

# Package ‘multiSeg’

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**Type** Package

**Title** Multidimensional changepoint detection with dynamic programming

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**Description** Experimental package to test different pruning methods in the multidimensional change-point problem. The core function of the package are implemented in C++.

**License** GPL-2

**Imports** Rcpp (>= 0.12.3), graphics, utils, stats

**LinkingTo** Rcpp

**RoxygenNote** 6.0.1

**Archs** x64

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changepoints	<i>Vector of changepoints</i>
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## Description

Vector of changepoints

## Usage

changepoints(res)

**Arguments**

res                      A multiSeg object (obtained with function multiSeg)

**Value**

The vector of changepoints

**Examples**

```
n <- 500
var <- 1
means <- matrix(c(0,1,2,1,0,1,2,2,0,0,1,1),3,4)
changes <- c(0.3,0.6,1)
dataG(n,means,changes, var)
file = paste(getwd(),"/dataG.txt",sep = "")
res <- multiSeg(file,4*2*log(n),1)
changepoints(res)
```

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dataG

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*Multidimensional Gaussian Data Generator*


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**Description**

Simulating Multidimensional Gaussian Data with a model of segmentation, that is a given matrix of means and a vector of changepoints.

**Usage**

```
dataG(n, means, chgpt, sigma = 1)
```

**Arguments**

n                      number of observations to generate.

means                  matrix of means, the number of columns = number of variables = number of dimensions. The i-th row corresponds to the i-th segment mean in all dimensions.

chgpt                  vector of changepoints (an increasing sequence of integers).

sigma                  standard deviation of the gaussian model

**Value**

The matrix of simulated data + the matrix is saved in the file dataG.txt at the current path (obtained by getwd())

**Examples**

```
data <- dataG(500, matrix(c(0,1,2,1,0,1,2,2,0,0,1,1),3,4),c(0.3,0.6,1))
head(data)
```

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multiSeg	<i>Multidimensional multiple changepoint algorithm with pruning</i>
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**Description**

Dynamic programming algorithm in multiple dimensions with pruning

**Usage**

```
multiSeg(file, beta, type = 3, show = 0)
```

**Arguments**

file	the complete path + file name of the data to use
beta	the penalty coefficient
type	an integer equal to 0,1,2 or 3. Complexity of the pruning. (see function pruning). If type = i, we use pruning method from 1 to i
Show	an integer. Following the actual iteration during computation. Display every 'show' iteration.

**Value**

A multiSeg object = (chgpt, means, nb, type, delay). With n the number of observations, all these elements are vector of size n except means which is a matrix of size nxp. 'Chgpt' is a vector of last changepoint at each position. 'mean' is the matrix of means on each last segment at each position. 'nb' is a vector whose elements are the number of present lastchangepoint candidates at each position. 'type' is a vector saving how the candidate was pruned 'delay' is the number of iterations before pruning for each data point.

**Examples**

```
n <- 100
var <- 1
means <- matrix(c(0,1,2,1,0,1,2,2,0,0,1,1),3,4)
changes <- c(0.3,0.6,1)
data <- dataG(n,means,changes, var)
file = paste(getwd(),"/dataG.txt",sep = "")
multiSeg(file,4*2*log(n),1)
```

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pruning	<i>Plots of the pruning path</i>
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**Description**

Displaying the properties of the pruning

**Usage**

```
pruning(res)
```

**Arguments**

res                      A multiSeg object (obtained with function multiSeg)

**Value**

a plot with 3 graphics. First plot = number of candidates (nb) Second plot (in red) = delay before pruning for each candidate (delay) Third plot = cumulative sums for all type of pruning (0, 1, 2 or 3). type = 0 (black curve): no pruning type = 1 (red curve): radius < 0 type = 2 (green curve): intersection = emptyset type = 3 (blue curve): candidate hidden by one sphere of the past

**Examples**

```
n <- 500
var <- 1
means <- matrix(c(0,1,2,1,0,1,2,2,0,0,1,1),3,4)
changes <- c(0.3,0.6,1)
data <- dataG(n,means,changes, var)
file = paste(getwd(),"/dataG.txt",sep = "")
res <- multiSeg(file,4*2*log(n),1)
pruning(res)
res$type
```

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segmentation

*Screening of the segmentation*


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**Description**

Display the segments and changepoints

**Usage**

```
segmentation(file, res)
```

**Arguments**

file                      the path + name of the data file  
res                        A multiSeg object (obtained with function multiSeg)

**Examples**

```
n <- 500
var <- 1
means <- matrix(c(0,1,2,1,0,1,2,2,0,0,1,1),3,4)
changes <- c(0.3,0.6,1)
dataG(n,means,changes, var)
file = paste(getwd(),"/dataG.txt",sep = "")
res <- multiSeg(file,4*2*log(n),1)
segmentation(file,res)
```

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