

Package ‘sdcTable’

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Title Methods for Statistical Disclosure Control in Tabular Data

Description Methods for statistical disclosure control in tabular data such as primary and secondary cell suppression as described for example in Hundepol et al. (2012) <doi:10.1002/9781118348239> are covered in this package.

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URL <https://github.com/sdcTools/sdcTable>

BugReports <https://github.com/sdcTools/userSupport/issues>

Depends R (>= 2.10), Rcpp (>= 0.11.0), sdcHierarchies (>= 0.16)

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LinkingTo Rcpp

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argusVersion	<i>argusVersion</i>
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Description

returns the version and build number of a given tau-argus executable specified in argument exe.

Usage

```
argusVersion(exe, verbose = FALSE)
```

Arguments

exe	a path to a tau-argus executable
verbose	(logical) if TRUE, the version info and build number of the given tau-argus executable will be printed.

Value

a list with two elements being the tau-argus version and the build-number.

Examples

```
## Not run:
argusVersion(exe="C:\\Tau\\TauArgus.exe", verbose=TRUE)

## End(Not run)
```

attack	<i>attacking primary suppressed cells and calculating current lower and upper bounds</i>
--------	--

Description

Function `attack` is used to calculate lower and upper bounds for a given `sdcProblem` (stored as object of class `sdcProblem-class`). For all calculations the current suppression pattern is used when calculating solutions of the attacker's problem.

Usage

```
attack(object, verbose = FALSE)
```

Arguments

object	an object of class <code>sdcProblem-class</code>
verbose	a logical vector specifying if output should be verbose (TRUE) or not (FALSE)

Value

a data.frame with column 'index' holding indices of primary suppressed cells and columns 'bounds_min' and 'bounds_max' featuring calculated lower and upper bounds for each cell. Column 'protected' shows if a given cell is accordingly protected (TRUE) or not (FALSE).

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

Examples

```
# load problem (as it was created after performing primary suppression
# in the example of \link{primarySuppression})
sp <- searchpaths()
fn <- paste(sp[grepl("sdcTable", sp)], "/data/problemWithSupps.RData", sep="")
problem <- get(load(fn))

# calculate current lower|upper bounds given current suppression pattern
# (in this case consisting of primary suppressions only)
attack(problem, verbose=FALSE)
```

calc.cutList	<i>perform calculations on cutList-objects depending on argument type</i>
--------------	---

Description

perform calculations on cutList-objects depending on argument type

Usage

```
calc.cutList(object, type, input)
```

```
## S4 method for signature 'cutList,character,list'
calc.cutList(object, type, input)
```

Arguments

object	an object of class cutList
type	a character vector of length 1 defining what to calculate return modify. Allowed types are: <ul style="list-style-type: none"> • strengthen: strengthen constraints in argument object • checkViolation: check if a given solution violates any in argument object • bindTogether: combine two cutList-objects
input	a list depending on argument type. <ul style="list-style-type: none"> • type==strengthen: input is not used (empty list) • type==checkViolation: input is a list of length 2 <ul style="list-style-type: none"> – first element: numeric vector specifying a solution to a linear problem – second element: numeric vector specifying weights • type==bindTogether: input is a list of length 1 <ul style="list-style-type: none"> – first element: object of class cutList

Value

manipulated data based on argument type

- an object of class cutList if argument type matches 'strengthen' or 'bindTogether'
- a logical vector of length 1 if argument type matches 'checkViolation' with TRUE if at least one constraint is violated by the given solution

Note

internal function

Author(s)

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 calc.dimVar

 modify dimVar-objects depending on argument type

Description

modify dimVar-objects depending on argument type

Usage

```
calc.dimVar(object, type, input)
```

```
## S4 method for signature 'dimVar,character,character'
```

```
calc.dimVar(object, type, input)
```

Arguments

object	an object of class dimVar
type	a character vector of length 1 defining what to calculate return modify. Allowed types are: <ul style="list-style-type: none"> • hasDefaultCodes: calculates if a vector of codes (specified by argument input) corresponds to default codes in object • matchCodeOrig: obtain default standard codes for a vector of original codes specified by argument input • matchCodeDefault: obtain original codes for a vector of default standard codes specified by argument input • standardize: perform standardization of level-codes (temporarily removing duplicates,..) • requiredMinimalCodes: calculate a set of minimal codes that are required to calculate a specific (sub)total specified by argument input
input	a character vector

Value

information from object depending on type

- a character vector if type matches 'matchCodeOrig', 'matchCodeDefault', 'standardize' or 'requiredMinimalCodes'
- a logical vector of length 1 if type matches 'hasDefaultCodes' being TRUE if argument input are default codes and FALSE otherwise

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

calc.linProb	<i>perform calculations on linProb-objects depending on argument type</i>
--------------	---

Description

perform calculations on linProb-objects depending on argument type

Usage

```
calc.linProb(object, type, input)
```

```
## S4 method for signature 'linProb,character,list'
calc.linProb(object, type, input)
```

Arguments

object	an object of class linProb
type	a character vector of length 1 defining what to calculate/return/modify. Allowed types are: <ul style="list-style-type: none"> • solveProblem: solve the linear problem (minimize objective function) • fixVariables: try to fix objective variables to 0/1 based on dual costs depending on input
input	a list depending on argument type. <ul style="list-style-type: none"> • type==solveProblem: a list of length 1 <ul style="list-style-type: none"> – first element: character vector of length 1 specifying the solver to use. • type==fixVariables: a list of length 3 <ul style="list-style-type: none"> – first element: numeric vector specifying lower bounds for the objective variables – second element: numeric vector specifying upper bounds for the objective variables – third element: numeric vector specifying indices of primary suppressed cells

Value

manipulated data based on argument type

- list containing the solution and additional information if argument type matches 'solveProblem'
- a numeric vector of indices if argument type matches 'fixVariables'

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

calc.multiple *perform calculations on multiple objects depending on argument type*

Description

perform calculations on multiple objects depending on argument type

Usage

```
calc.multiple(type, input)

## S4 method for signature 'character,list'
calc.multiple(type, input)
```

Arguments

type	<p>a character vector of length 1 defining what to calculate/return/modify. Allowed types are:</p> <ul style="list-style-type: none"> • makePartitions: information on subtables required for HITAS and HYPECUBE algorithms • genMatMFull: the constraint matrix used in the master problem • makeAttackerProblem: set up the attackers problem for a given (sub)table • calcFullProblem: calculate a complete problem object containing all information required to solve the secondary cell suppression problem
input	<p>a list depending on argument type.</p> <ul style="list-style-type: none"> • if type matches 'makePartitions', 'genMatMFull' or 'makeAttackerProblem': a list of length 2 with elements 'objectA' and 'objectB' <ul style="list-style-type: none"> – element 'object A': an object of class problemInstance – element 'object B': an object of class dimInfo • type matches 'calcFullProblem': a list of length 1 <ul style="list-style-type: none"> – element 'object A': an object of class dataObj – element 'object B': an object of class dimInfo

Value

manipulated data based on argument type

- list with elements 'groups', 'indices', 'strIDs', 'nrGroups' and 'nrTables' if argument type matches 'makePartitions'
- object of class simpleTriplet if argument type matches 'genMatMFull'
- object of class linProb if argument type matches 'makeAttackerProblem'
- object of class sdcProblem if argument type matches 'calcFullProblem'

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

calc.problemInstance *perform calculations on problemInstance-objects depending on argument type*

Description

perform calculations on problemInstance-objects depending on argument type

Usage

```
calc.problemInstance(object, type, input)
```

```
## S4 method for signature 'problemInstance,character,list'
```

```
calc.problemInstance(object,  
  type, input)
```

Arguments

- | | |
|--------|---|
| object | an object of class problemInstance |
| type | a character vector of length 1 defining what to calculate/return/modify. Allowed types are: <ul style="list-style-type: none"> • makeMasterProblem: create the master problem that is the core of the secondary cell suppression problem • isProtectedSolution: check if a solution violates any required (upper/lower/sliding) protection levels |
| input | a list depending on argument type. <ul style="list-style-type: none"> • type==makeMasterProblem: input is not used (empty list) • type==isProtectedSolution: input is a list of length 2 with elements 'input1' and 'input2' <ul style="list-style-type: none"> – element 'input1': numeric vector of calculated known lower cell bounds (from attacker's problem) – element 'input2': numeric vector of known upper cell bounds (from attacker's problem) |

Value

information from objects of class `problemInstance` depending on argument type

- an object of class `linProb` if argument type matches 'makeMasterProblem'
- logical vector of length 1 if argument type matches 'isProtectedSolution' with TRUE if all primary suppressed cells are adequately protected, FALSE otherwise

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

calc.sdcProblem	<i>perform calculations on sdcProblem-objects depending on argument type</i>
-----------------	--

Description

perform calculations on `sdcProblem`-objects depending on argument type

Usage

```
calc.sdcProblem(object, type, input)
```

```
## S4 method for signature 'sdcProblem,character,list'
calc.sdcProblem(object)
```

Arguments

object	an object of class <code>sdcProblem</code>
type	a character vector of length 1 defining what to calculate/return/modify. Allowed types are: <ul style="list-style-type: none"> • <code>rule.freq</code>: modify suppression status within object according to frequency suppression rule • <code>rule.nk</code>: modify <code>sdcStatus</code> of object according to nk-dominance rule • <code>rule.p</code>: modify <code>sdcStatus</code> of object according to p-percent rule • <code>rule.pq</code>: modify <code>sdcStatus</code> of object according to pq-rule • <code>heuristicSolution</code>: obtain a heuristic (greedy) solution to the problem defined by object • <code>cutAndBranch</code>: solve a secondary cell suppression problem defined by object using cut and branch • <code>anonWorker</code>: is used to solve the suppression problem depending on information provided with argument <code>input</code>

- ghmiter: solve a secondary cell suppression problem defined by object using hypercube algorithm
- preprocess: perform a preprocess procedure by trying to identify primary suppressed cells that are already protected due to other primary suppressed cells
- cellID: find index of cell defined by information provided with argument input
- finalize: create an object of class safeObj
- ghmiter.diagObj: calculate codes required to identify diagonal cells given a valid cell code - used for ghmiter-algorithm only
- ghmiter.calcInformation: calculate information for quaders identified by diagonal indices - used for ghmiter-algorithm only
- ghmiter.suppressQuader: suppress a quader based on indices
- ghmiter.selectQuader: select a quader for suppression depending on information provided with argument input - used for ghmiter-algorithm only
- ghmiter.suppressAdditionalQuader: select and suppress an additional quader (if required) based on information provided with argument input - used for ghmiter-algorithm only
- contributingIndices: calculate indices within the current problem that contribute to a given cell
- reduceProblem: reduce the problem given by object using a vector of indices
- genStructuralCuts: calculate cuts that are absolute necessary for a valid solution of the secondary cell suppression problem

input

a list depending on argument type.

- a list (typically generated using genParaObj()) specifying parameters for primary cell suppression if argument type matches 'rule.freq', 'rule.nk' or 'rule.p'
- a list if argument type matches 'heuristicSolution' having the following elements:
 - element 'aProb': an object of class linProb defining the attacker's problem
 - element 'validCuts': an object of class cutList representing a list of constraints
 - element 'solver': a character vector of length 1 specifying a solver to use
 - element 'verbose': a logical vector of length 1 setting if verbose output is desired
- a list (typically generated using genParaObj()) specifying parameters for the secondary cell suppression problem if argument type matches 'cutAndBranch', 'anonWorker', 'ghmiter', 'preprocess'
- a list of length 3 if argument type matches 'cellID' having following elements
 - first element: character vector specifying variable names that need to exist in slot 'dimInfo' of object

- second element: character vector specifying codes for each variable that define a specific table cell
- third element: logical vector of length 1 with TRUE setting verbosity and FALSE to turn verbose output off
- a list of length 3 if argument type matches 'ghmiter.diagObj' having following elements
 - first element: numeric vector of length 1
 - second element: a list with as many elements as dimensional variables have been specified and each element being a character vector of dimension-variable specific codes
 - third element: logical vector of length 1 defining if diagonal indices with frequency == 0 should be allowed or not
- a list of length 4 if argument type matches 'ghmiter.calcInformation' having following elements
 - first element: a list object typically generated with method calc.sdcProblem and type=='ghmiter.diagObj'
 - second element: a list with as many elements as dimensional variables have been specified and each element being a character vector of dimension-variable specific codes
 - third element: numeric vector of length 1 specifying a desired protection level
 - fourth element: logical vector of length 1 defining if quader containing empty cells should be allowed or not
- a list of length 1 if argument type matches 'ghmiter.suppressQuader' having following element
 - first element: numeric vector of indices that should be suppressed
- a list of length 2 if argument type matches 'ghmiter.selectQuader' having following elements
 - first element: a list object typically generated with method calc.sdcProblem and type=='ghmiter.calcInformation'
 - second element: a list (typically generated using genParaObj())
- a list of length 4 if argument type matches 'ghmiter.suppressAdditionalQuader' having following elements
 - first element: a list object typically generated with method calc.sdcProblem and type=='ghmiter.diagObj'
 - second element: a list object typically generated with method calc.sdcProblem and type=='ghmiter.calcInformation'
 - third element: a list object typically generated with method calc.sdcProblem and type=='ghmiter.selectQuader'
 - fourth element: a list (typically generated using genParaObj())
- a list of length 1 if argument type matches 'contributingIndices' having following element
 - first element: character vector of length 1 being an ID for which contributing indices should be calculated
- a list of length 1 if argument type matches 'reduceProblem' having following element

- first element: numeric vector defining indices of cells that should be kept in the reduced problem
- an empty list if argument type matches 'genStructuralCuts'

Value

information from objects of class `sdcProblem` depending on argument type

- an object of class `sdcProblem` if argument type matches 'rule.freq', 'rule.nk', 'rule.p', 'cutAndBranch', 'anonWorker', 'ghmiter', 'ghmiter.supressQuader', 'ghmiter.suppressAdditionalQuader' or 'reduceProblem'
- a numeric vector with elements being 0 or 1 if argument type matches 'heuristicSolution'
- a list if argument type matches 'preprocess' having following elements:
 - element 'sdcProblem': an object of class `sdcProblem`
 - element 'aProb': an object of class `linProb`
 - element 'validCuts': an object of class `cutList`
- a numeric vector of length 1 specifying the index of the cell of interest if argument type matches 'cellID'
- an object of class `safeObj` if argument type matches 'finalize'
- a list if argument type matches 'ghmiter.diagObj' having following elements:
 - element 'cellToProtect': character vector of length 1 defining the ID of the cell to protect
 - element 'indToProtect': numeric vector of length 1 defining the index of the cell to protect
 - element 'diagIndices': numeric vector defining indices of possible cells defining cubes
- a list containing information about each quader that could possibly be suppressed if argument type matches 'ghmiter.calcInformation'
- a list containing information about a single quader that should be suppressed if argument type matches 'ghmiter.selectQuader'
- a numeric vector with indices that contribute to the desired table cell if argument type matches 'contributingIndices'
- an object of class `cutList` if argument type matches 'genStructuralCuts'

Note

internal function

Author(s)

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calc.simpleTriplet *modify simpleTriplet-objects depending on argument type*

Description

modify simpleTriplet-objects depending on argument type

Usage

```
calc.simpleTriplet(object, type, input)
```

```
## S4 method for signature 'simpleTriplet,character,list'
calc.simpleTriplet(object, type,
  input)
```

Arguments

object	an object of class simpleTriplet
type	a character vector of length 1 defining what to calculate/return/modify. Allowed types are: <ul style="list-style-type: none"> • removeRow: remove a row with given index from object • removeCol: remove a column with given index from object • addRow: add a row to object • addCol: add a column to object • modifyRow: change specified row of object • modifyCol: change specified column of object • modifyCell: change specified cell of object • bind: bind two objects of class simpleTriplet together
input	a list depending on argument type. <ul style="list-style-type: none"> • type==removeRow: input is a list of length 1 <ul style="list-style-type: none"> – first element: numeric vector of length 1 defining the index of the row that should be removed • type==removeCol: input is a list of length 1 <ul style="list-style-type: none"> – first element: numeric vector of length 1 defining the index of the column that should be removed • type==addRow: input is a list of length 2 <ul style="list-style-type: none"> – first element: numeric vector of column-indices – second element: numeric vector defining the cell-values of the row that will be added • type==addCol: input is a list of length 2 <ul style="list-style-type: none"> – first element: numeric vector of row-indices – second element: numeric vector defining the cell-values of the column that will be added

- `type==modifyRow`: input is a list of length 3
 - first element: numeric vector of length 1 specifying the the row-index of the row that will be modified
 - second element: numeric vector specifying the column-indices that should be modified
 - third element: numeric vector defining values that should be set in the given row
- `type==modifyCol`: input is a list of length 3
 - first element: numeric vector specifying the row-indices that should be modified
 - second element: numeric vector of length 1 specifying the the column-index of the column that will be modified
 - third element: numeric vector defining values that should be set in the given column
- `type==modifyCell`: input is a list of length 3
 - first element: numeric vector of length 1 defining the column-index
 - second element: numeric vector of length 1 defining the row-index
 - third element: numeric vector of length 1 holding the value that should be set in the given cell
- `type==bind`: input is a list of length 2
 - first element: an object of class `simpleTriplet`
 - second argument: is a logical vector of length 1 being `TRUE` if a `'rbind'` or `'FALSE'` if a `'cbind'` should be done

Value

an object of class `simpleTriplet`

Note

internal function

Author(s)

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cellInfo

query information for a specific cell in [safeObj-class](#) objects

Description

Function `cellInfo` is used to query information for a single table cell for objects of class `safeObj-class`.

Usage

```
cellInfo(object, characteristics, varNames, verbose = FALSE)
```

Arguments

object	an object of class <code>safeObj-class</code>
characteristics	a character vector specifying characteristics of the table cell that should be identified for each dimensional variable defining the table
varNames	a character vector specifying variable names of dimensional variables defining the tables
verbose	logical vector of length 1 defining verbosity, defaults to 'FALSE'

Value

a list containing the following calculated information

- `cellID`: numeric vector of length 1 specifying the index of the cell within the final result dataset
- `data`: a data.frame containing a single row with the index of the table cell of interest
- `primSupp`: logical vector of length 1 that is 'TRUE' if the cell is a primary sensitive cell and 'FALSE' otherwise
- `secondSupp`: logical vector of length 1 that is 'TRUE' if the cell is a secondary suppressed cell and 'FALSE' otherwise

Note

Important: the *i*-th element of argument `characteristics` is used as the desired characteristic for the dimensional variable specified at the *i*-th position of argument `varNames`!

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

Examples

```
# load protected data (as created in the example
# of \link{protectTable})
sp <- searchpaths()
fn <- paste(sp[grep("sdcTable", sp)], "/data/protectedData.RData", sep="")
protectedData <- get(load(fn))
characteristics <- c('male', 'D')
varNames <- c('gender', 'region')
info <- cellInfo(protectedData, characteristics, varNames, verbose=FALSE)

# show the info about this cell
str(info)
```

changeCellStatus	<i>change anonymization status of a specific cell</i>
------------------	---

Description

Function `changeCellStatus` allows to changemodify the anonymization state of single table cells for objects of class `sdcProblem-class`.

Usage

```
changeCellStatus(object, characteristics, varNames, rule,  
                 verbose = FALSE)
```

Arguments

object	an object of class <code>sdcProblem-class</code>
characteristics	a character vector specifying characteristics of the table cell that should be identified for each dimensional variable defining the table
varNames	a character vector specifying variable names of dimensional variables defining the tables
rule	character vector of length 1 specifying a valid anonymization code ('u', 'z', 'x', 's') to which the the cell under consideration should be set.
verbose	logical vector of length 1 defining verbosity, defaults to 'FALSE'

Value

a `sdcProblem-class` object

Note

Important: the *i*-th element of argument `characteristics` is uses as the desired characteristic for the dimensional variable specified at the *i*-th position of argument `varNames`!

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

Examples

```
# load primary suppressed data (as created in the example  
# of \code{\link{primarySuppression}})  
sp <- searchpaths()  
fn <- paste(sp[grepl("sdcTable", sp)], "/data/problemWithSupps.RData", sep="")  
problem <- get(load(fn))  
  
# we want to mark the cell region='D' and gender='male' primary sensitive
```

```

characteristics <- c('D', 'male')
varNames <- c('region', 'gender')
verbose <- TRUE
rule <- 'u'

# looking at the distribution of anonymization states before...
print(table(getInfo(problem, 'sdcStatus')))

# setting the specific cell as primary sensitive
problem <- changeCellStatus(problem, characteristics, varNames, rule, verbose)

# having a second look at the anonymization states
print(table(getInfo(problem, 'sdcStatus')))

```

<code>createArgusInput</code>	<i>createArgusInput</i>
-------------------------------	-------------------------

Description

create required input-files and batch-file for tau-argus given an `sdcProblem-obj` object

Usage

```

createArgusInput(obj, typ = "microdata", verbose = FALSE,
  path = getwd(), solver = "FREE", method, primSuppRules = NULL,
  responsevar = NULL, shadowvar = NULL, costvar = NULL,
  requestvar = NULL, holdingvar = NULL, ...)

```

Arguments

<code>obj</code>	an object of class <code>sdcProblem-class</code> from <code>sdcTable</code>
<code>typ</code>	(character) either <code>microdata</code> or <code>tabular</code>
<code>verbose</code>	(logical) if <code>TRUE</code> , the contents of the batch-file are written to the prompt
<code>path</code>	path, into which (temporary) files will be written to (amongst them being the batch-files). Each file written to this folder belonging to the same problem contains a random id in its filename.
<code>solver</code>	which solver should be used. allowed choices are <ul style="list-style-type: none"> • "FREE" • "CPLEX" • "XPRESS" <p>In case "CPLEX" is used, it is also mandatory to specify argument 'licensefile' which needs to be the absolute path the the cplex license file</p>
<code>method</code>	secondary cell suppression algorithm, possible choices include: <ul style="list-style-type: none"> • MOD: modular approach. If specified, the following arguments in ... can additionally be set:

- MaxTimePerSubtable: number specifying max. time (in minutes) spent for each subtable
- SingleSingle: 0/1 (default=1)
- SingleMultiple: 0/1 (default=1)
- MinFreq: 0/1 (default=1)
- GH: hypercube. If specified, the following arguments in . . . can additionally be set:
 - BoundPercentage: Default percentage to protect primary suppressed cells, default 75
 - ModelSize: are we dealing with a small (0) or large (1) model? (default=1)
 - ApplySingleton: should singletons be additionally protected? 0/1 (default=1)
- OPT: optimal cell suppression. If specified, the following arguments in . . . can additionally be set:
 - MaxComputingTime: number specifying max. allowed computing time (in minutes)

primSuppRules	rules for primary suppression, provided as a list. For details, please have a look at the examples below.
responsevar	which variable should be tabulated (defaults to frequencies). For details see tau-argus manual section 4.4.4.
shadowvar	if specified, this variable is used to apply the safety rules, defaults to responsevar. For details see tau-argus manual section 4.4.4.
costvar	if specified, this variable describes the costs of suppressing each individual cell. For details see tau-argus manual section 4.4.4.
requestvar	if specified, this variable (0/1-coded) contains information about records that request protection. Records with 1 will be protected in case a corresponding request rule matches. It is ignored, if tabular input is used.
holdingvar	if specified, this variable contains information about records that should be grouped together. It is ignored, if tabular input is used.
...	allows to specify additional parameters for selected suppression-method as described above as well as licensefile in case "CPLEX" was specified in argument solver.

Value

the filepath to the batch-file

Examples

```
# loading micro data from sdcTable
data("microData1", package="sdcTable")
microData1$num1 <- rnorm(mean=100, sd=25, nrow(microData1))
microData1$num2 <- round(rnorm(mean=500, sd=125, nrow(microData1)),2)
microData1$weight <- sample(10:100, nrow(microData1), replace=TRUE)
```

```

dim.region <- data.frame(
  levels=c('@', '@@', '@@', '@@', '@@'),
  codes=c('Total', 'A', 'B', 'C', 'D'),
  stringsAsFactors=FALSE)

dim.region_dupl <- data.frame(
  levels=c('@', '@@', '@@', '@@@', '@@@', '@@@', '@@@'),
  codes=c('Total', 'A', 'B', 'b1', 'C', 'D', 'd1'),
  stringsAsFactors=FALSE)

dim.gender <- data.frame(
  levels=c('@', '@@', '@@'),
  codes=c('Total', 'male', 'female'),
  stringsAsFactors=FALSE)

dimList <- list(region=dim.region, gender=dim.gender)
dimList_dupl <- list(region=dim.region_dupl, gender=dim.gender)
dimVarInd <- c(1,2)
numVarInd <- 3:5
sampWeightInd <- 6

freqVarInd <- weightInd <- NULL

# creating an object of class \link{sdcProblem-class}
obj <- makeProblem(
  data=microData1,
  dimList=dimList,
  dimVarInd=dimVarInd,
  freqVarInd=freqVarInd,
  numVarInd=numVarInd,
  weightInd=weightInd,
  sampWeightInd=sampWeightInd)

# creating an object of class \link{sdcProblem-class} containing "duplicated" codes
obj_dupl <- makeProblem(
  data=microData1,
  dimList=dimList_dupl,
  dimVarInd=dimVarInd,
  freqVarInd=freqVarInd,
  numVarInd=numVarInd,
  weightInd=weightInd,
  sampWeightInd=sampWeightInd)

## create primary suppression rules
primSuppRules <- list()
primSuppRules[[1]] <- list(type="freq", n=5, rg=20)
primSuppRules[[2]] <- list(type="p", n=5, p=20)
# other supported formats are:
# list(type="nk", n=5, k=20)
# list(type="zero", rg=5)
# list(type="mis", val=1)
# list(type="wgt", val=1)
# list(type="man", val=20)

```

```

## create batchInput object
b0_md1 <- createArgusInput(obj, typ="microdata", path=getwd(), solver="FREE", method="OPT",
  primSuppRules=primSuppRules, responsevar="num1")
b0_td1 <- createArgusInput(obj, typ="tabular", path=getwd(), solver="FREE", method="OPT")
b0_td2 <- createArgusInput(obj_dupl, typ="tabular", path=getwd(), solver="FREE", method="OPT")
## Not run:
## in case CPLEX should be used, it is required to specify argument licensefile
b0_md2 <- createArgusInput(obj, typ="microdata", path=getwd(), solver="CPLEX", method="OPT",
  primSuppRules=primSuppRules, responsevar="num1", licensefile="/path/to/my/cplexlicense")

## End(Not run)

```

cutList-class

S4 class describing a cutList-object

Description

An object of class `cutList` holds constraints that can be extracted and used as for objects of class [linProb-class](#). An object of class `cutList` consists of a constraint matrix (slot `con`), a vector of directions (slot `direction`) and a vector specifying the right hand sides of the constraints (slot `rhs`).

Details

slot con: an object of class [simpleTriplet-class](#) specifying the constraint matrix of the problem

slot direction: a character vector holding the directions of the constraints, allowed values are:

- ==: equal
- <: less
- >: greater
- <=: less or equal
- >=: greater or equal

slot rhs: numeric vector holding right hand side values of the constraints

Note

objects of class `cutList` are dynamically generated (and removed) during the cut and branch algorithm when solving the secondary cell suppression problem

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

dataObj-class	<i>S4 class describing a dataObj-object</i>
---------------	---

Description

This class models a data object containing the 'raw' data for a given problem as well as information on the position of the dimensional variables, the count variable, additional numerical variables, weights or sampling weights within the raw data. Also slot 'isMicroData' shows if slot 'rawData' consists of microdata (multiple observations for each cell are possible, isMicroData==TRUE) or if data have already been aggregated (isMicroData==FALSE)

Details

slot rawData: list with each element being a vector of either codes of dimensional variables, counts, weights that should be used for secondary cell suppression problem, numerical variables or sampling weights.

slot dimVarInd: numeric vector (or NULL) defining the indices of the dimensional variables within slot 'rawData'

slot freqVarInd: numeric vector (or NULL) defining the indices of the frequency variables within slot 'rawData'

slot numVarInd: numeric vector (or NULL) defining the indices of the numerical variables within slot 'rawData'

slot weightVarInd: numeric vector (or NULL) defining the indices of the variables holding weights within slot 'rawData'

slot sampWeightInd: numeric vector (or NULL) defining the indices of the variables holding sampling weights within slot 'rawData'

slot isMicroData: logical vector of length 1 (or NULL) that is TRUE if slot 'rawData' are micro-Data and FALSE otherwise

Note

objects of class dataObj are input for slot dataObj in class sdcProblem

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

dimInfo-class *S4 class describing a dimInfo-object*

Description

An object of class dimInfo holds all necessary information about the dimensional variables defining a hierarchical table that needs to be protected.

Details

slot dimInfo: a list (or NULL) with all list elements being objects of class dimVar

slot strID: a character vector (or NULL) defining IDs that identify each table cell. The ID's are based on (default) codes of the dimensional variables defining a cell.

slot strInfo: a list object (or NULL) with each list element being a numeric vector of length 2 defining the start and end-digit that is allocated by the i-th dimensional variable in ID-codes available in slot strID

slot vNames: a character vector (or NULL) defining the variable names of the dimensional variables defining the table structure

slot posIndex: a numeric vector (or NULL) holding the position of the dimensional variables within slot rawData of class dataObj

Note

objects of class dimInfo are input for slots in classes sdcProblem and safeObj

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

dimVar-class *S4 class describing a dimVar-object*

Description

An object of class dimVar holds all necessary information about a single dimensional variable such as original and standardized codes, the level-structure, the hierarchical structure, codes that may be (temporarily) removed from building the complete hierarchy (dups) and their corresponding codes that correspond to these duplicated codes.

Details

- slot codesOriginal:** a character vector (or NULL) holding original variable codes
- slot codesDefault:** a character vector (or NULL) holding standardized codes
- slot codesMinimal:** a logical vector (or NULL) defining if a code is required to build the complete hierarchy or not (then the code is a (sub)total)
- slot vName:** character vector of length 1 (or NULL) defining the variable name of the dimensional variable
- slot levels:** a numeric vector (or NULL) defining the level structure. For each code the corresponding level is listed with the grand-total always having level==1
- slot structure:** a numeric vector (or NULL) with length of the total number of levels. Each element shows how many digits the i-th level allocates within the standardized codes (note: level 1 always allocates exactly 1 digit in the standardized codes)
- slot dims:** a list (or NULL) defining the hierarchical structure of the dimensional variable. Each list-element is a character vector with elements available in slot codesDefault and the first element always being a (sub)total and the remaining elements being the codes that contribute to the (sub)total
- slot dups:** character vector (or NULL) having showing original codes that are duplicates in the hierarchy and can temporarily removed when building a table with this dimensional variable
- slot dupsUp:** character vector (or NULL) with original codes that are the corresponding upper-levels to the codes that may be removed because they are duplicates and that are listed in slot dups

Note

objects of class dimVar form the base for elements in slot dimInfo of class dimInfo.

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

get.cutList

query cutList-objects depending on argument type

Description

query cutList-objects depending on argument type

Usage

```
get.cutList(object, type)
```

```
## S4 method for signature 'cutList,character'
get.cutList(object, type)
```


Arguments

- | | |
|--------|--|
| object | an object of class cutList |
| type | a character vector of length 1 defining what to calculate return modify. Allowed types are: <ul style="list-style-type: none">• constraints: constraint matrix of object• direction: directions of the constraints• rhs: right hand side of the constraints• nrConstraints: total number of constraints |

Value

information from objects of class cutList depending on argument type

- object of class simpleTriplet if argument type matches 'constraints'
- character vector if argument type matches 'direction'
- numeric vector if argument type matches 'objective' or 'rhs'

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

get.dataObj *query dataObj-objects depending on argument type*

Description

query dataObj-objects depending on argument type

Usage

```
get.dataObj(object, type)

## S4 method for signature 'dataObj,character'
get.dataObj(object, type)
```

Arguments

object	an object of class dataObj
type	a character vector of length 1 defining what to calculate/return/modify. Allowed types are: <ul style="list-style-type: none"> • rawData: raw input data • dimVarInd: indices of dimensional variables • freqVarInd: index of frequency variable • numVarInd: indices of numerical variables • weightVarInd index of weight variable • sampWeightInd index of variable holding sampling weights • isMicroData does object consist of microdata? • numVarNames variable names of numerical variables • freqVarName variable name of frequency variable • varName variable names of dimensional variables

Value

information from objects of class dataObj depending on argument type

- a list if argument type matches 'rawData'
- numeric vector if argument type matches 'dimVarInd', 'freqVarInd', 'numVarInd', 'weightVarInd' or 'sampWeightInd'
- character vector if argument type matches 'numVarNames', 'freqVarName' or 'varName'
- logical vector of length 1 if argument type matches 'isMicroData'

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

get.dimInfo

query dimInfo-objects depending on argument type

Description

query dimInfo-objects depending on argument type

Usage

```
get.dimInfo(object, type)
```

```
## S4 method for signature 'dimInfo,character'
```

```
get.dimInfo(object, type)
```

Arguments

object	an object of class dataObj
type	a character vector of length 1 defining what to calculate/return/modify. Allowed types are: <ul style="list-style-type: none"> • strInfo: info on how many digits in the default codes each dimensional variable allocates • dimInfo: a list object with each slot containing an object of class dimVar • varName: variable names • strID: character vector of ID's defining table cells • posIndex vector showing the index of the elements of dimInfo in the underlying data

Value

information from objects of class dimInfo depending on argument type

- a list (or NULL) if argument type matches 'strInfo', 'dimInfo'
- numeric vector (or NULL) if argument type matches 'posIndex'
- character vector (or NULL) if argument type matches 'varName' or 'strID'

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

get.dimVar

query dimVar-objects depending on argument type

Description

query dimVar-objects depending on argument type

Usage

```
get.dimVar(object, type)
```

```
## S4 method for signature 'dimVar,character'
```

```
get.dimVar(object, type)
```

Arguments

object	an object of class dimVar
type	a character vector of length 1 defining what to calculate/return/modify. Allowed types are: <ul style="list-style-type: none"> • varName: variable name of the variable from which object was calculated • codesOriginal: original codes (as specified by the user) • codesDefault: calculated, default codes • codesMinimal: all codes required to calculate the complete hierarchy (no sub-totals) • levels: level-structure of the dimensional variable • structure: vector showing how many digits in the default codes are required for each level • dims: list showing the complete hierarchy of the dimensional variable • dups: vector of duplicated codes • dupsUp: vector of codes that are the 'upper' levels to which the codes in dups correspond • hasDuplicates: does the dimensional variable has codes that can be (temporarily) removed • nrLevels: the total number of levels of a dimensional variable • minimalCodesDefault: the standardized codes of the minimal set of required level-codes

Value

information from objects of class dataObj depending on argument type

- a list if argument type matches 'dims'
- numeric vector if argument type matches 'levels' or 'nrLevels'
- character vector if argument type matches 'codesOriginal', 'codesDefault', 'vName', 'dups', 'dupsUp' or 'minimalCodesDefault'
- logical vector of length 1 if argument type matches 'hasDuplicates'
- a logical vector if argument type matches 'codesMinimal'

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

get.linProb	<i>query linProb-objects depending on argument type</i>
-------------	---

Description

query linProb-objects depending on argument type

Usage

```
get.linProb(object, type)
```

```
## S4 method for signature 'linProb,character'
get.linProb(object, type)
```

Arguments

object	an object of class linProb
type	a character vector of length 1 defining what to calculate/return/modify. Allowed types are: <ul style="list-style-type: none"> • constraints: constraint matrix of object linProb • direction: directions of the constraints • rhs: right hand side of the constraints • objective: objective function • types: types of the objective variables • bounds: bounds of the objective variables

Value

information from objects of class linProb depending on type

- an object of class simpleTriplet if type matches 'constraints'
- a character vector if type matches 'direction' or 'types'
- a numeric vector if type matches 'objective' or 'rhs'
- a list with elements 'lower' and 'upper' if type matches 'bounds'
 - element 'lower': a list with the first element containing indices and the second element containing corresponding lower bounds
 - element 'upper': a list with the first element containing indices and the second element containing corresponding upper bounds

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

get.problemInstance *query problemInstance-objects depending on argument type*

Description

query problemInstance-objects depending on argument type

Usage

```
get.problemInstance(object, type)
```

```
## S4 method for signature 'problemInstance,character'
get.problemInstance(object, type)
```

Arguments

object	an object of class problemInstance
type	a character vector of length 1 defining what to calculate/return/modify. Allowed types are: <ul style="list-style-type: none"> • strID: vector of unique IDs for each table cell • nrVars: total number of table cells • freq: vector of frequencies • w: a vector of weights used in the linear problem (or NULL) • numVars: a list containing numeric vectors containing values for numerical variables for each table cell (or NULL) • sdcStatus: a vector containing the suppression state for each cell (possible values are 'u': primary suppression, 'x': secondary suppression, 'z': forced for publication, 's': publishable cell, 'w': dummy cells that are considered only when applying the simple greedy heuristic to protect the table) • lb: lower bound assumed to be known by attackers for each table cell • ub: upper bound assumed to be known by attackers for each table cell • LPL: lower protection level required to protect table cells • UPL: upper protection level required to protect table cells • SPL: sliding protection level required to protect table cells • primSupps: vector of indices of primary sensitive cells • secondSupps: vector of indices of secondary suppressed cells • forcedCells: vector of indices of cells that must not be suppressed • hasPrimSupps: shows if object has primary suppressions or not • hasSecondSupps: shows if object has secondary suppressions or not • hasForcedCells: shows if object has cells that must not be suppressed • weight: gives weight that is used the suppression procedures • suppPattern: gives the current suppression pattern

Value

information from objects of class dataObj depending on argument type

- a list (or NULL) if argument type matches 'numVars'
- numeric vector if argument type matches 'freq', 'lb', 'ub', 'LPL', 'UPL', 'SPL', 'weight', 'suppPattern'
- numeric vector (or NULL) if argument type matches 'w', 'primSupps', 'secondSupps', 'forcedCells'
- character vector if argument type matches 'strID', 'sdcStatus', ''
- logical vector of length 1 if argument type matches 'hasPrimSupps', 'hasSecondSupps', 'hasForcedCells'
- numerical vector of length 1 if argument type matches 'nrVars'

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

get.safeObj

query safeObj-objects depending on argument type

Description

query safeObj-objects depending on argument type

Usage

```
get.safeObj(object, type, input)
```

Arguments

- | | |
|--------|--|
| object | an object of class safeObj |
| type | a character vector of length 1 defining what to calculate/return/modify. Allowed types are: <ul style="list-style-type: none"> • dimInfo: get infos on dimensional variables that formed the base of the protected data • elapsedTime: get elapsed time of the protection procedure • finalData: return final data object • nrNonDuplicatedCells: total number of cells that are duplicates • nrPrimSupps: total number of primary suppressed cells • nrSecondSupps: total number of secondary cell suppressions |

- nrPublishableCells: total number of cells that can be published
 - suppMethod: suppression method that has been used
 - cellInfo: extract information about a specific cell
 - cellID: calculate ID of a specific cell defined by level-codes and variable names
- input a list depending on argument type.
- type matches 'dimInfo', 'elapsedTime', 'finalData', 'nrNonDuplicatedCells', 'nrPrimSupps', 'nrSecondSupps', 'nrPublishableCells' or 'suppMethod': input is not used (empty list)
 - type matches 'cellInfo' or 'cellID': input is a list of length 3
 - first element: character vector specifying variable names that need to exist in slot 'dimInfo' of object
 - second element: character vector specifying codes for each variable that define a specific table cell
 - third element: logical vector of length 1 with TRUE setting verbosity and FALSE to turn verbose output off

Value

information from object depending on type

- an object of class dimInfo (or NULL) if type matches 'dimInfo'
- a numeric vector if type matches 'elapsedTime', 'nrNonDuplicatedCells', 'nrPrimSupps', 'nrSecondSupps', 'nrPublishableCells' or 'cellID'
- a character vector if type matches 'suppMethod'
- a data.frame if type matches 'finalData'
- a list if type matches 'cellInfo' containing the following elements:
 - element 'cellID': numeric vector of length 1 specifying the index of the cell of interest
 - element 'data': row of slot 'finalData' with the row being defined by the calculated cellID
 - element 'primSupp': logical vector of length 1 being TRUE if cell is a primary suppressed cell
 - element 'secondSupps': logical vector of length 1 being TRUE if cell is a secondary suppressed cell

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

get.sdcProblem	<i>query sdcProblem-objects depending on argument type</i>
----------------	--

Description

query sdcProblem-objects depending on argument type

Usage

```
get.sdcProblem(object, type)
```

```
## S4 method for signature 'sdcProblem,character'
get.sdcProblem(object, type)
```

Arguments

object	an object of class sdcProblem
type	a character vector of length 1 defining what to calculate/return/modify. Allowed types are: <ul style="list-style-type: none"> • dataObj: a list containing the (raw) input data • problemInstance: return the current problem instance • partition: a list containing information on the subtables that are required to be protected as well as information on the processing order of the subtables • elapsedTime: the elapsed time of the protection algorithm so far • dimInfo: information on the variables defining the hierarchical table • indicesDealtWith: a set of indices that have already been dealt with during the protection algorithm • startI: current level at which subtables need to be protected (useful when restarting HITASIHYPERCUBE) • startJ: current number of the subtable within a given level that needs to be protected (useful when restarting HITASIHYPERCUBE) • innerAndMarginalCellInfo: for a given problem, get indices of inner- and marginal table cells

Value

information from objects of class sdcProblem depending on argument type

- an object of class dataObj (or NULL) if type matches 'dataObj'
- an object of class problemInstance (or NULL) if type matches 'problemInstance'
- a list (or NULL) if argument type matches 'partition' containing the following elements:
 - element 'groups': list with each list-element being a character vector specifying a specific level-group
 - element 'indices': list with each list-element being a numeric vector defining indices of a subtable

- element 'strIDs': list with each list-element being a character vector defining IDs of a subtable
- element 'nrGroups': numeric vector of length 1 defining the total number of groups that have to be considered
- element 'nrTables': numeric vector of length 1 defining the total number of subtables that have to be considered
- a list (or NULL) if argument `type` matches 'innerAndMarginalCellInfo' containing the following elements:
 - element 'innerCells': character vector specifying ID's of inner cells
 - element 'totCells': character vector specifying ID's of marginal cells
 - element 'indexInnerCells': numeric vector specifying indices of inner cells
 - element 'indexTotCells': numeric vector specifying indices of marginal cells
- an object of class `dimInfo` (or NULL) if `type` matches 'dimInfo'
- numeric vector if argument `type` matches 'elapsedTime'
- numeric vector of length 1 if argument `type` matches 'startI' or 'startJ'

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

`get.simpleTriplet` *query simpleTriplet-objects depending on argument type*

Description

query simpleTriplet-objects depending on argument type

Usage

```
get.simpleTriplet(object, type, input)

## S4 method for signature 'simpleTriplet,character,list'
get.simpleTriplet(object, type,
  input)
```

Arguments

object	an object of class simpleTriplet
type	a character vector of length 1 defining what to calculate return modify. Allowed types are: <ul style="list-style-type: none"> • rowInd: extract all row-indices • colInd: extract all column-indices • values: extract all values • nrRows: return the number of rows of the input object • nrCols: return the number of columns of the input object • nrCells: return the number of cells (different from 0!) • duplicatedRows: return a numeric vector showing indices of duplicated rows • transpose: transpose input object and return the transposed matrix • getRow: return a specific row of input object • getCol: return a specific column of input object
input	a list depending on argument type. <ul style="list-style-type: none"> • type == 'getRow': input is a list of length 1 <ul style="list-style-type: none"> – first element: numeric vector of length 1 defining index of row that is to be returned • type == 'getCol': input is a list of length 1 <ul style="list-style-type: none"> – first element: numeric vector of length 1 defining index of column that is to be returned • else: input is not used at all (empty list)

Value

information from object depending on type

- a numeric vector if type matches 'rowInd', 'colInd', 'values', 'nrRows', 'nrCols', 'nrCells' or 'duplicatedRows'
- an object of class simpleTriplet if type matches 'transpose', 'getRow' or 'getCol'

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

getInfo	<i>query information from objects</i>
---------	---------------------------------------

Description

Function `getInfo` is used to query information from objects of class `sdProblem-class`, `problemInstance-class` or `safeObj-class`

Usage

```
getInfo(object, type)
```

Arguments

- | | |
|--------|---|
| object | a <code>sdProblem-class</code> object, <code>problemInstance-class</code> object or <code>safeObj-class</code> object. |
| type | <p>a character vector of length 1 specifying the information which should be returned.</p> <ul style="list-style-type: none"> • if argument object is of class <code>sdProblem-class</code> or <code>problemInstance-class</code>, valid choices are: <ul style="list-style-type: none"> – lb: slot 'lb' of input object if it is of class <code>problemInstance-class</code> or this slot within slot 'problemInstance' if object is of class <code>sdProblem-class</code> – ub: slot 'ub' of input object if it is of class <code>problemInstance-class</code> or this slot within slot 'problemInstance' if object is of class <code>sdProblem-class</code> – LPL: slot 'LPL' of input object if it is of class <code>problemInstance-class</code> or this slot within slot 'problemInstance' if object is of class <code>sdProblem-class</code> – SPL: slot 'SPL' of input object if it is of class <code>problemInstance-class</code> or this slot within slot 'problemInstance' if object is of class <code>sdProblem-class</code> – UPL: slot 'UPL' of input object if it is of class <code>problemInstance-class</code> or this slot within slot 'problemInstance' if object is of class <code>sdProblem-class</code> – sdStatus: slot 'sdStatus' of input object if it is of class <code>problemInstance-class</code> or this slot within slot 'problemInstance' if object is of class <code>sdProblem-class</code> – freq: slot 'freq' of input object if it is of class <code>problemInstance-class</code> or this slot within slot 'problemInstance' if object is of class <code>sdProblem-class</code> – strID: slot 'strID' of input object if it is of class <code>problemInstance-class</code> or this slot within slot 'problemInstance' if object is of class <code>sdProblem-class</code> – numVars: slot 'numVars' of input object if it is of class <code>problemInstance-class</code> or this slot within slot 'problemInstance' if object is of class <code>sdProblem-class</code> – w: slot 'w' of input object if it is of class <code>problemInstance-class</code> or this slot within slot 'problemInstance' if object is of class <code>sdProblem-class</code> • if argument object is of class <code>safeObj-class</code>, valid choices are: <ul style="list-style-type: none"> – finalData: slot 'finalData' of input object of class <code>safeObj-class</code> – nrNonDuplicatedCells: slot 'nrNonDuplicatedCells' of input object of class <code>safeObj-class</code> |

- nrPrimSupps: slot 'nrPrimSupps' of input object of class [safeObj-class](#)
- nrSecondSupps: slot 'nrSecondSupps' of input object of class [safeObj-class](#)
- nrPublishableCells: slot 'nrPublishableCells' of input object of class [safeObj-class](#)
- suppMethod: slot 'suppMethod' of input object of class [safeObj-class](#)

Value

manipulated data dependent on arguments object and type

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

Examples

```
# load problem (as it was created in the example
# of \link{makeProblem})
sp <- searchpaths()
fn <- paste(sp[grepl("sdcTable", sp)], "/data/problem.RData", sep="")
problem <- get(load(fn))

# problem is an object of class \link{sdcProblem-class}
print(class(problem))

for (slot in c('lb','ub','LPL','SPL','UPL','sdcStatus',
  'freq', 'strID', 'numVars', 'w')) {
  cat('slot', slot,':\n')
  print(getInfo(problem, type=slot))
}

# extracting information for objects of class \link{safeObj-class}
fn <- paste(sp[grepl("sdcTable", sp)], "/data/protectedData.RData", sep="")
protectedData <- get(load(fn))
for (slot in c('finalData', 'nrNonDuplicatedCells', 'nrPrimSupps',
  'nrSecondSupps', 'nrPublishableCells', 'suppMethod')) {
  cat('slot', slot,':\n')
  print(getInfo(protectedData, type=slot))
}
```

init.cutList

initialize cutList-objects depending on argument type

Description

initialize cutList-objects depending on argument type

Usage

```
init.cutList(type, input)

## S4 method for signature 'character,list'
init.cutList(type, input)
```

Arguments

- | | |
|--------------------|--|
| <code>type</code> | a character vector of length 1 defining what/how to initialize. Allowed types are: <ul style="list-style-type: none">• <code>empty</code>: create an empty <code>cutList</code>-object• <code>singleCut</code>: create a <code>cutList</code>-object with exactly one constraint• <code>multipleCuts</code>: create a <code>cutList</code>-object with more than one constraint |
| <code>input</code> | a list depending on argument <code>type</code> . <ul style="list-style-type: none">• <code>type==empty</code>: <code>input</code> is not used (empty list)• <code>type==singleCut</code>: <code>input</code> is a list of length 3<ul style="list-style-type: none">– first element: numeric vector specifying a values for the row of the constraint matrix that must be created– second element: character vector of length 1 specifying the direction– third element: numeric vector of length 1 specifying the right hand side of the constraint• <code>type==multipleCuts</code>: <code>input</code> is a list of length 3<ul style="list-style-type: none">– first element: object of class <code>matrix</code>– second element: character vector specifying the direction of the constraints– third element: numeric vector specifying the right hand side of the constraints |

Value

an object of class `cutList`

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

init.dataObj	<i>initialize dataObj-objects</i>
--------------	-----------------------------------

Description

initialize dataObj-objects

Usage

```
init.dataObj(input)

## S4 method for signature 'list'
init.dataObj(input)
```

Arguments

input a list with element described below:

- element 'inputData': a list object holding data
- element 'dimVarInd': index (within inputData) of variables that define the table to protect
- element 'freqVarInd': index (within inputData) of variable holding frequencies
- element 'numVarInd' index (within inputData) of numerical variables (or NULL)
- element 'weightInd': index (within inputData) of variable holding weights (or NULL)
- element 'sampWeightInd': index (within inputData) of variable holding sampling weights (or NULL)
- element 'isMicroData': logical vector of length 1

Value

an object of class dataObj

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

init.dimVar	<i>initialize dimVar-object</i>
-------------	---------------------------------

Description

initialize dimVar-object

Usage

```
init.dimVar(input)

## S4 method for signature 'list'
init.dimVar(input)
```

Arguments

input	a list with 2 elements
-------	------------------------

- first element: either an object of class 'matrix' or a data.frame or a link to a file. The input data need to be in a specific format (2 columns) with the first column defining the level-structure and the second column defining the level-codes.
- second element: a character vector of length 1 specifying a variable name

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

init.simpleTriplet	<i>initialize simpleTriplet-objects depending on argument type</i>
--------------------	--

Description

init.simpleTriplet should be used to create objects of class simpleTriplet. It is possible to create an object from class simpleTriplet from an existing matrix (using type=='simpleTriplet'). A positive (or negative) identity matrix stored as an object of class simpleTriplet can be created by specifying type=='simpleTripletDiag'.

Usage

```
init.simpleTriplet(type, input)

## S4 method for signature 'character,list'
init.simpleTriplet(type, input)
```


Arguments

- type** a character vector of length 1 defining what/how to initialize. Allowed types are:
- simpleTriplet: a simple triplet matrix
 - simpleTripletDiag: identity matrix
- input** a list depending on argument type.
- type == 'simpleTriplet': input is a list of length 1
 - first element: object of class 'matrix'
 - type == 'simpleTripletDiag': input is a list of length 2
 - first element: numeric vector of length 1 defining the desired number of rows of the identity matrix
 - second element: logical vector of length 1 being TRUE if a positive and FALSE if a negative identity matrix should be returned

Value

an object of class simpleTriplet

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

linProb-class *S4 class describing a linProb-object*

Description

An object of class linProb defines a linear problem given by the objective coefficients (slot objective), a constraint matrix (slot constraints), the direction (slot direction) and the right hand side (slot rhs) of the constraints. Also, allowed lower (slot boundsLower) and upper (slot boundsUpper) bounds of the variables as well as its types (slot types) are specified.

Details

slot objective: a numeric vector holding coefficients of the objective function

slot constraints: an object of class [simpleTriplet-class](#) specifying the constraint matrix of the problem

slot direction: a character vector holding the directions of the constraints, allowed values are:

- ==: equal
- <: less
- >: greater

- <=: less or equal
- >=: greater or equal

slot rhs: numeric vector holding right hand side values of the constraints

slot boundsLower: a numeric vector holding lower bounds of the objective variables

slot boundsUpper: a numeric vector holding upper bounds of the objective variables

slot types: a character vector specifying types of the objective variables, allowed types are:

- C: binary
- B: continuous
- I: integer

Note

when solving the problems in the procedure, minimization of the objective is performed.

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

makeProblem

create `sdcProblem-class`-objects

Description

Function `makeProblem` is used to create `sdcProblem-class`-objects.

Usage

```
makeProblem(data, dimList, dimVarInd = NULL, freqVarInd = NULL,
            numVarInd = NULL, weightInd = NULL, sampWeightInd = NULL)
```

Arguments

- | | |
|---------|---|
| data | a data frame featuring at least one column for each desired dimensional variable. Optionally the input data can feature variables that contain information on cell counts, weights that should be used during the cut and branch algorithm, additional numeric variables or variables that hold information on sampling weights. |
| dimList | a named list where the names refer to variable names in input data. Each list element can be one of: <ul style="list-style-type: none"> • <code>tree</code>: generated with <code>hier_*()</code> functions from the <code>sdcHierarchies</code> package • <code>data.frame</code>: a two column data.frame containing the complete level hierarchy of a dimensional variable using a top-to-bottom approach. The format of the data.frame is as follows: |

- first column: a character vector specifying levels with each vector element being a string only containing of '@'s from length 1 to n. If a vector element consists of i-chars, the corresponding code is of level i. The code '@' (one character) equals the grand total (level=1), the code '@@' (two characters) is of level 2 (directly below the overall total).
- second column: a character vector specifying level codes

- path: absolute or relative path to a .csv file that contains two columns separated by semicolons (;) having the same structure as the "@; levelname"-structure described above

dimVarInd	numeric vector (or NULL) defining the column-indices of dimensional variables (defining the table) within argument data. If NULL, the names of argument dimList are used to calculate the indices of the dimensional variables within data internally.
freqVarInd	numeric vector (or NULL) defining the column-indices of a variable holding counts within argument data
numVarInd	numeric vector (or NULL) defining the column-indices of additional numeric variables available in argument data
weightInd	numeric vector of length 1 (or NULL) defining the column-index of a variable holding weights that should be used during as objective coefficients during the cut and branch algorithm to protect primary sensitive cells within argument data
sampWeightInd	numeric vector of length 1 (or NULL) defining the column-index of a variable holding sampling weights within argument data

Value

a [sdcProblem-class-object](#)

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

Examples

```
# loading micro data
data("microData1", package="sdcTable")
microData <- microData1; rm(microData1)
# having a look at the data structure
str(microData)

# we can observe that we have a micro data set consisting
# of two spanning variables ('region' and 'gender') and one
# numeric variable ('val')

# specify structure of hierarchical variable 'region'
# levels 'A' to 'D' sum up to a Total
dim.region <- data.frame(
  levels=c('@', '@@', '@@@', '@@@@', '@@@@'),
  codes=c('Total', 'A', 'B', 'C', 'D'),
  stringsAsFactors=FALSE)
```

```

# specify structure of hierarchical variable 'gender'
# using create_node() and add_nodes() (see ?manage_hierarchies)
dim.gender <- hier_create(root = "Total", nodes = c("male", "female"))
hier_display(dim.gender)

# create a named list with each element being a data-frame
# containing information on one dimensional variable and
# the names referring to variables in the input data
dimList <- list(region=dim.region, gender=dim.gender)

# third column contains a numeric variable
numVarInd <- 3

# no variables holding counts, numeric values, weights or sampling
# weights are available in the input data
freqVarInd <- weightInd <- sampWeightInd <- NULL

# creating an object of class \code{\link{sdProblem-class}}
problem <- makeProblem(
  data=microData,
  dimList=dimList,
  freqVarInd=freqVarInd,
  numVarInd=numVarInd,
  weightInd=weightInd,
  sampWeightInd=sampWeightInd)

# what do we have?
print(class(problem))

# have a look at the data
sdProb2df(problem, addDups=TRUE,
  addNumVars=TRUE, dimCodes="original")

```

microData1

synthetic microdata

Description

example microdata used for example in [protectLinkedTables](#).

Format

A dataframe with 100 observations on 5 variables (region,gender,ecoOld,ecoNew and numVal)

microData2	<i>synthetic microdata</i>
------------	----------------------------

Description

example microdata used for various examples.

Format

A dataframe with 100 observations on 2 variables (region and gender)

primarySuppression	<i>perform primary suppression in sdcProblem-class-objects</i>
--------------------	--

Description

Function [primarySuppression](#) is used to identify and suppress primary sensitive table cells in [sdcProblem-class](#) objects. Argument `type` allows to select a rule that should be used to identify primary sensitive cells. At the moment it is possible to identify and suppress sensitive table cells using the frequency-rule, the nk-dominance rule and the p-percent rule.

Usage

```
primarySuppression(object, type, ...)
```

Arguments

<code>object</code>	a sdcProblem-class object
<code>type</code>	character vector of length 1 defining the primary suppression rule. Allowed types are: <ul style="list-style-type: none"> • <code>freq</code>: apply frequency rule with parameters <code>maxN</code> and <code>allowZeros</code> • <code>nk</code>: apply nk-dominance rule with parameters <code>n</code>, <code>k</code> and <code>numVarInd</code> • <code>p</code>: apply p-percent rule with parameters <code>p</code> and <code>numVarInd</code> • <code>pq</code>: apply pq-rule with parameters <code>p</code> and <code>q</code>
<code>...</code>	parameters used in the identification of primary sensitive cells. Parameters that can be modified/changed are: <ul style="list-style-type: none"> • <code>maxN</code>: numeric vector of length 1 used when applying the frequency rule. All cells having counts \leq <code>maxN</code> are set as primary suppressed. The default value of <code>maxN</code> is 3. • <code>allowZeros</code>: logical vector of length 1 specifying if empty cells (<code>count==0</code>) should be considered sensitive when using the frequency rule. The default value of <code>allowZeros</code> is 'FALSE' so that empty cells are not considered primary sensitive by default.

- p: numeric vector of length 1 specifying parameter p that is used when applying the p-percent rule with default value of 80.
- pq: numeric vector of length 2 specifying parameters p and q that are used when applying the pq-rule with the default being c(25, 50).
- n: numeric vector of length 1 specifying parameter n that is used when applying the nk-dominance rule. Parameter n is set to 2 by default.
- k: numeric vector of length 1 specifying parameter k that is used when applying the nk-dominance rule. Parameter n is set to 85 by default.
- numVarInd: numeric vector of length 1 specifying the index of the numerical variable that should be used to identify cells that are dominated by 2 (p-percent rule) or n (nk-dominance)-rule. If type is either 'nk', 'p' or 'pq', it is mandatory to specify numVarInd.

Value

a `sdcProblem-class` object

Note

the nk-dominance rule, the p-percent rule and the pq-rule can only be applied if micro data have been used as input data to function `makeProblem`.

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

Examples

```
# load micro data
sp <- searchpaths()
fn <- paste(sp[grep("sdcTable", sp)], "/data/microData1.RData", sep="")
microData <- get(load(fn))

# load problem (as it was created in the example in \code{\link{makeProblem}})
fn <- paste(sp[grep("sdcTable", sp)], "/data/problem.RData", sep="")
problem <- get(load(fn))

# we have a look at the frequency table by gender and region
xtabs(rep(1, nrow(microData)) ~ gender + region, data=microData)

# cell with region=='A' and gender=='female' has 2 units contributing to it
# this cell should be considered sensitive according the the freq-rule with 'maxN' equal to 2!
p1 <- primarySuppression(problem, type='freq', maxN=2)

# we can also apply a p-percent rule with parameter 'p' being 30 as below.
# This is only possible if we are dealing with micro data and we also have to specify the index of
# a numeric variable.
p2 <- primarySuppression(problem, type='p', p=30, numVarInd=1)

# looking at anonymization states we see, that one cell is primary suppressed (sdcStatus=='u')
# and the remaining cells are possible candidates for secondary suppression (sdcStatus=='s') given
```

```
# the frequency rule with parameter 'maxN=2'.
# Applying the p-percent rule with parameter 'p=30' resulted in two primary suppressions.
data.frame(p1.sdc=getInfo(p1, type='sdcStatus'), p2.sdc=getInfo(p2, type="sdcStatus"))
```

```
print,dimVar-method    print dimVar-class objects
```

Description

print [dimVar-class](#) objects in a reasonable way

Usage

```
## S4 method for signature 'dimVar'
print(x, ...)
```

Arguments

x	An object of class dimVar-class
...	currently not used

```
print,sdcProblem-method
                          print objects of class sdcProblem-class.
```

Description

print some useful information instead of just displaying the entire object (which may be large)

Usage

```
## S4 method for signature 'sdcProblem'
print(x, ...)
```

Arguments

x	an objects of class sdcProblem-class
...	currently not used.

problem *data of class* `sdcProblem-class`

Description

example data of class `sdcProblem-class` as created in the example of `makeProblem`

Format

an object of class `sdcProblem-class`

problemInstance-class *S4 class describing a problemInstance-object*

Description

An object of class `problemInstance` holds the main information that is required to solve the secondary cell suppression problem.

Details

- slot** `strID`: a character vector (or NULL) of ID's identifying table cells
- slot** `Freq`: a numeric vector (or NULL) of counts for each table cell
- slot** `w`: a numeric vector (or NULL) of weights that should be used when solving the secondary cell suppression problem
- slot** `numVars`: a list (or NULL) with each element being a numeric vector holding values of specified numerical variables for each table cell
- slot** `lb`: numeric vector (or NULL) holding assumed lower bounds for each table cell
- slot** `ub`: numeric vector (or NULL) holding assumed upper bounds for each table cell
- slot** `LPL`: numeric vector (or NULL) holding required lower protection levels for each table cell
- slot** `UPL`: numeric vector (or NULL) holding required upper protection levels for each table cell
- slot** `SPL`: numeric vector (or NULL) holding required sliding protection levels for each table cell
- slot** `sdStatus`: character vector (or NULL) holding the current anonymization state for each cell.
 - z: cell is forced to be published and must not be suppressed
 - u: cell has been primary suppressed
 - x: cell is a secondary suppression
 - s: cell can be published

Note

objects of class `problemInstance` are used as input for slot `problemInstance` in class `sdcProblem`

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

problemWithSupps *data of class [sdcProblem-class](#)*

Description

example data of class [sdcProblem-class](#) as created in the example of [primarySuppression](#)

Format

an object of class [sdcProblem-class](#) featuring primary suppressed table cells

protectedData *data of class [safeObj-class](#)*

Description

example data of class [safeObj-class](#) as created in the example of [protectTable](#)

Format

an object of class [safeObj-class](#) being a protected dataset

protectLinkedTables *protect two [sdcProblem-class](#) objects that have common cells*

Description

[protectLinkedTables](#) can be used to protect tables, that have common cells. It is of course required that after the anonymization process has finished, all common cells have the same anonymization state in both tables.

Usage

```
protectLinkedTables(objectA, objectB, commonCells, method, ...)
```

Arguments

objectA	a sdcProblem-class object
objectB	a sdcProblem-class object
commonCells	<p>a list object defining common cells in objectA and objectB. For each variable that has one or more common codes in both tables, a list element needs to be specified.</p> <ul style="list-style-type: none"> • List-elements of length 3: Variable has exact same levels and structure in both tables <ul style="list-style-type: none"> – first element: character vector of length 1 specifying the variable name in argument objectA – second element: character vector of length 1 specifying the variable name in argument objectB – third element: character vector of length 1 being with keyword ALL • List-elements of length 4: Variable has different codes and levels in tables objectA and objectB <ul style="list-style-type: none"> – first element: character vector of length 1 specifying the variable name in argument objectA – second element: character vector of length 1 specifying the variable name in argument objectB – third element: character vector defining codes within objectA – fourth element: character vector with length that equals the length of the third list-element. The vector defines codes of the variable in objectB that match the codes given in the third list-element for objectA.
method	<p>a character vector of length 1 specifying the algorithm that should be used to protect the primary sensitive table cells. Allowed values are:</p> <ul style="list-style-type: none"> • HITAS: • SIMPLEHEURISTIC: • OPT:
...	<p>additional arguments to control the secondary cell suppression algorithm. For details, see protectTable.</p>

Value

a list of length 2 with each list-element being an [safeObj-class](#) object

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

See Also

[protectTable](#)

Examples

```

## Not run:
# load micro data for further processing
sp <- searchpaths()
fn <- paste(sp[grep("sdcTable", sp)], "/data/microData2.RData", sep="")
microData <- get(load(fn))

# table1: defined by variables 'gender' and 'ecoOld'
microData1 <- microData[,c(2,3,5)]

# table2: defined by variables 'region', 'gender' and 'ecoNew'
microData2 <- microData[,c(1,2,4,5)]

# we need to create information on the hierarchies
# variable 'region': exists only in microDat2
d_region <- hier_create(root = "Tot", nodes = c("R1", "R2"))

# variable 'gender': exists in both datasets
d_gender <- hier_create(root = "Tot", nodes = c("m", "f"))

# variable 'eco1': exists only in microDat1
d_eco1 <- hier_create(root = "Tot", nodes = c("A", "B"))
d_eco1 <- hier_add(d_eco1, root = "A", nodes = c("Aa", "Ab"))
d_eco1 <- hier_add(d_eco1, root = "B", nodes = c("Ba", "Bb"))

# variable 'ecoNew': exists only in microDat2
d_eco2 <- hier_create(root = "Tot", nodes = c("C", "D"))
d_eco2 <- hier_add(d_eco2, root = "C", nodes = c("Ca", "Cb", "Cc"))
d_eco2 <- hier_add(d_eco2, root = "D", nodes = c("Da", "Db", "Dc"))

# creating objects holding information on dimensions
dl1 <- list(gender = d_gender, ecoOld = d_eco1)
dl2 <- list(region = d_region, gender = d_gender, ecoNew = d_eco2)

# creating input objects for further processing. For details have a look at
# \code{\link{makeProblem}}.
p1 <- makeProblem(
  data = microData1,
  dimList = dl1,
  dimVarInd = 1:2,
  numVarInd = 3
)
p2 <- makeProblem(
  data = microData2,
  dimList = dl2,
  dimVarInd = 1:3,
  numVarInd = 4
)

# the cell specified by gender == "Tot" and ecoOld == "A"
# is one of the common cells! -> we mark it as primary suppression
p1 <- changeCellStatus(

```

```

object = p1,
characteristics = c("Tot", "A"),
varNames = c("gender", "ecoOld"),
rule = "u",
verbose = FALSE
)

# the cell specified by region == "Tot" and gender == "f" and ecoNew == "C"
# is one of the common cells! -> we mark it as primary suppression
p2 <- changeCellStatus(
  object = p2,
  characteristics = c("Tot", "f", "C"),
  varNames = c("region", "gender", "ecoNew"),
  rule = "u",
  verbose = FALSE
)

# specifying input to define common cells
common_cells <- list()

# variable "gender"
common_cells$v.gender <- list()
common_cells$v.gender[[1]] <- "gender" # variable name in "p1"
common_cells$v.gender[[2]] <- "gender" # variable name in "p2"
# "gender" has equal characteristics on both datasets -> keyword "ALL"
common_cells$v.gender[[3]] <- "ALL"

# variables: "ecoOld" and "ecoNew"
common_cells$v.eco <- list()
common_cells$v.eco[[1]] <- "ecoOld" # variable name in "p1"
common_cells$v.eco[[2]] <- "ecoNew" # variable name in "p2"

# vector of common characteristics: "A" and "B" in variable "ecoOld" in 'p1'
common_cells$v.eco[[3]] <- c("A", "B")
# correspond to characteristics "C" and "D" in variable "ecoNew" in "p2"
common_cells$v.eco[[4]] <- c("C", "D")

# protect the linked data
result <- protectLinkedTables(
  objectA = p1,
  objectB = p2,
  commonCells = common_cells,
  method = "HITAS",
  verbose = TRUE
)

# having a look at the results
result.tab1 <- result[[1]]
result.tab2 <- result[[2]]
summary(result.tab1)
summary(result.tab2)

## End(Not run)

```

protectTable	<i>protecting sdcProblem-class objects</i>
--------------	--

Description

Function `protectTable` is used to protect primary sensitive table cells (that usually have been identified and set using `primarySuppression`). The function protects primary sensitive table cells according to the method that has been chosen and the parameters that have been set. Additional parameters that are used to control the protection algorithm are set using parameter . . .

Usage

```
protectTable(object, method, ...)
```

Arguments

object	a <code>sdcProblem-class</code> object that has created using <code>makeProblem</code> and has been modified by <code>primarySuppression</code>
method	a character vector of length 1 specifying the algorithm that should be used to protect the primary sensitive table cells. Allowed values are: <ul style="list-style-type: none"> • OPT: protect the complete problem at once using a cut and branch algorithm. The optimal algorithm should be used for small problem-instances only. • HITAS: split the overall problem in smaller problems. These problems are protected using a top-down approach. • HYPERCUBE: protect the complete problem by protecting sub-tables with a fast heuristic that is based on finding and suppressing geometric structures (n-dimensional cubes) that are required to protect primary sensitive table cells. • SIMPLEHEURISTIC: heuristic, quick procedure which might be applied to very large problem instances
. . .	parameters used in the protection algorithm that has been selected. Parameters that can be changed are: <ul style="list-style-type: none"> • general parameters include: <ul style="list-style-type: none"> – verbose: logical vector of length 1 defining if verbose output should be produced. Parameter verbose defaults to 'FALSE' – save: logical vector of length 1 defining if temporary results should be saved in the current working directory (TRUE) or not (FALSE). Parameter save defaults to 'FALSE' • parameters used for HITAS/OPT procedures: <ul style="list-style-type: none"> – solver: character vector of length 1 defining the solver to be used. Currently available choices are limited to 'glpk'.

- `timeLimit`: numeric vector of length 1 (or NULL) defining a time limit in minutes after which the cut and branch algorithm should stop and return a possible non-optimal solution. Parameter `safe` has a default value of 'NULL'
- `maxVars`: a numeric vector of length 1 (or NULL) defining the maximum problem size in terms of decision variables for which an optimization should be tried. If the number of decision variables in the current problem are larger than parameter `maxVars`, only a possible non-optimal, heuristic solution is calculated. Parameter `safe` has a default value of 'NULL'
- `fastSolution`: logical vector of length 1 defining if or if not the cut and branch algorithm will be started or if the possibly non-optimal heuristic solution is returned independent of parameter `maxVars`. Parameter `fastSolution` has a default value of 'FALSE'
- `fixVariables`: logical vector of length 1 defining whether or not it should be tried to fix some variables to zero or one based on reduced costs early in the cut and branch algorithm. Parameter `fixVariables` has a default value of 'TRUE'
- `approxPerc`: numeric vector of length 1 that defines a percentage for which a integer solution of the cut and branch algorithm is accepted as optimal with respect to the upper bound given by the (relaxed) solution of the master problem. Its default value is set to '10'
- `useC`: boolean vector of length 1 defining if c++ implementation of the secondary cell suppression problem should be used, defaults to FALSE
- parameters used for HYPERCUBE procedure:
 - `protectionLevel`: numeric vector of length 1 specifying the required protection level for the HYPERCUBE-procedure. Its default value is 80
 - `suppMethod`: character vector of length 1 defining the rule on how to select the 'optimal' cube to protect a single sensitive cells. Possible choices are:
 - * `minSupps`: minimize the number of additional secondary suppressions (this is also the default setting).
 - * `minSum`: minimize the sum of counts of additional suppressed cells
 - * `minSumLogs`: minimize the log of the sum of additional suppressed cells
 - `suppAdditionalQuader`: logical vector of length 1 specifying if additional cubes should be suppressed if any secondary suppressions in the 'optimal' cube are 'singletons'. Parameter `suppAdditionalQuader` has a default value of 'FALSE'
- parameter used for `protectLinkedTables()`:
 - `maxIter`: numeric vector of length 1 specifying the maximal number of iterations that should be make while trying to protect common cells of two different tables. The default value of parameter `maxIter` is 10
- parameters used for SIMPLEHEURISTIC procedure:
 - `detectSingletons`: logical, should a singleton-detection procedure be run before protecting the data, defaults to FALSE.

Details

The implemented methods may have bugs that yield in not-fully protected tables. Especially the usage of OPT, HITAS and HYPERCUBE in production is not suggested as these methods may eventually be removed completely. In case you encounter any problems, please report it or use Tau-Argus (<http://research.cbs.nl/casc/tau.htm>).

Value

an `safeObj-class` object

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

Examples

```
# load problem (as it was created after performing primary suppression
# in the example of \code{\link{primarySuppression}})
sp <- searchpaths()
fn <- paste(sp[grep("sdcTable", sp)], "/data/problemWithSupps.RData", sep="")
problem <- get(load(fn))

# protect the table using the 'HITAS' algorithm with verbose output
protectedData <- protectTable(problem, method='HITAS', verbose=TRUE, useC=TRUE)

# showing a summary
summary(protectedData)

# looking at the final table with result suppression pattern
print(getInfo(protectedData, type='finalData'))
```

runArgusBatchFile *runArgusBatchFile*

Description

allows to run batch-files for tau argus given the path to an executable of argus. The provided batch input files can either be created using function `createArgusInput` or can be arbitrarily created. In the latter case, argument `obj` should not be specified and not output is returned, the script is just executed in tau-argus.

Usage

```
runArgusBatchFile(obj = NULL, batchF,
  exe = "C:\\Tau\\TauArgus.exe", batchDataDir = NULL,
  verbose = FALSE)
```

Arguments

obj	NULL or an object of class <code>sdcProblem-class</code> that was used to generate the batchfile for argus. If not NULL, this object is used to create correct variable names. Else, only the output from tau-Argus is read and returned as a <code>data.table</code> . In this case it is possible to run tau-Argus on arbitrarily created batch-files.
batchF	a filepath to an batch-input file created by e.g. <code>createArgusInput</code> .
exe	(character) file-path to tau-argus executable
batchDataDir	if different from NULL, this directory is used to look for input-file and writes output files to. This helps to use relative paths in batch input files.
verbose	(logical) if TRUE, some additional information is printed to the prompt

Value

a `data.table` containing the protected table or an error in case the batch-file was not solved correctly if the batch-file was created using `sdcTable` (argument `obj`) was specified. In case an arbitrarily batch-file has been run, NULL is returned.

Note

in case a custom batch-file is used as input (e.g `obj` is NULL), this functions does currently not try to read in any tables to the system.

safeObj-class

S4 class describing a safeObj-object

Description

Objects of class `safeObj` are the final result after protection a tabular structure. After a successful run of `protectTable` an object of this class is generated and returned. Objects of class `safeObj` contain a final, complete data set (slot `finalData`) that has a column showing the anonymization state of each cell and the complete information on the dimensional variables that have defined the table that has been protected (slot `dimInfo`). Also, the number of non-duplicated table cells (slot `nrNonDuplicatedCells`) is returned along with the number of primary (slot `nrPrimSupps`) and secondary (slot `nrSecondSupps`) suppressions. Furthermore, the number of cells that can be published (slot `nrPublishableCells`), the algorithm that has been used to protect the data (slot `suppMethod`) and the time that was needed to protect the data structure (slot `elapsedTime`) is returned.

Details

slot `finalData`: a `data.frame` (or NULL) featuring columns for each variable defining the table (with their original codes), the cell counts and values of any numerical variables and the anonymization status for each cell with

- s, z: cell can be published
- u: cell is a primary sensitive cell

- x: cell was selected as a secondary suppression
- slot** dimInfo: an object of class `dimInfo-class` holding all information on variables defining the table
- slot** nrNonDuplicatedCells: numeric vector of length 1 (or NULL) showing the number of non-duplicated table cells. This value is different from 0 if any dimensional variable features duplicated codes. These codes have been re-added to the final dataset.
- slot** nrPrimSupps: numeric vector of length 1 (or NULL) showing the number of primary suppressed cells
- slot** nrSecondSupps: numeric vector of length 1 (or NULL) showing the number of secondary suppressions
- slot** nrPublishableCells: numeric vector of length 1 (or NULL) showing the number of cells that may be published
- slot** suppMethod: character vector of length 1 holding information on the protection method
- slot** elapsedTime: numeric vector of length 1 holding the time that was required to protect the table

Note

objects of class `safeObj` are returned after the function `protectTable` has finished.

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

sdcProb2df

sdcProb2df

Description

returns a `data.frame` or `data.table` from an `sdcProblem-class`-object which contains the current state of the problem instance.

Usage

```
sdcProb2df(obj, addDups = TRUE, addNumVars = FALSE,
           dimCodes = "both")
```

Arguments

- | | |
|-------------------------|---|
| <code>obj</code> | an object of class <code>sdcProblem-class</code> from <code>sdcTable</code> |
| <code>addDups</code> | (logical), if TRUE, duplicated cells are included in the output |
| <code>addNumVars</code> | (logical), if TRUE, numerical variables (if defined in <code>makeProblem</code>) will be included in the output. |
| <code>dimCodes</code> | (character) allows to specify in which coding the dimensional variables should be returned. Possible choices are: |

- "both": both original and internally used, standardized codes are included in the output
- "original": only original codes of dimensional variables are included in the output
- "default": only internally used, standardized codes are included in the output

Value

a `data.table` containing information about all cells of the given sdc problem instance is returned.

Examples

```
## have a look at ?makeProblem
```

sdcProblem-class *S4 class describing a sdcProblem-object*

Description

An object of class `sdcProblem` contains the entire information that is required to protect the complete table that is given by the dimensional variables. Such an object holds the data itself (slot `dataObj`), the entire information about the dimensional variables (slot `dimInfo`), information on all table cells (ID's, bounds, values, anonymization state in slot `problemInstance`), the indices on the subtables that need to be considered if one wants to protect primary sensitive cells using a heuristic approach (slot `partition`, information on which groups or rather subtables have already been protected while performing a heuristic method (slots `startI` and `startJ`) and the time that has been elapsed (slot `elapsedTime`).

Details

- slot** `dataObj`: an object of class `dataObj` (or `NULL`) holding information on the underlying data
- slot** `dimInfo`: an object of class `dimInfo` (or `NULL`) containing information on all dimensional variables
- slot** `problemInstance`: an object of class `problemInstance` holding information on values, bounds, required protection levels as well as the anonymization state for all table cells
- slot** `partition`: a list object (or `NULL`) that is typically generated with `calc.multiple(type='makePartitions',...)` specifying information on the subtables and the necessary order that need to be protected when using a heuristic approach to solve the cell suppression problem
- slot** `startI`: a numeric vector of length 1 defining the group-level of the subtables in which a heuristic algorithm needs to start. All subtables having a group-index less than `startI` have already been protected
- slot** `startJ`: a numeric vector of length 1 defining the number of the table within the group defined by parameter `startI` at which a heuristic algorithm needs to start. All tables in the group having an index `j` smaller than `startJ` have already been protected

slot indicesDealtWith: a numeric vector holding indices of table cells that have protected and whose anonymization state must remain fixed

slot elapsedTime: a numeric vector of length 1 holding the time that has already been elapsed during the anonymization process

Note

objects of class `sdCProblem` are typically generated by function `makeProblem` and are the input of functions `primarySuppression` and `protectTable`

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

set.cutList	<i>modify cutList-objects depending on argument type</i>
-------------	--

Description

modify cutList-objects depending on argument type

Usage

```
set.cutList(object, type, input)
```

```
## S4 method for signature 'cutList,character,list'
set.cutList(object, type, input)
```

Arguments

object	an object of class <code>cutList</code>
type	a character vector of length 1 defining what to calculate/return/modify. Allowed types are: <ul style="list-style-type: none"> • <code>addCompleteConstraint</code>: add a constraint to argument object • <code>removeCompleteConstraint</code>: remove a constraint from argument object
input	a list depending on argument type. <ul style="list-style-type: none"> • <code>type==addCompleteConstraint</code>: a list of length 1 <ul style="list-style-type: none"> – first element: an object of class <code>cutList</code> with exactly one constraint • <code>type==removeCompleteConstraint</code>: a list of length 1 <ul style="list-style-type: none"> – first element: numeric vector of length 1 specifying the index of the constraint that should be removed

Value

an object of class `cutList`

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

set.dataObj

modify dataObj-objects depending on argument type

Description

modify dataObj-objects depending on argument type

Usage

```
set.dataObj(object, type, input)
```

```
## S4 method for signature 'dataObj,character,listOrNULL'  
set.dataObj(object, type, input)
```

Arguments

object	an object of class dataObj
type	a character vector of length 1 defining what to calculate return modify. Allowed types are: <ul style="list-style-type: none">• rawData: set slot 'rawData' of argument object
input	a list depending on argument type. <ul style="list-style-type: none">• type==rawData: a list containing raw data

Value

an object of class dataObj

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

set.dimInfo	<i>modify dimInfo-objects depending on argument type</i>
-------------	--

Description

modify dimInfo-objects depending on argument type

Usage

```
set.dimInfo(object, type, input)
```

```
## S4 method for signature 'dimInfo,character,character'
```

```
set.dimInfo(object, type, input)
```

Arguments

object	an object of class dimInfo
type	a character vector of length 1 defining what to calculate return modify. Allowed types are: <ul style="list-style-type: none">• strID: set slot 'strID' of argument object
input	a list depending on argument type. <ul style="list-style-type: none">• type==strID: a character vector containing ID's

Value

an object of class dimInfo

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

set.linProb	<i>change linProb-objects depending on argument type</i>
-------------	--

Description

change linProb-objects depending on argument type

Usage

```
set.linProb(object, type, input)
```

```
## S4 method for signature 'linProb,character,list'
set.linProb(object, type, input)
```

Arguments

object	an object of class linProb
type	a character vector of length 1 defining what to calculate/return/modify. Allowed types are: <ul style="list-style-type: none"> • objective: change coefficients of the objective • direction: change vector of direction of the constraints • rhs: change vector of right hand side of the constraints • types: change vector of bounds of the objective variables • bounds: change bounds of the objective variables • constraints: change constraint matrix • removeCompleteConstraint: remove a specific constraint from the object • addCompleteConstraint: add a constraint to the object
input	a list depending on argument type. <ul style="list-style-type: none"> • type==objective: a list of length 1 <ul style="list-style-type: none"> – first element: numeric vector defining coefficients of the objective • type==direction: a list of length 1 <ul style="list-style-type: none"> – first element: character vector defining direction of the constraints • type==rhs: a list of length 1 <ul style="list-style-type: none"> – first element: numeric vector defining right hand side of the constraints • type==types: a list of length 1 <ul style="list-style-type: none"> – first element: character vector defining types of objective variables • type==bounds: a list of length 2 <ul style="list-style-type: none"> – element 'lower': a list with the first element containing indices and the second element containing corresponding lower bounds – element 'upper': a list with the first element containing indices and the second element containing corresponding upper bounds • type==constraints: a list of length 1 <ul style="list-style-type: none"> – first element: an object of class simpleTriplet

- type==removeCompleteConstraint: a list of length 1
 - first element: numeric vector of length 1 defining the index of the constraint that should be removed
- type==addCompleteConstraint: a list of length 1
 - first element: an object of class cutList defining the constraint that should be added

Value

an object of class linProb

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

set.problemInstance *modify problemInstance-objects depending on argument type*

Description

modify problemInstance-objects depending on argument type

Usage

```
set.problemInstance(object, type, input)
```

```
## S4 method for signature 'problemInstance,character,list'
set.problemInstance(object,
  type, input)
```

Arguments

object	an object of class problemInstance
type	a character vector of length 1 defining what to calculate/return/modify. Allowed types are: <ul style="list-style-type: none"> • lb: set assumed to be known lower bounds • ub: set assumed to be upper lower bounds • LPL: set lower protection levels • UPL: set upper protection levels • SPL: set sliding protection levels • sdcStatus: change anonymization status
input	a list with elements 'indices' and 'values'.

- element 'indices': numeric vector defining the indices of the cells that should be modified
- element 'values': numeric vector whose values are going to replace current values for cells defined by 'indices' depending on argument type

Value

an object of class `problemInstance`

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

<code>set.sdcProblem</code>	<i>modify sdcProblem-objects depending on argument type</i>
-----------------------------	---

Description

modify `sdcProblem`-objects depending on argument type

Usage

```
set.sdcProblem(object, type, input)
```

```
## S4 method for signature 'sdcProblem,character,list'
set.sdcProblem(object, type, input)
```

Arguments

<code>object</code>	an object of class <code>sdcProblem</code>
<code>type</code>	a character vector of length 1 defining what to calculate return modify. Allowed types are: <ul style="list-style-type: none"> • <code>problemInstance</code>: set modify slot 'problemInstance' of argument object • <code>partition</code>: set modify slot 'partition' of argument object • <code>startI</code>: set modify slot 'startI' of argument object • <code>startJ</code>: set modify slot 'startJ' of argument object • <code>indicesDealtWith</code>: set modify slot 'indicesDealtWith' of argument object • <code>elapsedTime</code>: set modify slot 'elapsedTime' of argument object
<code>input</code>	a list with elements depending on argument type. <ul style="list-style-type: none"> • an object of class <code>problemInstance</code> if argument type matches 'problemInstance' • a list (derived from <code>calc.multiple(type='makePartition', ...)</code> if argument type matches 'partition'

- a numeric vector of length 1 if argument type matches 'startI', 'startJ' or 'elapsedTime'
- a numeric vector if argument type matches 'indicesDealtWith'

Value

an object of class `sdcProblem`

Note

internal function

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

setInfo	<i>set information of <code>sdcProblem-class</code>- or <code>problemInstance-class</code> objects</i>
---------	--

Description

Function `getInfo` is used to query information from `sdcProblem-class`- or `problemInstance-class` objects

Usage

```
setInfo(object, type, index, input)
```

Arguments

- | | |
|--------|--|
| object | an object of class <code>sdcProblem-class</code> or <code>problemInstance-class</code> |
| type | <p>a character vector of length 1 specifying the the information that should be changed or modified, valid choices are:</p> <ul style="list-style-type: none"> • lb: slot 'lb' of input object if it is of class <code>problemInstance-class</code> or slot 'lb' within slot 'problemInstance' if object is of class <code>sdcProblem-class</code> • ub: slot 'ub' of input object if it is of class <code>problemInstance-class</code> or slot 'ub' within slot 'problemInstance' if object is of class <code>sdcProblem-class</code> • LPL: slot 'LPL' of input object if it is of class <code>problemInstance-class</code> or slot 'LPL' within slot 'problemInstance' if object is of class <code>sdcProblem-class</code> • SPL: slot 'SPL' of input object if it is of class <code>problemInstance-class</code> or slot 'SPL' within slot 'problemInstance' if object is of class <code>sdcProblem-class</code> • UPL: slot 'UPL' of input object if it is of class <code>problemInstance-class</code> or slot 'UPL' within slot 'problemInstance' if object is of class <code>sdcProblem-class</code> • sdcStatus: slot 'sdcStatus' of input object if it is of class <code>problemInstance-class</code> or slot 'sdcStatus' within slot 'problemInstance' if object is of class <code>sdcProblem-class</code> |

index	numeric vector defining cell-indices for which which values in a specified slot should be changed/modified
input	numeric or character vector depending on argument type with its length matching the length of argument index <ul style="list-style-type: none"> • character vector if type matches 'sdcStatus' • a numeric vector if type matches 'lb', 'ub', 'LPL', 'SPL' or 'UPL'

Value

a [sdcProblem-class](#)- or [problemInstance-class](#) object

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

Examples

```
# load primary suppressed data (created in the example of \code{\link{primarySuppression}})
sp <- searchpaths()
fn <- paste(sp[grep("sdcTable", sp)], "/data/problemWithSupps.RData", sep="")
problem <- get(load(fn))

# which is the overall total?
index.tot <- which.max(getInfo(problem, 'freq'))
index.tot

# we see that the cell with index.tot==1 is the overall total and its
# anonymization state of the total can be extracted as follows:
print(getInfo(problem, type='sdcStatus')[index.tot])

# we want this cell to never be suppressed
problem <- setInfo(problem, type='sdcStatus', index=index.tot, input='z')

# we can verify this:
print(getInfo(problem, type='sdcStatus')[index.tot])

# changing slot 'UPL' for all cells
inp <- data.frame(strID=getInfo(problem, 'strID'), UPL_old=getInfo(problem, 'UPL'))
inp$UPL_new <- inp$UPL_old+1
problem <- setInfo(problem, type='UPL', index=1:nrow(inp), input=inp$UPL_new)
```

show, safeObj-method *show* [safeObj-class](#) objects

Description

extract and show information stored in [safeObj-class](#) objects

Usage

```
## S4 method for signature 'safeObj'
show(object)
```

Arguments

object an object of class [safeObj-class](#)

show, sdcProblem-method

show objects of class [sdcProblem-class](#).

Description

just calls the corresponding print-method

Usage

```
## S4 method for signature 'sdcProblem'
show(object)
```

Arguments

object an objects of class [sdcProblem-class](#)

[simpleTriplet-class](#) *S4 class describing a simpleTriplet-object*

Description

Objects of class `simpleTriplet` define matrices that are stored in a sparse format. Only the row- and column indices and the corresponding values of non-zero cells are stored. Additionally, the dimension of the matrix given by the total number of rows and columns is stored.

Details

slot i: a numeric vector specifying row-indices with each value being `geq 1` and `leq` of the value in `nrRows`

slot j: a numeric vector specifying column-indices with each value being `geq 1` and `leq` of the value in `nrCols`

slot v: a numeric vector specifying the values of the matrix in cells specified by the corresponding row- and column indices

slot nrRows: a numeric vector of length 1 holding the total number of rows of the matrix

slot nrCols: a numeric vector of length 1 holding the total number of columns of the matrix

Note

objects of class `simpleTriplet` are input of slot constraints in class `linProb-class` and slot `con` in class `cutList-class`

Author(s)

Bernhard Meindl <bernhard.meindl@statistik.gv.at>

summary, safeObj-method

summarize safeObj-class objects

Description

extract and show information stored in `safeObj-class` objects

Usage

```
## S4 method for signature 'safeObj'
summary(object, ...)
```

Arguments

object	an object of class <code>safeObj-class</code>
...	additional arguments, currently ignored

summary,sdcProblem-method

summarize object of class `sdcProblem-class` or `safeObj-class`.

Description

extract and show relevant information stored in object of class `sdcProblem-class` or `safeObj-class`.

Usage

```
## S4 method for signature 'sdcProblem'
summary(object, ...)
```

Arguments

object	Objects of either class <code>sdcProblem-class</code> or <code>safeObj-class</code> .
...	currently not used.

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