphs are plotted.
cex	an optional argument for the generic plot functions, used to adjust the size of the elements plotted.
options	a character string that gives the output options fir the figures. If NULL, options="r, echo = FALSE, fig.align = 'center', fig.height = 3.5, fig.width = 5.5" for linux and Mac and options="r, echo = FALSE, fig.height = 3.5, fig.width = 5.5" for Windows

**Details**

The Mselec argument is used in order to select a part of the illustrative variables that are drawn and described. For example, you can use either :

- Mselec = 1:5 then the illustrative variables numbered 1 to 5 are drawn.
- Mselec = c("name1", "name5") then the illustrative variables named name1 and name5 are drawn.
- Mselec = "cos2 5" then the 5 illustrative variables that have the highest cos2 on the 2 dimensions of the plane are drawn.
- Mselec = "cos2 0.8" then the illustrative variables that have a cos2 higher to 0.8 on the plane are drawn.
- Mselec = "cos2" then the optimal number of illustrative variables that have the highest cos2 on the 2 dimensions of the plane are drawn.

The Mcoef argument is used in order to adjust the selection of the illustrative variables when based on Mselec = "cos2". For example :

- if Mcoef = 2, the threshold is 2 times higher, and thus 2 times more restrictive.
- if Mcoef = 0.5, the threshold is 2 times lower, and thus 2 times less restrictive.

**Author(s)**

Simon Thuleau and Francois Husson

**See Also**

[factoGraph](#), [graphInd](#), [graphHab](#), [graphCA](#), [graphVar](#)

**Examples**

```
## Not run:
require(FactoMineR)
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
graphSup(res.pca)

## End(Not run)
```

---

graphVar	<i>Variables factor map</i>
----------	-----------------------------

---

**Description**

Realise the optimised variables graph

**Usage**

```
graphVar(res, file = "", dim = 1:2, Vselec = "cos2", Vcoef = 1,
         figure.title = "Figure", graph = TRUE, cex = 0.7,
         codeGraphVar=NULL, options=NULL)
```

**Arguments**

res	an object of class PCA or MCA.
file	the file path where to write the description in Rmarkdown language. If not specified, the description is written in the console.
dim	a 2 dimensional numerical vector giving the factorial dimensions to use for the representation (by default the first plane).
Vselec	the variables to select ; see the details section.
Vcoef	a numerical coefficient to adjust the variables selection rule ; see the details section.
figure.title	the text label to add before graph title.
graph	a boolean : if TRUE, graphs are plotted.
cex	an optional argument for the generic plot functions, used to adjust the size of the elements plotted.
codeGraphVar	a character string corresponding to the code to use for the variables graph.
options	a character string that gives the output options fir the figures. If NULL, options="r, echo = FALSE, fig.align = 'center', fig.height = 3.5, fig.width = 5.5" for linux and Mac and options="r, echo = FALSE, fig.height = 3.5, fig.width = 5.5" for Windows

## Details

The `Vselec` argument is used in order to select a part of the variables that are drawn and described. For example, you can use either :

- `Vselec = 1:5` then the variables numbered 1 to 5 are drawn.
- `Vselec = c("name1", "name5")` then the variables named `name1` and `name5` are drawn.
- `Vselec = "contrib 10"` then the 10 active or illustrative variables that have the highest contribution on the 2 dimensions of the plane are drawn.
- `Vselec = "contrib"` then the optimal number of active or illustrative variables that have the highest contribution on the 2 dimensions of the plane are drawn.
- `Vselec = "cos2 5"` then the 5 active or illustrative variables that have the highest `cos2` on the 2 dimensions of the plane are drawn.
- `Vselec = "cos2 0.8"` then the active or illustrative variables that have a `cos2` higher to 0.8 on the plane are drawn.
- `Vselec = "cos2"` then the optimal number of active or illustrative variables that have the highest `cos2` on the 2 dimensions of the plane are drawn.

The `Vcoef` argument is used in order to adjust the selection of the variables when based on `Vselec = "contrib"` or `Vselec = "cos2"`. For example :

- if `Vcoef = 2`, the threshold is 2 times higher, and thus 2 times more restrictive.
- if `Vcoef = 0.5`, the threshold is 2 times lower, and thus 2 times less restrictive.

## Author(s)

Simon Thuleau and Francois Husson

## See Also

[factoGraph](#), [graphInd](#), [graphHab](#), [graphCA](#), [graphSup](#)

## Examples

```
## Not run:
require(FactoMineR)
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
graphVar(res.pca)

## End(Not run)
```

## Description

Analysis of the inertia distribution among each axis, the amount and the significativity

**Usage**

```
inertiaDistrib(res, file = "", ncp = NULL, q = 0.95, time = "10000L",
               parallel = TRUE, figure.title = "Figure", graph = TRUE, options = NULL)
```

**Arguments**

<code>res</code>	an object of class PCA, CA or MCA.
<code>file</code>	the file path where to write the description in Rmarkdown language. If not specified, the description is written in the console.
<code>ncp</code>	an integer to force the number of dimension to analyse.
<code>q</code>	the quantile of computed values to use as reference value (ie. the confidence about the signification of dimensions).
<code>time</code>	a character indicating the loop condition. This string is made of a number and a letter coupled. The number X with letter L means to compute X datasets exactly. The number X with letter s means to compute as many datasets as possible during approximativley X seconds.
<code>parallel</code>	a boolean : if TRUE, the computation uses map reduce on the processor cores to increase the performance. Useful for huge datasets.
<code>figure.title</code>	the text label to add before graph title.
<code>graph</code>	a boolean : if TRUE, graphs are plotted.
<code>options</code>	a character string that gives the output options fir the figures. If NULL, options="r, echo = FALSE, fig.align = 'center', fig.height = 3.5, fig.width = 5.5" for linux and Mac and options="r, echo = FALSE, fig.height = 3.5, fig.width = 5.5" for Windows

**Value**

`ncp` the number of significant dimensions (or the dimensions kept).

**Author(s)**

Simon Thuleau and Francois Husson

**See Also**

[dimRestrict](#), [eigenRef](#)

**Examples**

```
## Not run:
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
inertiaDistrib(res.pca, q = 0.95, time = "10s")

data(children)
res.ca = CA(children, row.sup = 15:18, col.sup = 6:8, graph = FALSE)
inertiaDistrib(res.ca, q = 0.99, time = "10000L")
```

```

data(tea)
res.mca = MCA(tea, quanti.sup = 19,quali.sup = 20:36, graph = FALSE)
inertiaDistrib(res.mca, dim = 1:8, q = 0.90, time = "10s")

## End(Not run)

```

---

Investigate

*Resume factorial Analysis*


---

## Description

Compute all the package functions : detection of outliers, evaluation of inertia distribution, dimensions description, classification and realisation of graphical views. All the results are written as Word, html or PDF documents.

## Usage

```

Investigate(res, file = "Investigate.Rmd", document = c("html_document"),
  Iselec = "contrib", Vselec = "cos2", Rselec = "contrib",
  Cselec = "cos2", Mselec = "cos2", Icoef = 1, Vcoef = 1, Rcoef = 1,
  Ccoef = 1, Mcoef = 1, ncp = NULL, time = "10s", nclust = -1,
  mmax = 10, nmax = 10, hab = NULL, ellipse = TRUE, display.HCPC = TRUE,
  out.selec = TRUE, remove.temp = TRUE, parallel = TRUE, cex = 0.7,
  openFile = TRUE, keepRmd = FALSE, codeGraphInd = NULL,
  codeGraphVar=NULL, codeGraphCA = NULL, options = NULL,
  language = "auto")

```

## Arguments

<code>res</code>	a PCA, CA or MCA object.
<code>file</code>	the file path where to write the description in Rmarkdown language. If the file already exists, its content is overwritten. If not specified, the description is written in the console.
<code>document</code>	a character vector giving the document format desired between "word_document", "pdf_document" and "html_document".
<code>Iselec</code>	the individuals to select ; see the details section.
<code>Vselec</code>	the variables to select ; see the details section.
<code>Rselec</code>	the rows to select (for a <a href="#">CA</a> res object) ; see the details section.
<code>Cselec</code>	the columns to select (for a <a href="#">CA</a> res object) ; see the details section.
<code>Mselec</code>	the supplementary variables to select ; see the details section.
<code>Icoef</code>	a numerical coefficient to adjust the individuals selection rule ; see the details section.
<code>Vcoef</code>	a numerical coefficient to adjust the variables selection rule ; see the details section.



Rcoef	a numerical coefficient to adjust the rows selection rule (for a CA res object) ; see the details section.
Ccoef	a numerical coefficient to adjust the columns selection rule (for a CA res object) ; see the details section.
Mcoef	a numerical coefficient to adjust the supplementary variables selection rule ; see the details section.
ncp	an integer to force the number of dimension to analyse.
time	a character indicating the loop condition. This string is made of a number and a letter coupled. The number X with letter L means to compute X datasets exactly. The number X with letter s means to compute as many datasets as possible during approximativley X seconds.
nclust	an integer to force the number of cluster for the classification.
mmax	an integer giving the maximum number of individuals (or rows) to illustrate each group (by default 10).
nmax	an integer giving the maximum number of variables (or columns) to illustrate each group of individuals (by default 10).
hab	a variable name or index to use to color the individuals (or rows) among the variable categories.
ellipse	a boolean : if TRUE, ellipses are plotted with the coloration of individuals (or rows).
display.HCPC	a boolean : if TRUE, the function performs the classification.
out.selec	a boolean : if TRUE, the function performs the detection of outliers.
remove.temp	a boolean : if TRUE, the temporary files created are deleted after the function execution.
parallel	a boolean : if TRUE, the computation uses map reduce on the processor cores to increase the performance. Useful for huge datasets.
cex	an optional argument for the generic plot functions, used to adjust the size of the elements plotted.
openFile	Open the file with the appropriate application; TRUE by default
keepRmd	Keep the Rmd file; FALSE by default
codeGraphInd	a character string corresponding to the code to use for the individuals graph.
codeGraphVar	a character string corresponding to the code to use for the variables graph.
codeGraphCA	a character string corresponding to the code to use for the CA graph.
options	a character string that gives the output options fir the figures. If NULL, options="r, echo = FALSE, fig.align = 'center', fig.height = 3.5, fig.width = 5.5" for linux and Mac and options="r, echo = FALSE, fig.height = 3.5, fig.width = 5.5" for Windows
language	possible values "auto", "en", or "fr": by default, "auto" detects the language (English or French), "en" for English and "fr" for "French"

## Details

The `Iselec` argument (respectively `Vselec`, `Rselec` or `Cselec`) is used in order to select a part of the elements that are drawn and described. For example, you can use either :

- `Iselec = 1:5` then the individuals (respectively the variables, the rows or the columns) numbered 1 to 5 are drawn.
- `Iselec = c("name1", "name5")` then the individuals (respectively the variables, the rows or the columns) named `name1` and `name5` are drawn.
- `Iselec = "contrib 10"` then the 10 active or illustrative individuals (respectively the variables, the rows or the columns) that have the highest contribution on the 2 dimensions of the plane are drawn.
- `Iselec = "contrib"` then the optimal number of active or illustrative individuals (respectively the variables, the rows or the columns) that have the highest contribution on the 2 dimensions of the plane are drawn.
- `Iselec = "cos2 5"` then the 5 active or illustrative individuals (respectively the variables, the rows or the columns) that have the highest `cos2` on the 2 dimensions of the plane are drawn.
- `Iselec = "cos2 0.8"` then the active or illustrative individuals (respectively the variables, the rows or the columns) that have a `cos2` higher to 0.8 on the plane are drawn.
- `Iselec = "cos2"` then the optimal number of active or illustrative individuals (respectively the variables, the rows or the columns) that have the highest `cos2` on the 2 dimensions of the plane are drawn.

The `Icoef` argument (respectively `Vcoef`, `Rcoef` or `Ccoef`) is used in order to adjust the selection of the elements when based on `Iselec = "contrib"` or `Iselec = "cos2"`. For example :

- if `Icoef = 2`, the threshold is 2 times higher, and thus 2 times more restrictive.
- if `Icoef = 0.5`, the threshold is 2 times lower, and thus 2 times less restrictive.

## Value

the function creates and opens a Word, html or PDF document that contains all the descriptions of analysis.

## Author(s)

Simon Thuleau and Francois Husson

## Examples

```
require(FactoMineR)
data(decathlon)
## Not run:
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
Investigate(res.pca, file = "PCA.Rmd", document = "html_document", time = "1000L",
            parallel = FALSE)

data(children)
res.ca = CA(children, row.sup = 15:18, col.sup = 6:8, graph = FALSE)
Investigate(res.ca, file = "CA.Rmd", document = "pdf_document")

data(tea)
res.mca = MCA(tea, quanti.sup = 19, quali.sup = 20:36, graph = FALSE)
```

```
Investigate(res.mca, file = "MCA.Rmd", document = c("word_document", "pdf_document"))
## End(Not run)
```

---

outliers

*Outliers detection*


---

## Description

Detection of singular individuals that concentrates too much inertia.

## Usage

```
outliers(res, file = "", Vselec = "cos2", Vcoef = 1, nmax = 10,
         figure.title = "Figure", graph = TRUE, cex = 0.7, options = NULL)
```

## Arguments

res	an object of class PCA or MCA.
file	a numerical vector giving the factorial dimensions for with to compute the eigen values calculation.
Vselec	the variables to select ; see the details section.
Vcoef	a numerical coefficient to adjust the variables selection rule ; see the details section.
nmax	an integer giving the maximum number of variables to illustrate each outlier (by default 10).
figure.title	the text label to add before graph title.
graph	a boolean : if TRUE, graphs are plotted.
cex	an optional argument for the generic plot functions, used to adjust the size of the elements plotted.
options	a character string that gives the output options for the figures. If NULL, options="r, echo = FALSE, fig.align = 'center', fig.height = 3.5, fig.width = 5.5" for linux and Mac and options="r, echo = FALSE, fig.height = 3.5, fig.width = 5.5" for Windows

## Details

The algorithm detects an individual as an outlier if its contribution to the plane is higher to 3 standard deviation.

The Vselec argument is used in order to select a part of the variables that are drawn and described. For example, you can use either :

- Vselec = 1:5 then the variables numbered 1 to 5 are drawn.
- Vselec = c("name1", "name5") then the variables named name1 and name5 are drawn.

- Vselec = "contrib 10" then the 10 active or illustrative variables that have the highest contribution on the 2 dimensions of the plane are drawn.
- Vselec = "contrib" then the optimal number of active or illustrative variables that have the highest contribution on the 2 dimensions of the plane are drawn.
- Vselec = "cos2 5" then the 5 active or illustrative variables that have the highest cos2 on the 2 dimensions of the plane are drawn.
- Vselec = "cos2 0.8" then the active or illustrative variables that have a cos2 higher to 0.8 on the plane are drawn.
- Vselec = "cos2" then the optimal number of active or illustrative variables that have the highest cos2 on the 2 dimensions of the plane are drawn.

The Vcoef argument is used in order to adjust the selection of the variables when based on Vselec = "contrib" or Vselec = "cos2". For example :

- if Vcoef = 2, the threshold is 2 times higher, and thus 2 times more restrictive.
- if Vcoef = 0.5, the threshold is 2 times lower, and thus 2 times less restrictive.

### Value

new.res	the res object without the outliers (they are completely eliminated).
res.out	the res object with the outliers as supplementary individuals.
memory	the original res object.
N	the number of outliers.
ID	the label of outliers.

### Author(s)

Simon Thuleau and Francois Husson

### Examples

```
## Not run:
require(FactoMineR)
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
outliers(res.pca, file = "PCA.Rmd")

## End(Not run)
```

---

readRmd

*Read Rmarkdown file*

---

### Description

Compile and open a Rmarkdown file.

### Usage

```
readRmd(file, document = "html_document")
```

**Arguments**

file	the file path where to write the description in Rmarkdown langage. If not specified, the description is written in the console.
document	a character vector giving the document format desired between "word_document", "pdf_document" and "html_document". This have to be any of those indicated in the file config (by <a href="#">createRmd</a> ).

**Author(s)**

Simon Thuleau and Francois Husson

**See Also**

[createRmd](#), [writeRmd](#)

**Examples**

```
## Not run:
require(FactoMineR)
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
create.rmd(res.pca, file = "PCA.Rmd", document = "pdf_document")
readRmd(file = "PCA.Rmd", document = "pdf_document")

data(children)
res.ca = CA(children, row.sup = 15:18, col.sup = 6:8, graph = FALSE)
create.rmd(res.ca, file = "CA.Rmd", document = "html_document")
readRmd(file = "CA.Rmd", document = "html_document")

data(tea)
res.mca = MCA(tea, quanti.sup = 19, quali.sup = 20:36, graph = FALSE)
create.rmd(res.mca, file = "MCA.Rmd", document = c("word_document", "pdf_document"))
readRmd(file = "MCA.Rmd", document = "word_document")

## End(Not run)
```

---

scriptRmd

*File script*

---

**Description**

Read the script of a file and return each line as a character chain

**Usage**

```
scriptRmd(file, output = "code.R")
```

**Arguments**

file            the file path to read.  
 output         the file path to write the R code.

**Author(s)**

Simon Thuleau and Francois Husson

**Examples**

```
## Not run:
require(FactoMineR)
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
create.rmd(res.pca, file = "PCA.Rmd", document = "pdf_document")
scriptRmd(file = "PCA.Rmd")

data(children)
res.ca = CA(children, row.sup = 15:18, col.sup = 6:8, graph = FALSE)
create.rmd(res.ca, file = "CA.Rmd", document = "html_document")
scriptRmd(file = "CA.Rmd")

data(tea)
res.mca = MCA(tea, quanti.sup = 19, quali.sup = 20:36, graph = FALSE)
create.rmd(res.mca, file = "MCA.Rmd", document = c("word_document", "pdf_document"))
scriptRmd(file = "MCA.Rmd")

## End(Not run)
```

---

selection

*Graphical elements selection*

---

**Description**

Select the best elements to plot in a graph

**Usage**

```
selection(res, dim = 1:2, margin = 1, selec = "cos2", coef = 1)
```

**Arguments**

res            an object of class PCA, CA or MCA.  
 dim           a 2 dimensional numerical vector giving the factorial dimensions to use for the representation (by default the first plane).  
 margin        an integer (by default 1). If equals 1, the function computes on the individuals (or rows). If equals 2, the function computes on the active variables (or columns). If equals 3, the function computes on the supplementary variables.

selec	the elements to select ; see the details section.
coef	a numerical coefficient to adjust the elements selection rule ; see the details section.

### Details

The `selec` argument is used in order to select a part of the elements that are drawn and described. For example, you can use either :

- `selec = 1:5` then the elements numbered 1 to 5 are drawn.
- `selec = c("name1", "name5")` then the elements named `name1` and `name5` are drawn.
- `selec = "contrib 10"` then the 10 active or illustrative elements that have the highest contribution on the 2 dimensions of the plane are drawn.
- `selec = "contrib"` then the optimal number of active or illustrative elements that have the highest contribution on the 2 dimensions of the plane are drawn.
- `selec = "cos2 5"` then the 5 active or illustrative elements that have the highest `cos2` on the 2 dimensions of the plane are drawn.
- `selec = "cos2 0.8"` then the active or illustrative elements that have a `cos2` higher to 0.8 on the plane are drawn.
- `selec = "cos2"` then the optimal number of active or illustrative elements that have the highest `cos2` on the 2 dimensions of the plane are drawn.

The `coef` argument is used in order to adjust the selection of the elements when based on `selec = "contrib"` or `selec = "cos2"`. For example :

- if `coef = 2`, the threshold is 2 times higher, and thus 2 times more restrictive.
- if `coef = 0.5`, the threshold is 2 times lower, and thus 2 times less restrictive.

### Value

<code>drawn</code>	the elements selected.
<code>what.drawn</code>	the criterion of selection (as a sentence).

### Author(s)

Simon Thuleau and Francois Husson

### See Also

[description](#)

### Examples

```
## Not run:
require(FactoMineR)
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
selection(res.pca, margin = 1, selec = "contrib 10")

## End(Not run)
```

---

whichFacto	<i>Analysis class</i>
------------	-----------------------

---

**Description**

Return the class of the factorial object (ie. the kind of analysis performed)

**Usage**

```
whichFacto(res)
```

**Arguments**

res                    an object of class PCA, CA or MCA.

**Author(s)**

Simon Thuleau and Francois Husson

**Examples**

```
## Not run:
require(FactoMineR)
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
whichFacto(res.pca)

## End(Not run)
```

---

writeRmd	<i>Write Rmarkdown file</i>
----------	-----------------------------

---

**Description**

Writes text or dumps a variable in a Rmarkdown file, and declares the utilisation and the configuration of a chunk.

**Usage**

```
writeRmd(..., file = "", append = TRUE, sep = " ", end = "\n", dump = FALSE,
          start = FALSE, stop = FALSE, options = NULL)
```



**Arguments**

...	some R objects or other arguments to pass to the <code>cat</code> function.
file	the file path where to write the description in Rmarkdown langage. If not specified, the description is written in the console.
append	a boolean, if TRUE the text is written at the end of the file. Else it is overwritten.
sep	a character chain to insert between each element written in the file (by default a blank space).
end	a character chain to add at the end of the text written in the file (by default a line break).
dump	a boolean : if TRUE, the text send to the function is interpreted as a variable name. A dump as to be written in a chunk declaration.
start	a boolean : if TRUE, the text written is preceded by a beginning chunk declaration.
stop	a boolean : if TRUE, the text written is preceded by a ending chunk declaration.
options	a character chain listing the options to declare for a chunk declaration.

**Details**

To learn about all the possible chunk options, see <https://yihui.org/knitr/options>. Anyway, to declare a R langage chunk, write at least "r" as option.

**Author(s)**

Simon Thuleau and Francois Husson

**See Also**

[createRmd](#), [readRmd](#)

**Examples**

```
## Not run:
require(FactoMineR)
data(decathlon)
res.pca = PCA(decathlon, quanti.sup = c(11:12), quali.sup = c(13), graph = FALSE)
create.rmd(res.pca, file = "PCA.Rmd", document = "pdf_document")

drawn = selection(res.pca)$drawn

writeRmd(start = TRUE, options = "r, echo = FALSE, fig.align = 'center', fig.height = 3.5,
         fig.width = 5.5", file = "PCA.Rmd", end = "")
writeRmd("drawn", file = file, dump = TRUE)
writeRmd("plot.PCA(res, select = drawn, choix = 'ind', invisible = 'quali', title = ')",
         stop = TRUE, file = "PCA.Rmd")

writeRmd("**", figure.title, " - ", "Individuals factor map (PCA)", "**", file = "PCA.Rmd",
         sep = "")

## End(Not run)
```

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