# Package ‘matsbyname’

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abs_byname

Description

Absolute value of matrix elements

Usage

abs_byname(a)

Arguments

a           a matrix or list of matrices

Value

a with each element replaced by its absolute value
aggregatebyname

Examples

```r
abs_byname(1)
abs_byname(-1)
```

```r
m <- matrix(c(-10,1,1,100), nrow = 2, dimnames = list(paste0("i", 1:2), paste0("c", 1:2))) %>%
  setrowtype("Industry") %>% setcoltype("Commodity")

abs_byname(m)
```

aggregatebyname

Aggregate rows and columns in a matrix

Description

Rows (margin 1), columns (margin = 2), or both (margin = c(1,2), the default) are aggregated according to aggregation_map.

Usage

```r
aggregatebyname(
  a,
  aggregation_map = NULL,
  margin = c(1, 2),
  pattern_type = "exact"
)
```

Arguments

- `a` a matrix or list of matrices whose rows or columns are to be aggregated
- `aggregation_map` a named list of rows or columns to be aggregated (or NULL). See details.
- `margin` 1, 2, or c(1,2) for row aggregation, column aggregation, or both
- `pattern_type` See make_pattern().

Details

When aggregation_map is NULL (the default), rows (or columns or both) of same name are aggregated together.

If aggregation_map is not NULL, it must be a named list. The name of each aggregation_map item is the name of a row or column in a that will contain the specified aggregation. The value of each item in aggregation_map must be a vector of names of rows or columns in a. The names in the value are aggregated and inserted into a with the name of the value. For example `aggregation_map = list(new_row = c("r1","r2"))` will aggregate rows "r1" and "r2", delete rows "r1" and "r2", and insert a new row whose name is "new_row" and whose value is the sum of rows "r1" and "r2".

The items in aggregation_map are interpreted as regular expressions, and they are escaped using Hmisc::escapeRegex() prior to use.

Note that aggregation on one margin only will sort only the aggregated margin, because the other margin is not guaranteed to have unique names.
**aggregate_to_pref_suff_byname**

**Value**

a version of a with aggregated rows and/or columns

**Examples**

```r
touch(dplyr)
touch(tibble)
m <- matrix(1:9, byrow = TRUE, nrow = 3,
           dimnames = list(c("r2", "r1", "r1"),
                           c("c2", "c1", "c1"))) %>%
           setrowtype("rows") %>%
           setcoltype("cols")
# Aggregate all rows by establishing an aggregation map (am)
am <- list(new_row = c("r1", "r2"))
aggregate_byname(m, aggregation_map = am, margin = 1)
# aggregate_byname() also works with lists and in data frames
m1 <- matrix(42, nrow = 1, dimnames = list(c("r1"), c("c1")))
m2 <- matrix(1:4, byrow = TRUE, nrow = 2,
           dimnames = list(c("a", "a"),
                           c("a", "a")))
m3 <- matrix(1:9, byrow = TRUE, nrow = 3,
           dimnames = list(c("r2", "r1", "r1"),
                           c("c2", "c1", "c1")))
DF <- tibble(m = list(m1, m1, m1, m2, m2, m2, m3, m3, m3),
              margin = list(1, 2, c(1,2), 1, 2, c(1, 2), 1, 2, c(1, 2))) %>%
m1
DF$aggregated[[1]] # by rows
DF$aggregated[[2]] # by cols
DF$aggregated[[3]] # by rows and cols
m2
DF$aggregated[[4]] # by rows
DF$aggregated[[5]] # by cols
DF$aggregated[[6]] # by rows and cols
m3
DF$aggregated[[7]] # by rows
DF$aggregated[[8]] # by cols
DF$aggregated[[9]] # by rows and cols
```

---

**aggregate_to_pref_suff_byname**

*Aggregate a matrix to prefixes or suffixes of row and/or column names*

**Description**

Row and column names are often constructed in the form prefix_start prefix prefix_end suffix_start suffix suffix_end and described by a notation vector. (See notation_vec().) This function performs aggregation by prefix or suffix according to a notation vector.
### aggregate_to_pref_suff_byname

**Usage**

```r
aggregate_to_pref_suff_byname(
  a,
  aggregation_map = NULL,
  keep,
  margin = c(1, 2),
  notation,
  pattern_type = "exact"
)
```

**Arguments**

- `a` a matrix of list of matrices to be aggregated by prefix or suffix
- `aggregation_map` See `aggregate_byname()`. 
- `keep` See `rename_to_pref_suff_byname()`
- `margin` the dimension over which aggregation is to be performed; 1 for rows, 2 for columns, or `c(1, 2)` for both.
- `notation` See `notation_vec()`.
- `pattern_type` See `aggregate_byname()`.

**Details**

This function is a convenience function, as it bundles sequential calls to two helper functions, `rename_to_pref_suff_byname()` and `aggregate_byname()`. All arguments are passed to the helper functions.

**Value**

an aggregated version of `a`

**Examples**

```r
m <- matrix((1:9), byrow = TRUE, nrow = 3,
  dimnames = list(c("r1 -> b", "r2 -> b", "r3 -> a"), c("c1 -> z", "c2 -> y", "c3 -> y")))
m

# Aggregation by prefixes does nothing more than rename, because all prefixes are different.
# Doing renaming like this (without also aggregating) is potentially dangerous, because
# some rows and some columns could end up with same names.
aggregate_to_pref_suff_byname(m, keep = "prefix", notation = arrow_notation())

# Aggregation by suffix reduces the number of rows and columns,
# because there are same suffixes in both rows and columns
aggregate_to_pref_suff_byname(m, keep = "suffix", notation = arrow_notation())
```
**allbyname**

*Are all matrix elements TRUE?*

**Description**

Tells whether all elements in matrix \( a \) are true.

**Usage**

\[
\text{allbyname}(a)
\]

**Arguments**

\( a \) a matrix or list of matrices

**Details**

\( a \) can be a matrix or a list of matrices.

**Value**

TRUE if all elements of \( a \) are TRUE, FALSE otherwise

**Examples**

\[
\text{allbyname}(\text{matrix(rep(TRUE, times = 4), nrow = 2, ncol = 2)}) \\
\text{allbyname}(\text{matrix(c(TRUE, FALSE), nrow = 2, ncol = 1)})
\]

---

**andbyname**

*And "by name"*

**Description**

Operands should be logical, although numerical operands are accepted. Numerical operands are interpreted as FALSE when 0 and TRUE for any other number.

**Usage**

\[
\text{andbyname}(\ldots)
\]

**Arguments**

\( \ldots \) operands to the logical \text{and} function

**Value**

logical \text{and} applied to the operands
Examples

    any_byname(TRUE)
    any_byname(FALSE)
    any_byname(list(TRUE, FALSE), list(TRUE, TRUE), list(TRUE, TRUE), list(TRUE, TRUE))
    m1 <- matrix(c(TRUE, TRUE, TRUE, FALSE), nrow = 2, ncol = 2,
                 dimnames = list(c("r1", "r2"), c("c1", "c2")))
    m2 <- matrix(c(TRUE, FALSE, TRUE, TRUE), nrow = 2, ncol = 2,
                 dimnames = list(c("r1", "r2"), c("c1", "c2")))
    any_byname(m1, m1)
    any_byname(m1, m2)
    any_byname(list(m1, m1), list(m1, m1), list(m2, m2))

any_byname

Are any matrix elements TRUE?

Description

Tells whether any elements in matrix a are true.

Usage

any_byname(a)

Arguments

a a matrix or list of matrices

Details

a can be a matrix or a list of matrices.

Value

TRUE if any elements of a are TRUE, FALSE otherwise

Examples

    any_byname(matrix(c(TRUE, FALSE), nrow = 2, ncol = 1))
    any_byname(matrix(rep(FALSE, times = 4), nrow = 2, ncol = 2))
Binary apply by name

Description

If either \(a\) or \(b\) is missing or NULL, 0 is passed to \(\text{FUN}\) in its place. Note that if either \(a\) and \(b\) are lists, elements must be named the same. The names of list elements of \(a\) are applied to the output.

Usage

\[
\text{binaryapply\_byname}( \text{FUN}, \ a, \ b, \ .\text{FUNdots} = \text{NULL}, \ \text{match\_type} = \text{c}("all", \text{"matmult"}, \text{"none"}), \ \text{set\_rowcoltypes} = \text{TRUE}, \ \text{.organize} = \text{TRUE})
\]

Arguments

- **FUN**: a binary function to be applied "by name" to \(a\) and \(b\).
- **a**: the first operand for \(\text{FUN}\).
- **b**: the second operand for \(\text{FUN}\).
- **.FUNdots**: a list of additional named arguments passed to \(\text{FUN}\).
- **match\_type**: one of "all", "matmult", or "none". When both \(a\) and \(b\) are matrices, "all" (the default) indicates that rowtypes of \(a\) must match rowtypes of \(b\) and coltypes of \(a\) must match coltypes of \(b\). If "matmult", coltypes of \(a\) must match rowtypes of \(b\). If "none", neither coltypes nor rowtypes are checked.
- **set\_rowcolypes**: tells whether to apply row and column types from \(a\) and \(b\) to the output. Set TRUE (the default) to apply row and column types to the output. Set FALSE, to not apply row and column types to the output.
- **.organize**: a boolean that tells whether or not to automatically complete \(a\) and \(b\) relative to each other and sort the rows and columns of the completed matrices. Normally, this should be TRUE (the default). However, if \(\text{FUN}\) takes over this responsibility, set to FALSE.

Value

the result of applying \(\text{FUN} \) "by name" to \(a\) and \(b\)
Examples

```r
productnames <- c("p1", "p2")
industrynames <- c("i1", "i2")
U <- matrix(1:4, ncol = 2, dimnames = list(productnames, industrynames)) %>%
  setrowtype("Products") %>% setcoltype("Industries")
Y <- matrix(1:4, ncol = 2, dimnames = list(rev(productnames), rev(industry names))) %>%
  setrowtype("Products") %>% setcoltype("Industries")
sum_byname(U, Y)
binaryapply_byname(\+, U, Y)
```

---

**clean_byname**

*Clean (delete) rows or columns of matrices that contain exclusively clean_value*

**Description**

Cleaning is performed when all entries in a row or column or both, depending on the value of margin are within +/- tol of clean_value. Internally, values are deemed within +/- of tol when \( \text{abs}(x - \text{clean_value}) <= \text{tol} \).

**Usage**

```r
clean_byname(a, margin = c(1, 2), clean_value = 0, tol = 0)
```

**Arguments**

- **a** the matrix to be cleaned
- **margin** the dimension over which cleaning should occur, 1 for rows, 2 for columns, or c(1,2) for both rows and columns. Default is c(1,2).
- **clean_value** the undesirable value. Default is 0.
- **tol** the tolerance with which any value is deemed equal to clean_value. Default is 0.

When a row (when margin = 1) or a column (when margin = 2) contains exclusively clean_value (within tol), the row or column is deleted from the matrix.

**Details**

If there is concern about machine precision, you might want to call this function with tol = .Machine$double.eps.

**Value**

a "cleaned" matrix, expunged of rows or columns that contain exclusively clean_value.
Examples

```r
m <- matrix(c(-20, 1, -20, 2), nrow = 2, dimnames = list(c("r1", "r2"), c("c1", "c2")))
m
m %>% clean_byname(margin = 1, clean_value = -20) # Eliminates -20, -20 row
# Nothing cleaned, because no columns contain all 0's (the default clean_value).
m %>% clean_byname(margin = 2)
# Also works with lists
list(m, m) %>% clean_byname(margin = 1, clean_value = -20)
# Also works with data frames
DF <- data.frame(m = I(list()))
DF[[1,"m"]]<- m
DF[[2,"m"]]<- m
DF %>% clean_byname(margin = 1, clean_value = -20)
m2 <- matrix(c(-20, -20, 0, -20, 0, -20, -20, -20), nrow = 3,
              dimnames = list(c("r1", "r2", "r3"), c("c1", "c2", "c3")))
m2
clean_byname(m2, margin = c(1,2), clean_value = -20)
DF2 <- data.frame(m2 = I(list()))
DF2[[1, "m2"]]<- m2
DF2[[2, "m2"]]<- m2
DF2 %>% clean_byname(margin = c(1, 2), clean_value = -20)
```

colprods_byname Column products, sorted by name

Description

Calculates column products (the product of all elements in a column) for a matrix. An optional rowname for the resulting row vector can be supplied. If rowname is NULL or NA (the default), the row name is set to the row type as given by rowtype(a).

Usage

```r
colprods_byname(a, rowname = NA)
```

Arguments

- `a` a matrix or data frame from which column products are desired.
- `rowname` name of the output row containing column products.

Value

A row vector of type matrix containing the column products of a.
Examples

library(dplyr)
M <- matrix(c(1:6), nrow = 2, dimnames = list(paste0("i", 1:2), paste0("c", 3:1))) %>%
setrowtype("Industries") %>% setcoltype("Commodities")
colprods_byname(M)
colprods_byname(M, rowname = "E.ktoe")
M %>% colprods_byname %>% rowprods_byname
# This also works with lists
colprods_byname(list(M, M))
colprods_byname(list(M, M), rowname = "E.ktoe")
colprods_byname(list(M, M), rowname = NA)
colprods_byname(list(M, M), rowname = NULL)
DF <- data.frame(M = I(list()))
DF[1,"M"] <- M
DF[2,"M"] <- M
colprods_byname(DF$M[[1]])
colprods_byname(DF$M)
colprods_byname(DF$M, "prods")
res <- DF %>% mutate(
  cs = colprods_byname(M),
  cs2 = colprods_byname(M, rowname = "prod")
)
res$cs2

__colsums_byname__

*Column sums, sorted by name*

Description

Calculates column sums for a matrix by premultiplying by an identity vector (containing all 1's). In contrast to `colSums` (which returns a numeric result), the return value from `colsums_byname` is a matrix. An optional `rowname` for the resulting row vector can be supplied. If `rowname` is NA (the default), the row name is set to the row type as given by `rowtype(a)`. If `rowname` is set to NULL, the row name is returned empty.

Usage

`colsums_byname(a, rowname = NA)`

Arguments

- `a`: a matrix or list of matrices from which column sums are desired.
- `rowname`: name of the output row containing column sums.

Value

A row vector of type matrix containing the column sums of `a`. 
Examples

```r
library(dplyr)
m <- matrix(c(1:6), nrow = 2, dimnames = list(paste0("i", 1:2), paste0("c", 3:1))) %>%
  setrowtype("Industries") %>% setcoltype("Commodities")
m
colsums_byname(m)
colsums_byname(m, rowname = "E.ktoe")
m %>%
colsums_byname() %>%
rowsums_byname()
# This also works with lists
colsums_byname(list(m, m))
colsums_byname(list(m, m), rowname = "E.ktoe")
colsums_byname(list(m, m), rowname = NA)
colsums_byname(list(m, m), rowname = NULL)
DF <- data.frame(m = I(list()))
DF[[1,"m"]]<- m
DF[[2,"m"]]<- m
colsums_byname(DF$m[[1]])
colsums_byname(DF$m)
colsums_byname(DF$m, "sums")
res <- DF %>% mutate(
  cs = colsums_byname(m),
  cs2 = colsums_byname(m, rowname = "sum")
)
res$cs2
```

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Description

Extracts column type of a.

Usage

coltype(a)

Arguments

a the object from which you want to extract column types

Value

the column type of a
Examples

```r
commoditynames <- c("c1", "c2")
industrynames <- c("i1", "i2")
U <- matrix(1:4, ncol = 2, dimnames = list(commoditynames, industrynames)) %>%
  setrowtype(rowtype = "Commodities") %>%
  setcoltype("Industries")
coltype(U)
# This also works for lists
coltype(list(U,U))
```

---

**comparebyname**

**Compare matrix entries to a value**

**Description**

Compares matrix entries to a value, returning a matrix of same size as a containing TRUE or FALSE values as the result of applying compare_fun and val to all entries in a.

**Usage**

```r
comparebyname(a, compare_fun = c("==", "!="", "<", "<="", ">=", ":"), val = 0)
```

**Arguments**

- **a**: a matrix or list of matrices whose values are to be counted according to compare_fun
- **compare_fun**: the comparison function, one of "==", "!="", "<", "<="", ">=", or ":". Default is "==".
- **val**: a single value against which entries in matrix a are compared. Default is 0.

**Value**

a logical matrix of same size as a containing TRUE where the criterion is met, FALSE otherwise

**Examples**

```r
m <- matrix(c(0, 1, 2, 3, 4, 0), nrow = 3, ncol = 2)
comparebyname(m, "<", 3)
comparebyname(list(m,m), "<", 3)
```
complete_and_sort

Description

Completes each matrix relative to each other, thereby assuring that both matrices have same row and column names. Missing rows and columns (relative to the other matrix) are filled with fill. Thereafter, rows and columns of the matrices are sorted such that they are in the same order (by name). To complete rows of m1 relative to columns of m2, set the m2 argument to transpose_byname(m2).

Usage

complete_and_sort(
  a,
  b,  # optional
  fill = 0,
  margin = c(1, 2),
  roworder = NA,
  colorder = NA
)

Arguments

a
  The first matrix

b
  The second (optional) matrix.

fill
  rows and columns added to a and b will contain the value fill. (a double)

margin
  Specifies the dimension(s) of a and b over which completing and sorting will occur

roworder
  Specifies a custom ordering for rows of returned matrices. Unspecified rows are dropped.

colorder
  Specifies a custom ordering for columns of returned matrices. Unspecified columns are dropped.

Details

margin has nearly the same semantic meaning as in apply. For rows only, give 1; for columns only, give 2; for both rows and columns, give c(1, 2), the default value.

If only m1 is specified, rows of m1 are completed and sorted relative to columns of m1. If neither m1 nor m2 have dimnames, m1 and m2 are returned unmodified. If only one of m1 or m2 has dimnames, an error is thrown.

Value

A named list containing completed and sorted versions of a and b.
Examples

```r
m1 <- matrix(c(1:6), nrow=3, dimnames = list(c("r1", "r2", "r3"), c("c2", "c1")))
m2 <- matrix(c(7:12), ncol=3, dimnames = list(c("r3", "r4"), c("c2", "c3", "c4")))
complete_and_sort(m1)
complete_and_sort(m1, m2)
complete_and_sort(m1, m2, roworder = c("r3", "r2", "r1"))
complete_and_sort(m1, m2, colorder = c("c4", "c3"))  # Drops un-specified columns
complete_and_sort(m1, m2, margin = 1)
complete_and_sort(m1, m2, margin = 2)
complete_and_sort(m1, t(m2))
complete_and_sort(m1, t(m2), margin = 1)
complete_and_sort(m1, t(m2), margin = 2)
v <- matrix(1:6, ncol=2, dimnames=list(c("r3", "r1", "r2"), c("c2", "c1")))
complete_and_sort(v, v)
# Also works with lists
complete_and_sort(list(m1,m1), list(m2,m2))
```

---

**complete_rows_cols**

*Complete rows and columns in one matrix relative to another*

**Description**

"Completing" rows and columns means that \( a \) contains a union of rows and columns between \( a \) and \( m \), with missing data represented by the value for \( fill \) (0, by default).

**Usage**

```r
complete_rows_cols(a = NULL,
                   mat = NULL,
                   fill = 0,
                   fillrow = NULL,
                   fillcol = NULL,
                   margin = c(1, 2))
```

**Arguments**

- **a**: a matrix or list of matrices to be completed.
- **mat**: a matrix from which dimnames will be extracted for the purposes of completing \( a \) with respect to \( mat \).
- **fill**: rows and columns added to \( a \) will contain the value \( fill \). (Default is 0.)
- **fillrow**: a row vector of type matrix with same column names as \( a \). Any rows added to \( a \) will be \( fillrow \). If non-\( NULL \), \( fillrow \) takes precedence over both \( fillcol \) and \( fill \) in the case of conflicts.
**complete_rows_cols**

- **fillcol**: a column vector of type `matrix` with same row names as `a`. Any columns added to `a` will be `fillcol`. If non-NULL, `fillcol` takes precedence over `fill` in the case of conflicts.
- **margin**: specifies the subscript(s) in `a` over which completion will occur. `margin` has nearly the same semantic meaning as in `apply` For rows only, give 1; for columns only, give 2; for both rows and columns, give c(1, 2), the default value.

**Details**

Note that `complete_rows_cols(mat1, mat2)` and `complete_rows_cols(mat2, mat1)` are not guaranteed to have the same order for rows and columns. (Nor are the values in the matrix guaranteed to have the same positions.) If `dimnames(mat)` is NULL, `a` is returned unmodified. If either `a` or `matrix` are missing names on a margin (row or column), an error is given. Matrices can be completed relative to themselves, meaning that `a` will be made square, containing the union of row and column names from `a` itself. All added rows and columns will be created from one of the `fill*` arguments. When conflicts arise, precedence among the `fill*` arguments is `fillrow` then `fillcol` then `fill`. Self-completion occurs if `a` is non-NULL and both `is.null(matrix)` and `is.null(names)`. Under these conditions, no warning is given. If `is.null(names)` and `dimnames` of `matrix` cannot be determined (because, for example, `matrix` doesn’t have any dimnames), `a` is completed relative to itself and a warning is given.

**Value**

A modified version of `a` possibly containing additional rows and columns whose names are obtained from `matrix`.

**Examples**

```r
m1 <- matrix(c(1:6), nrow=3, dimnames = list(c("r1", "r2", "r3"), c("c1", "c2")))
m2 <- matrix(c(7:12), ncol=3, dimnames = list(c("r2", "r3"), c("c2", "c3", "c4")))
complete_rows_cols(m1, m2) # Adds empty column c4
complete_rows_cols(m1, t(m2)) # Creates r2, r3 columns; c2, c3, c4 rows
complete_rows_cols(m1, m2, margin = 1) # No changes because r2 and r3 already present in m1
complete_rows_cols(m1, m2, margin = 2) # Adds empty columns c3 and c4
complete_rows_cols(m1, t(m2), margin = 1) # Adds empty rows c2, c3, c4
complete_rows_cols(m1, m2, fill = 100) # Adds columns c3 and c4 with 100's
complete_rows_cols(m1, t(m1)) # Adds empty c1, c2 rows; Adds empty r1, r2, r3 columns
# Same as previous. With missing matrix, complete relative to transpose of m1.
complete_rows_cols(m1)
# Adds rows r10, r11; cols c10, c11
complete_rows_cols(m1, matrix(0, nrow = 2, ncol = 2,
                         dimnames = list(c("r10", "r11"), c("c10", "c11"))))
# Also works with lists
complete_rows_cols(a = list(m1,m1))
complete_rows_cols(a = list(m1,m1), mat = list(m2,m2))
# No changes because r2, r3 already present in m1
complete_rows_cols(a = list(m1,m1), mat = list(m2,m2), margin = 1)
complete_rows_cols(a = list(m1,m1), mat = list(m2,m2), margin = 2)
complete_rows_cols(a = list(m1,m1),
                   mat = make_list(matrix(0, nrow = 2, ncol = 2,
                                           dimnames = list(c("r1", "r2"), c("c1", "c2")))),
                   fillcol = list(c("r1", "r2"), c("c1", "c2")))
```

# fillrow or fillcol can be specified
a <- matrix(c(11, 12, 21, 22), byrow = TRUE, nrow = 2, ncol = 2, 
  dimnames = list(c("r1", "r2"), c("c1", "c2")))
b <- matrix(c(1:6), byrow = TRUE, nrow = 3, ncol = 2, 
  dimnames = list(c("r1", "r2", "r3"), c("c1", "c2")))
fillrow <- matrix(c(31, 32), byrow = TRUE, nrow = 1, ncol = 2, 
  dimnames = list("r42", c("c1", "c2")))

complete_rows_cols(a = a, mat = b, fillrow = fillrow)

---

**count_vals_byname**  
Count the number of matrix entries that meet a criterion

**Description**

Expressions can be written in a natural way such as `count_vals_byname(m,"<=",1)`.

**Usage**

```r
count_vals_byname(
  a,
  compare_fun = c("==", "!="", "<", "<="", ">", ">=""),
  val = 0
)
```

**Arguments**

- **a**  
a matrix or list of matrices whose values are to be counted according to `compare_fun`

- **compare_fun**  
the comparison function, one of ":==", ":!="", ":<", ":<="", ":>", ":">="". Default is ":==".

- **val**  
the value against which matrix entries are compared. Default is 0.

**Details**

Either a single matrix or a list of matrices can be given as the `a` argument. `compare_fun` can be specified as a string ("!=") or as a back-quoted function (`\'!\'`).

**Value**

an integer indicating the number of entries in `a` that meet the specified criterion
Examples

```r
m <- matrix(c(0, 1, 2, 3, 4, 0), nrow = 3, ncol = 2)
count_vals_byname(m) # uses defaults: compare_fun = "==" and val = 0
count_vals_byname(m, compare_fun = "!=")
count_vals_byname(m, compare_fun = `!=`) # Write expressions in a natural way
count_vals_byname(m, "<=", 1)
# Also works for lists
count_vals_byname(list(m, m), "<=", 1)
```

count_vals_incols_byname

`count_vals_incols_byname`  
Count the number of matrix entries in columns that meet a criterion

Description

Expressions can be written in a natural way such as `count_vals_incols_byname(m,"<=",1)`.

Usage

```r
count_vals_incols_byname(
  a,
  compare_fun = c("==", "!=", "<", "<=",">",">"),
  val = 0
)
```

Arguments

- `a`: a matrix or list of matrices whose values are to be counted by columns according to `compare_fun`
- `compare_fun`: the comparison function, one of "==", "!=", "<", "<=",">",">". Default is "=="
- `val`: the value against which matrix entries are compared. Default is 0.

Details

Either a single matrix or a list of matrices can be given as the `a` argument. `compare_fun` can be specified as a string ("!=") or as a back-quoted function (`!=`).

Value

A matrix with a single row indicating the number of entries in `a` that meet the specified criterion in each column of `a`
count_vals_inrows_byname

Count the number of matrix entries in rows that meet a criterion

Description

Expressions can be written in a natural way such as count_vals_inrows_byname(m,"<=",1).

Usage

count_vals_inrows_byname(
  a,
  compare_fun = c("==", "!=", "<", "<="", ">=", ">"),
  val = 0
)

Arguments

a  a matrix or list of matrices whose values are to be counted by rows according to compare_fun

compare_fun the comparison function, one of "==", "!=", "<", "<="", ">="", ">>". Default is "==".

val the value against which matrix entries are compared. Default is 0.

Details

Either a single matrix or a list of matrices can be given as the a argument. compare_fun can be specified as a string ("!=") or as a back-quoted function (\`!=`).

Value

an matrix with a single column indicating the number of entries in a that meet the specified criterion in each row of a
create_colvecbyname

Create column vectors from data

Description

This function takes data in the .dat and creates column vectors.

Usage

create_colvecbyname(.dat, dimnames = NA, colname = NA)

Arguments

.dat Data to be converted to column vectors.

dimnames The dimension names to be used for creating the column vector, in a list format, or as a data frame column containing a list of the dimension names to be used for each observation.

colname The name of the column of the colvector.

Details

The row and column names in the resulting column vector are taken from the names of .dat and colname. If set, dimnames overrides the names of .dat and colname.

This function is a "byname" function that can accept a single number, a vector, a list, or a data frame in .dat.

Row types and column types are taken from the row type and column type attributes of .dat.

Value

A column vector, a list of column vectors, or a data frame column of column vectors, depending on the value of .dat.

Examples

m <- matrix(c(0, 1, 2, 3, 4, 0), nrow = 3, ncol = 2)
count_vals_inrowsbyname(m) # uses defaults: compare_fun = "==" and val = 0
count_vals_inrowsbyname(m, compare_fun = "!=")
# Write expressions in a natural way
count_vals_inrowsbyname(m, "<=", 1)
# Also works for lists
count_vals_inrowsbyname(list(m,m), "<=", 1)
create_matrix_byname

Create a "byname" matrix from a vector

Description

This function creates a "byname" matrix, or list of matrices, from .dat, depending on the input arguments. This function is similar to matrix(), but with "byname" characteristics.

Usage

create_matrix_byname(.dat, nrow, ncol, byrow = FALSE, dimnames)

Arguments

.dat  The data to be used to create the matrix, in a list format, or as a data frame column containing a list of the data to be used for each observation.

nrow  The number of rows to be used to create the matrix, in a list format, or as a data frame column containing a list of the number of rows to be used for each observation.

ncol  The number of columns to be used to create the matrix, in a list format, or as a data frame column containing a list of the number of columns to be used for each observation.
create_rowvec_byname

byrow

The argument stating whether the matrix should be filled by rows or by columns (FALSE by column, TRUE by row), in a list format, or as a data frame column containing a list of the byrow argument for each observation. Default is FALSE.

dimnames

The dimension names to be used for creating the matrices, in a list format, or as a data frame column containing a list of the dimension names to be used for each observation.

Details

Row and column names are taken from the dimnames argument.

Any row or column type information on .dat is preserved on output.

Value

A matrix, list of matrices, or column in a data frame, depending on the input arguments.

Examples

```r
create_matrix_byname(c(1, 2), nrow = 2, ncol = 1, dimnames = list(c("r1", "r2"), "c1"))
create_matrix_byname(list(1, 2), nrow = list(1, 1), ncol = list(1,1), dimnames = list(list("r1", "c1"), list("R1", "C1")))
```

create_rowvec_byname

Create row vectors from data

Description

This function takes data in the .dat and creates row vectors.

Usage

```r
create_rowvec_byname(.dat, dimnames = NA, rowname = NA)
```

Arguments

- `.dat` Data to be converted to row vectors.
- `dimnames` The dimension names to be used for creating the row vector, in a list format, or as a data frame column containing a list of the dimension names to be used for each observation.
- `rowname` The name of the row of the row vector.

Details

The row and column names in the resulting row vector are taken from rowname and the names of .dat. If set, dimnames overrides rowname and the names of .dat.

Row types and column types are taken from the row type and column type attributes of .dat.

This function is a "byname" function that can accept a single number, a vector, a list, or a data frame in .dat.
Value

A row vector, a list of row vectors, or a data frame column of row vectors, depending on the value of `.dat`.

Examples

```r
# Works with single numbers
create_rowvec_byname(c(c1 = 1) %>% setrowtype("rt") %>% setcoltype("ct"), rowname = "r1")
# Works with vectors
create_rowvec_byname(c(c1 = 1, c2 = 2), rowname = "r1")
# Works with a list
create_rowvec_byname(list(c(c1 = 1, c2 = 2), c(C1 = 3, C2 = 4, C3 = 5)),
                      rowname = list("r1", "R1"))
# Works in a tibble, too.
# (Must be a tibble, not a data frame, so that names are preserved.)
dat <- list(c(c1 = 1),
            c(C1 = 2, C2 = 3),
            c(c1 = 1, c2 = 2, c3 = 3, c4 = 4, c5 = 5, c6 = 6))
rnms <- list("r1", "R1", "r1")
df1 <- tibble::tibble(dat, rnms)
df1
df1 <- df1 %>%
    dplyr::mutate(
        rowvec_col = create_rowvec_byname(dat, rowname = rnms)
    )
df1$rowvec_col[[1]]
df1$rowvec_col[[2]]
df1$rowvec_col[[3]]
```

cumapply_byname

Apply a function cumulatively to a list of matrices or numbers

Description

`FUN` must be a binary function that also accepts a single argument. The result is a list with first element `FUN(a[[1]])`. For `i >= 2`, elements are `FUN(a[[i]], out[[i-1]])`, where `out` is the result list.

Usage

cumapply_byname(FUN, a)

Arguments

- **FUN**
  - the function to be applied
- **a**
  - the list of matrices or numbers to which `FUN` will be applied cumulatively
Details
naryapply_byname() and cumapply_byname() are similar. Their differences can be described by considering a data frame. naryapply_byname() applies FUN to several columns (variables) of the data frame. For example, sum_byname() applied to several variables gives another column containing the sums across each row of the data frame. cumapply_byname() applies FUN to successive entries in a single column. For example sum_byname() applied to a single column gives the sum of all numbers in that column.

Value
a list of same length as a containing the cumulative application of FUN to a

Examples

cumapply_byname(sum, list(1, 2, 3, 4))
cumapply_byname(sum_byname, list(1, 2, 3, 4))
cumapply_byname(prod, list(1, 2, 3, 4))
cumapply_byname(hadamardproduct_byname, list(1, 2, 3, 4))

Description
Provides cumulative element-products along a list or column of a data frame. If a is a single number, a is returned. If a is a list of numbers, a list representing the cumulative product of the numbers is returned. If a is a single matrix, a is returned. If a is a list of matrices, a list representing the cumulative product of the matrices is returned. In this case, each entry in the returned list is product "by name," such that row and column names of the matrices are respected.

Usage
cumprod_byname(a)

Arguments
a
a number, list of numbers, matrix or list of matrices for which cumulative element product is desired

Details
This function respects groups if a is a variable in a data frame.

Value
a single number, list of numbers, a single matrix, or a list of matrices, depending on the nature of a
cumsum_byname

Examples

cumprod_byname(list(1, 2, 3, 4, 5))
m1 <- matrix(c(1), nrow = 1, ncol = 1, dimnames = list("r1", "c1")) %>%
  setrowtype("row") %>% setcoltype("col")
m2 <- matrix(c(2), nrow = 1, ncol = 1, dimnames = list("r2", "c2")) %>%
  setrowtype("row") %>% setcoltype("col")
m3 <- matrix(c(3), nrow = 1, ncol = 1, dimnames = list("r3", "c3")) %>%
  setrowtype("row") %>% setcoltype("col")
cumprod_byname(list(m1, m2, m3))

cumsum_byname  Cumulative sum that respects row and column names

Description

Provides cumulative sums along a list or column of a data frame. If a is a single number, a is
returned. If a is a list of numbers, a list representing the cumulative sum of the numbers is returned.
If a is a single matrix, a is returned. If a is a list of matrices, a list representing the cumulative sum
of the matrices is returned. In this case, each entry in the returned list is sum "by name," such that
row and column names of the matrices are respected.

Usage

cumsum_byname(a)

Arguments

a  a number, list of numbers, matrix or list of matrices for which cumulative sum
is desired

Details

If cumulative sums are desired in the context of a data frame, groups in the data frame are respected
if mutate is used. See examples.

Value

a single number, list of numbers, a single matrix, or a list of matrices, depending on the nature of a

Examples

library(dplyr)
library(tibble)
m1 <- matrix(c(1), nrow = 1, ncol = 1, dimnames = list("r1", "c1")) %>%
  setrowtype("row") %>% setcoltype("col")
m2 <- matrix(c(2), nrow = 1, ncol = 1, dimnames = list("r2", "c2")) %>%
  setrowtype("row") %>% setcoltype("col")
m3 <- matrix(c(3), nrow = 1, ncol = 1, dimnames = list("r3", "c3")) %>%
  setrowtype("row") %>% setcoltype("col")
difference_byname

```r
cumsum_byname(list(m1, m2, m3))
# Groups are respected in the context of mutate.
tibble(grp = c("A", "A", "B"), m = list(m1, m2, m3)) %>%
  group_by(grp) %>%
mutate(m2 = cumsum_byname(m))
```

difference_byname  
Name-wise subtraction of matrices

Description

Name-wise subtraction of matrices

Usage

```r
difference_byname(minuend, subtrahend)
```

Arguments

- `minuend`: matrix or constant
- `subtrahend`: matrix or constant

- Performs a union and sorting of row and column names prior to differencing.
  - Zeroes are inserted for missing matrix elements.

Value

A matrix representing the name-wise difference between `minuend` and `subtrahend`

Examples

```r
library(dplyr)
difference_byname(100, 50)
commoditynames <- c("c1", "c2")
industrynames <- c("i1", "i2")
U <- matrix(1:4, ncol = 2, dimnames = list(commoditynames, industrynames)) %>%
  setrowtype("Commodities") %>% setcoltype("Industries")
G <- matrix(rev(1:4), ncol = 2, dimnames = list(rev(commoditynames), rev(industry names))) %>%
  setrowtype("Commodities") %>% setcoltype("Industries")
U - G  # Non-sensical. Row and column names not respected.
difference_byname(U, G)  # Row and column names respected! Should be all zeroes.
difference_byname(100, U)
difference_byname(10, G)
difference_byname(G)  # When subtrahend is missing, return minuend (in this case, G).
difference_byname(subtrahend = G)  # When minuend is missing, return - subtrahend (in this case, -G)
# This also works with lists
difference_byname(list(100, 100), list(50, 50))
difference_byname(list(U, U), list(G, G))
DF <- data.frame(U = I(list()), G = I(list()))
DF[1,"U"] <- U
DF[2,"U"] <- U
```
DF[1,"G"] <- G
DF[2,"G"] <- G
difference_byname(DF$U, DF$G)
DF %>% mutate(diffs = difference_byname(U, G))

---

**elementapply_byname**  
*Apply a function to an element of a matrix specified by rows and columns*

**Description**

`FUN` is applied to the element of `a` that is specified by `row` and `col`.

**Usage**

```r
elementapply_byname(FUN, a, row, col, .FUNdots = NULL)
```

**Arguments**

- `FUN`  
  a unary function to be applied to specified rows and columns of `a`
- `a`  
  the argument to `FUN`
- `row`  
  the row name of the element to which `FUN` will be applied
- `col`  
  the column name of the element to which `FUN` will be applied
- `.FUNdots`  
  a list of additional arguments to `FUN`. (Default is `NULL`.)

**Details**

`row` and `col` can be any of row or column names or integer indices or a mix of both.

**Value**

`a`, after `FUN` has been applied to the element at `row` and `col`

**Examples**

```r
divide <- function(x, divisor){
  x/divisor
}
m <- matrix(c(1:4), nrow = 2, ncol = 2, dimnames = list(c("r1", "r2"), c("c1", "c2"))) %>%
  setrowtype("row") %>% setcoltype("col")

elementapply_byname(divide, a = m, row = 1, col = 1, .FUNdots = list(divisor = 2))

(elementapply_byname(divide, a = m, row = 1, col = 2, .FUNdots = list(divisor = 10))

(elementapply_byname(divide, a = m, row = "r2", col = "c2", .FUNdots = list(divisor = 100))
```
equalbyname

Compare two matrices "by name" for equality

Description
If operands are matrices, they are completed and sorted relative to one another prior to comparison.

Usage
equalbyname(...)  

Arguments
...
  operands to be compared  

Details
Comparisons are made by isTRUE(all.equal(a,b)) so that variations among numbers within the computational precision will still return TRUE.

If EXACT comparison is needed, use identicalbyname, which compares using identical(a,b).

Value
TRUE iff all information is equal, including row and column types and row and column names and entries in the matrices.

Examples
a <- matrix(1:4, nrow = 2)
b <- matrix(1:4, nrow = 2)
equalbyname(a, b)
equalbyname(a, b + 1e-100)
identicalbyname(a, b + 1e-100)
a <- a %>% setrowtype("Industries") %>% setcoltype("Commodities")
equalbyname(a, b) # FALSE because a has row and column types, but b does not.
b <- b %>% setrowtype("Industries") %>% setcoltype("Commodities")
equalbyname(a, b)
dimnames(a) <- list(c("i1", "i2"), c("c1", "c2"))
dimnames(b) <- list(c("c1", "c2"), c("i1", "i2"))
equalbyname(a, b) # FALSE, because row and column names are not equal
dimnames(b) <- dimnames(a)
equalbyname(a, b)
**exp_byname**  
*Exponential of matrix elements*

**Description**  
Gives the exponential of all elements of a matrix or list of matrices.

**Usage**  
```
exp_byname(a)
```

**Arguments**  
- `a`  
  a matrix of list of matrices

**Value**  
`M` with each element replaced by its exponential.

**Examples**  
```
exp_byname(1)

m <- matrix(c(log(10), log(1), log(1), log(100)),
            nrow = 2, dimnames = list(paste0("i", 1:2),
                                    paste0("c", 1:2)))
  %>%
  setrowtype("Industry")
  %>%
  setcoltype("Commodity")
exp_byname(m)
```

**fractionize_byname**  
*Compute fractions of matrix entries*

**Description**  
This function divides all entries in `a` by the specified sum, thereby "fractionizing" the matrix.

**Usage**  
```
fractionize_byname(a, margin)
```

**Arguments**  
- `a`  
  the matrix to be fractionized
- `margin`  
  If 1 (rows), each entry in `a` is divided by its row’s sum. If 2 (columns), each entry in `a` is divided by its column’s sum. If c(1, 2) (both rows and columns), each entry in `a` is divided by the sum of all entries in `a`. 
Value

a fractionized matrix of same dimensions and same row and column types as a.

Examples

```r
M <- matrix(c(1, 5,
              4, 5),
            nrow = 2, ncol = 2, byrow = TRUE,
            dimnames = list(c("p1", "p2"), c("i1", "i2"))) %>%
            setcoltype("Products") %>% setrownames("Industries")
fractionize_byname(M, margin = c(1,2))
fractionize_byname(M, margin = 1)
fractionize_byname(M, margin = 2)
```

Description

Gives the geometric mean of corresponding entries of a and b.

Usage

```r
geometricmean_byname(...)```

Arguments

... operands; constants, matrices, or lists of matrices

Details

This function performs a union and sorting of row and column names prior to performing geometric mean. Zeroes are inserted for missing matrix elements.

Value

name-wise geometric mean of operands

Examples

```r
library(dplyr)
geometricmean_byname(10, 1000)
geometricmean_byname(10, 1000, 100000)
commoditynames <- c("c1", "c2")
industrynames <- c("i1")
U <- matrix(c(10, 1000), ncol = 1, nrow = 2, dimnames = list(commoditynames, industrynames)) %>%
            setrownames("Commodities") %>% setcoltype("Industries")
G <- matrix(c(1e3, 1e5), ncol = 1, nrow = 2,
            dimnames = list(rev(commoditynames), rev(industrynames))) %>%
            setrownames("Industries") %>% setcoltype("Commodities")
```

```r
 library(dplyr)
 geometricmean_byname(10, 1000)
 geometricmean_byname(10, 1000, 100000)
 commoditynames <- c("c1", "c2")
 industrynames <- c("i1")
 U <- matrix(c(10, 1000), ncol = 1, nrow = 2, dimnames = list(commoditynames, industrynames)) %>%
     setrownames("Commodities") %>% setcoltype("Industries")
 G <- matrix(c(1e3, 1e5), ncol = 1, nrow = 2, 
            dimnames = list(rev(commoditynames), rev(industrynames))) %>%
     setrownames("Industries") %>% setcoltype("Commodities")
```
setrowtype("Commodities") %>% setcoltype("Industries")
# Non-sensical. Row and column names not respected.
sqrt(U*G)
# Row and column names respected!
geometricmean_byname(U, G)
geometricmean_byname(1000, U)
geometricmean_byname(10, G)
# This also works with lists
geometricmean_byname(list(10, 1000), list(1000, 10))
geometricmean_byname(list(U,U), list(G,G))
DF <- data.frame(U = I(list()), G = I(list()))
DF[1,"U"] <- U
DF[2,"U"] <- U
DF[1,"G"] <- G
DF[2,"G"] <- G
geometricmean_byname(DF$U, DF$G)
DF %>% mutate(geomeans = geometricmean_byname(U, G))

getcolnames_byname

---

**Description**

Gets column names in a way that is amenable to use in chaining operations in a functional programming way.

**Usage**

```r
getcolnames_byname(a)
```

**Arguments**

- `a`: The matrix or data frame from which column names are to be retrieved.

**Value**

Column names of `m`.

**Examples**

```r
m <- matrix(c(1:6), nrow = 2, dimnames = list(paste0("i", 1:2), paste0("c", 1:3))) %>%
  setrowtype("Industries") %>% setcoltype("Commodities")
getcolnames_byname(m)
# This also works for lists
getcolnames_byname(list(m,m))
DF <- data.frame(m = I(list())))
DF[1,"m"] <- m
DF[2,"m"] <- m
getcolnames_byname(DF$m)
```
getrownames_byname

**Description**

Gets row names in a way that is amenable to use in chaining operations in a functional programming way.

**Usage**

`getrownames_byname(a)`

**Arguments**

- `a` The matrix or data frame on which row names are to be retrieved.

**Value**

Row names of `a`.

**Examples**

```r
m <- matrix(c(1:6), nrow = 2, dimnames = list(paste0("i", 1:2), paste0("c", 1:3))) %>%
  setrowtype("Industries") %>% setcoltype("Commodities")
getrownames_byname(m)
# This also works for lists
getrownames_byname(list(m,m))
DF <- data.frame(m = l(list()))
DF[[1,"m"]]<- m
DF[[2,"m"]]<- m
getrownames_byname(DF$m)
```

hadamardproduct_byname

**Name-wise matrix Hadamard multiplication**

**Description**

Performs a union and sorting of names of rows and columns for both multiplicand and multiplier for each sequential multiplication step. Zeroes are inserted for missing matrix elements. Doing so ensures that the dimensions of the multiplicand and multiplier are be conformable for each sequential multiplication.

**Usage**

`hadamardproduct_byname(...)"
Arguments

... operands; constants, matrices, or lists of matrices

Details

The Hadamard product is also known as the entrywise product.

Value

name-wise element product of operands

Examples

```r
library(dplyr)
hadamardproduct_byname(2, 2)
commoditynames <- c("c1", "c2")
industrynames <- c("i1", "i2")
U <- matrix(1:4, ncol = 2, dimnames = list(commoditynames, industrynames)) %>%
  setrowtype("Commodities") %>% setcoltype("Industries")
G <- matrix(1:4, ncol = 2, dimnames = list(rev(commoditynames), rev(industrynames))) %>%
  setrowtype("Commodities") %>% setcoltype("Industries")
U * G # Not what is desired, because names aren't aligned
hadamardproduct_byname(U, G)
hadamardproduct_byname(U, G, G)
hadamardproduct_byname(U, 0)
hadamardproduct_byname(0, G)
# This also works with lists
hadamardproduct_byname(list(U, U), list(G, G))
DF <- data.frame(U = I(list()), G = I(list()))
DF[[1,"U"]] <- U
DF[[2,"U"]] <- U
DF[[1,"G"]] <- G
DF[[2,"G"]] <- G
hadamardproduct_byname(DF$U, DF$G)
DF %>% mutate(entrywiseprods = hadamardproduct_byname(U, G))
```

Description

When dividing rows or columns of a matrix by elements of a vector, the vector elements are placed on the diagonal of a new matrix, the diagonal matrix is inverted, and the result is pre- or post-multiplied into the matrix. This function performs the hatizing and inverting of vector v in one step and takes advantage of computational efficiencies to achieve the desired result. The computational shortcut is apparent when one observes that the matrix produced by hatizing and inverting a vector is a diagonal matrix whose non-zero elements are the numerical inverses of the individual elements of v. So this function first inverts each element of v then places the inverted elements on the diagonal of a diagonal matrix.
### Usage

```r
datinv_byname(v, inf_becomes = .Machine$double.xmax)
```

### Arguments

- **v**: the vector to be hatized and inverted
- **inf_becomes**: a value to be substitute for any Inf produced by the inversion process. Default is .Machine$double.xmax. If FALSE (the default), Inf is not handled differently. If TRUE, Inf values in the resulting matrix are converted to zeroes.

### Details

Note that this function gives the same result as `invert_byname(hatize_byname(v))`, except that `invert_byname(hatize_byname(v))` fails due to a singular matrix error when any of the elements of `v` are zero. This function will give `inf_becomes` on the diagonal of the result for each zero element of `v`, arguably a better answer. The sign of Inf is preserved in the substitution. The default value of `inf_becomes` is .Machine$double.xmax. Set `inf_becomes` to NULL to disable this behavior.

The default behavior is helpful for cases when the result of `hatinv_byname` is later multiplied by 0 to obtain 0. Multiplying Inf by 0 gives NaN which would effectively end the stream of calculations.

### Value

a square diagonal matrix with inverted elements of `v` on the diagonal

### Examples

```r
v <- matrix(1:10, ncol = 1, dimnames = list(c(paste0("i", 1:10)), c("c1"))) %>%
  setrowtype("Industries") %>%
  setcoltype(NA)
hatinv_byname(v)
hatinv_byname(r)
# This function also works with lists.
hatinv_byname(list(v, v))
# Watch out for 0 values
v2 <- matrix(0:1, ncol = 1, dimnames = list(c(paste0("i", 0:1)), c("p1"))) %>%
  setrowtype("Industries") %>%
  setcoltype(NA)
# Produces singular matrix error
## Not run: v2 %>% hatize_byname() %>% invert_byname
# Handles 0 values well
hatinv_byname(v2)
hatinv_byname(v2, inf_becomes = 42)
hatinv_byname(v2, inf_becomes = NULL)
```
hatize_byname

*Create a diagonal “hat” matrix from a vector*

**Description**

A "hat" matrix is one in which the only non-zero elements are stored on the diagonal. To "hatize" a vector is to place its elements on the diagonal of an otherwise-zero square matrix. \( v \) must be a matrix object with one of its two dimensions of length 1 (i.e., a vector). The names of both dimensions of the hatized matrix are the same and taken from \( v \). Note that the vector names are sorted prior to forming the "hat" matrix.

**Usage**

```
hatize_byname(v)
```

**Arguments**

\( v \)  
The vector from which a "hat" matrix is to be created.

**Value**

A square "hat" matrix with size equal to the length of \( v \).

**Examples**

```
v <- matrix(1:10, ncol = 1, dimnames = list(c(paste0("i", 1:10)), c("c1"))) %>%
  setrowtype("Industries") %>%
  setcoltype(NA)
hatize_byname(v)

r <- matrix(1:5, nrow = 1, dimnames = list(c("r1"), c(paste0("c", 1:5)))) %>
  setrowtype(NA) %>%
  setcoltype("Commodities")
hatize_byname(r)

# This also works with lists.
hatize_byname(list(v, v))

# A 1x1 column vector is a degenerate case.
# Row names and rowtype are transferred to the column.
matrix(42, nrow = 1, ncol = 1, dimnames = list("r1")) %>%
  setrowtype("Product -> Industry") %>%
  hatize_byname()

# A 1x1 row vector is a degenerate case.
# Column names and coltype are transferred to the row.
matrix(42, nrow = 1, ncol = 1, dimnames = list(NULL, "c1")) %>%
  setcoltype("Industry -> Product") %>%
  hatize_byname()

# A 1x1 matrix with both row and column names generates a failure.
## Not run:
matrix(42, nrow = 1, ncol = 1, dimnames = list("r1", "c1")) %>%
  setrowtype("Product -> Industry") %>%
  setcoltype("Industry -> Product") %>%
  hatize_byname()
```
identical_byname

Compare two matrices "by name" for exact equality

Description

If operands are matrices, they are completed and sorted relative to one another prior to comparison.

Usage

identical_byname(...)

Arguments

... operand to be compared

Details

Comparisons are made by identical(a,b) so that variations among numbers within the computational precision will return FALSE.

If fuzzy comparison is needed, use equal_byname, which compares using isTRUE(all.equal(a,b)).

Value

TRUE iff all information is identical, including row and column types and row and column names and entries in the matrices.

Examples

a <- matrix(1:4, nrow = 2)
b <- matrix(1:4, nrow = 2)
identical_byname(a, b)
identical_byname(a, b + 1e-100)
a <- a>%>%setrownames("Industries")%>%setcolnames("Commodities")
identical_byname(a, b) # FALSE because a has row and column types, but b does not.
b <- b>%>%setrownames("Industries")%>%setcolnames("Commodities")
identical_byname(a, b)
dimnames(a) <- list(c("i1", "i2"), c("c1", "c2"))
dimnames(b) <- list(c("c1", "c2"), c("i1", "i2"))
identical_byname(a, b) # FALSE, because row and column names are not equal
dimnames(b) <- dimnames(a)
identical_byname(a, b)
identize_byname  

Named identity matrix or vector

**Description**

Creates an identity matrix ($I$) or vector ($i$) of same size and with same names and same row and column types as `a`.

**Usage**

identize_byname(a, margin = c(1, 2))

**Arguments**

- **a**
  - the matrix whose names and dimensions are to be preserved in an identity matrix or vector

- **margin**
  - determines whether an identity vector or matrix is returned. See details.

**Details**

Behaviour for different values of `margin` are as follows:

- If `margin = 1`, makes a column matrix filled with 1s. Row names and type are taken from row names and type of `a`. Column name and type are same as column type of `a`.
- If `margin = 2`, make a row matrix filled with 1s. Column names and type are taken from column name and type of `a`. Row name and type are same as row type of `a`.
- If `list(c(1,2))` (the default), make an identity matrix with 1s on the diagonal. Row and column names are sorted on output.

**Value**

An identity matrix or vector.

**Examples**

```r
M <- matrix(1:16, ncol = 4, dimnames=list(c(paste0("i", 1:4)), paste0("c", 1:4))) %>%
  setrowtype("Industries") %>%
  setcoltype("Commodities")
identize_byname(M)
identize_byname(M, margin = c(1,2))
identize_byname(M, margin = 1)
identize_byname(M, margin = 2)
N <- matrix(c(-21, -12, -21, -10), ncol = 2, dimnames = list(c("b", "a"), c("b", "a"))) %>%
  setrowtype("Industries") %>%
  setcoltype("Commodities")
identize_byname(N)
# This also works with lists
identize_byname(list(M, M))
```
Iminus_byname

Subtract a matrix with named rows and columns from a suitably named and sized identity matrix (I)

Description

The order of rows and columns of m may change before subtracting from I, because the rows and columns are sorted by name prior to subtracting from I. Furthermore, if m is not square, it will be made square before subtracting from I by calling complete_and_sort.

Usage

Iminus_byname(a)

Arguments

a  
the matrix to be subtracted from I

Value

The difference between an identity matrix (I) and m (whose rows and columns have been completed and sorted)

Examples

```r
m <- matrix(c(-21, -12, -21, -10), ncol = 2, dimnames = list(c("b", "a"), c("b", "a"))) %>%
  setrowtype("Industries") %>%
  setcoltype("Commodities")
# Rows and columns are unsorted
diag(1, nrow = 2) - m
# Rows and columns are sorted prior to subtracting from the identity matrix
Iminus_byname(m)
# This also works with lists
Iminus_byname(list(m, m))
# If the m is not square before subtracting from I,
# it will be made square by the function complete_and_sort.
m2 <- matrix(c(1,2,3,4,5,6), ncol = 2, dimnames = list(c("a", "b", "c"), c("a", "b"))) %>%
  setrowtype("Industries") %>%
  setcoltype("Commodities")
Iminus_byname(m2)
```

invert_byname

Invert a matrix

Description

This function transposes row and column names as well as row and column types. Rows and columns of a are sorted prior to inverting.
**Usage**

\[ \text{invert}_byname(a) \]

**Arguments**

- \( a \) : the matrix to be inverted. \( a \) must be square.

**Value**

the inversion of \( a \)

**Examples**

\[
\begin{align*}
  m & \leftarrow \text{matrix}(c(10,0,0,100), \text{nrow} = 2, \text{dimnames} = \text{list}(\text{paste0}("i", 1:2), \text{paste0}("c", 1:2))) \%>\% \\
  & \text{setrowtype}(\text{"Industry"}) \%>\% \text{setcoltype}(\text{"Commodity"}) \\
  \text{invert}_byname(m) \\
  \text{matrixproduct}_byname(m, \text{invert}_byname(m)) \\
  \text{matrixproduct}_byname(\text{invert}_byname(m), m) \\
  \text{invert}_byname(\text{list}(m, m))
\end{align*}
\]

---

**iszero_byname**

*Test whether this is the zero matrix*

**Description**

Note that this function tests whether the elements of \( \text{abs}(a) \) are \( \leq \text{tol} \). So, you can set \( \text{tol} = 0 \) to discover if \( a \) is EXACTLY the zero matrix.

**Usage**

\[ \text{iszero}_byname(a, \text{tol} = 1e-06) \]

**Arguments**

- \( a \) : a matrix of list of matrices
- \( \text{tol} \) : the allowable deviation from 0 for any element

**Value**

TRUE iff this is the zero matrix within \( \text{tol} \).
Examples

```r
zero <- matrix(0, nrow = 50, ncol = 50)
iszero_byname(zero)
nonzero <- matrix(1:4, nrow = 2)
iszero_byname(nonzero)
# Also works for lists
iszero_byname(list(zero, nonzero))
# And it works for data frames
DF <- data.frame(A = I(list()), B = I(list()))
DF[1,"A"] <- zero
DF[2,"A"] <- nonzero
DF[1,"B"] <- nonzero
DF[2,"B"] <- zero
iszero_byname(DF$A)
iszero_byname(DF$B)
iszero_byname(matrix(1e-10, nrow = 2))
iszero_byname(matrix(1e-10, nrow = 2), tol = 1e-11)
```

---

**kvec_from_template_byname**

Create a constant vector from matrix a

---

**Description**

This function creates a vector using a as a template and k as its value. Row names are taken from the row names of a. The column name is given by colname. Row and column types are transferred from a to the output, directly.

**Usage**

```r
kvec_from_template_byname(a, k = 1, colname = NA, column = TRUE)
```

**Arguments**

- `a` The template matrix for the column vector.
- `k` The value of the entries in the vector.
- `colname` The name of the output vector’s 1-sized dimension (the only column if column == TRUE, the only row otherwise).
- `column` Tells whether a column vector (TRUE, the default) or a row vector (FALSE) should be created.

**Details**

If column == FALSE, colname is interpreted as the row name for the output row identity vector.

**Value**

A vector vector formed from a.
Examples

kvec_from_template_byname(matrix(42, nrow = 4, ncol = 2,
    dimnames = list(c("r1", "r2", "r3", "r4"), c("c1", "c2")),
    colname = "c1")

list_of_rows_or_cols   Named list of rows or columns of matrices

Description

This function takes matrix m and converts it to a list of single-row (if margin == 1) or single-
column (if margin == 2) matrices. Each item in the list is named for its row (if margin == 1) or
column (if margin == 2).

Usage

list_of_rows_or_cols(a, margin)

Arguments

a        a matrix or list of matrices (say, from a column of a data frame)
margin   the margin of the matrices to be extracted (1 for rows, 2 for columns)

Details

Note that the result provides column vectors, regardless of the value of margin.

Value

a a named list of rows or columns extracted from m

Examples

m <- matrix(data = c(1:6),
    nrow = 2, ncol = 3,
    dimnames = list(c("p1", "p2"), c("i1", "i2", "i3"))) %>
    setrowtype(rowtype = "Products") %>%
    setcoltype(coltype = "Industries")
list_of_rows_or_cols(m, margin = 1)
list_of_rows_or_cols(m, margin = 2)
logarithmicmean_byname

Name- and element-wise logarithmic mean of matrices

Description
The logarithmic mean of corresponding entries of \( a \) and \( b \) is \( 0 \) if \( a = 0 \) or \( b = 0 \), \( a \) if \( a = b \), or \( \frac{(b-a)}{(\log(b) - \log(a))} \) otherwise.

Usage
logarithmicmean_byname(a, b, base = exp(1))

Arguments
- **a**: first operand (a matrix or constant value or lists of same).
- **b**: second operand (a matrix or constant value or lists of same).
- **base**: the base of the logarithm used when computing the logarithmic mean. (Default is base = exp(1).)

Details
This function performs a union and sorting of row and column names prior to performing logarithmic mean. Zeroes are inserted for missing matrix elements.

Internally, the third condition is implemented as \( \frac{(b-a)}{\log(b/a)} \).

Note that \( (b-a)/log(b/a) = (a-b)/log(a/b) \), so logarithmic mean is commutative; the order of arguments \( a \) and \( b \) does not change the result.

Value
A matrix representing the name-wise logarithmic mean of \( a \) and \( b \).

Examples
library(dplyr)
m1 <- matrix(c(1:6), nrow = 3, ncol = 2) %>%
  setrownames_byname(c("r1", "r2", "r3")) %>%
  setcolnames_byname(c("c1", "c2")) %>%
  setrowtype("row") %>%
  setcoltype("col")
m2 <- matrix(c(7:12), nrow = 3, ncol = 2) %>%
  setrownames_byname(c("r2", "r3", "r4")) %>%
  setcolnames_byname(c("c2", "c3")) %>%
  setrowtype("row") %>%
  setcoltype("col")
logarithmicmean_byname(m1, m2)
# This also works with lists
logarithmicmean_byname(list(m1, m1), list(m2, m2))
DF <- data.frame(m1 = I(list()), m2 = I(list()))
DF[1,"m1"] <- m1
DF[2,"m1"] <- m1
logmean

*Logarithmic mean of two numbers*

**Description**

Calculates the logarithmic mean of two numbers.

**Usage**

```
logmean(a, b, base = exp(1))
```

**Arguments**

- `a` the first operand (must be non-negative)
- `b` the second operand (must be non-negative)
- `base` the base of the logarithm used in this calculation. (Default is `exp(1)`.)

**Details**

This is an internal helper function for `logarithmicmean_byname`.

**Value**

0 if `a = 0` or `b = 0`; x1 if `a == b`; and \((a - b) / \log(a/b, base = base)\) for all other values of `a` and `b`

**Examples**

```r
matsbyname:::logmean(0, 0) # 0
matsbyname:::logmean(0, 1) # 0
matsbyname:::logmean(1, 0) # 0
matsbyname:::logmean(1, 1) # 1
matsbyname:::logmean(2, 1)
```

matsbyname:::logmean(1, 2) # commutative

matsbyname:::logmean(1, 10) # base = exp(1), the default

matsbyname:::logmean(1, 10, base = 10)
logbyname

---

**Description**

Specify the base of the log with base argument.

**Usage**

```r
logbyname(a, base = exp(1))
```

**Arguments**

- `a`: a matrix or list of matrices
- `base`: the base of the logarithm (default is \(\exp(1)\), giving the natural logarithm)

**Value**

M with each element replaced by its base base logarithm

**Examples**

```r
c <- c(10, 1, 100)
logbyname(c(1, 2, 3))
logbyname(c(1, 2, 3), base = 10)
```

---

make_list

---

**Description**

Repeats x as necessary to make n of them. Does not try to simplify x.

**Usage**

```r
make_list(x, n, lenx = ifelse(is.vector(x), length(x), 1))
```

**Arguments**

- `x`: the object to be duplicated
- `n`: the number of times to be duplicated
- `lenx`: the length of item x. Normally lenx is taken to be length(x), but if x is itself a list, you may wish for the list to be duplicated several times. In that case, set lenx = 1.
Value

a list of x duplicated n times

Examples

```r
m <- matrix(c(1:6), nrow=3, dimnames = list(c("r1", "r2", "r3"), c("c2", "c1")))
make_list(m, n = 1)
make_list(m, n = 2)
make_list(m, n = 5)
make_list(list(c(1,2), c(1,2)), n = 4)

m <- matrix(1:4, nrow = 2)
l <- list(m, m+100)
make_list(l, n = 4)
make_list(l, n = 1) # Warning because l is trimmed.
make_list(l, n = 5) # Warning because length(l) (i.e., 2) not evenly divisible by 5
make_list(list(c("r10", "r11"), c("c10", "c11")), n = 2) # Confused by x being a list
make_list(list(c("r10", "r11"), c("c10", "c11")), n = 2, lenx = 1) # Fix by setting lenx = 1
```

make_pattern

Create regex patterns for row and column selection by name

Description

This function is intended for use with the select_rows_byname and select_cols_byname functions. make_pattern correctly escapes special characters in row_col_names, such as ( and ), as needed. Thus, it is highly recommended that make_pattern be used when constructing patterns for row and column selections with select_rows_byname and select_cols_byname.

Usage

```r
make_pattern(
  row_col_names,
  pattern_type = c("exact", "leading", "trailing", "anywhere")
)
```

Arguments

- `row_col_names` a vector of row and column names
- `pattern_type` one of exact, leading, trailing, or anywhere. Default is "exact".

Details

pattern_type controls the type of pattern created:

- exact produces a pattern that selects row or column names by exact match.
- leading produces a pattern that selects row or column names if the item in row_col_names matches the beginnings of row or column names.
• trailing produces a pattern that selects row or column names if the item in row_col_names matches the ends of row or column names.
• anywhere produces a pattern that selects row or column names if the item in row_col_names matches any substring of row or column names.

Value
an extended regex pattern suitable for use with select_rows_byname or select_cols_byname.

Examples
make_pattern(row_col_names = c("a", "b"), pattern_type = "exact")

Description
Converts a vector with rows or columns named according to notation into a matrix.

Usage
matricize_byname(a, notation)

Arguments
a a row (column) vector to be converted to a matrix based on its row (column) names.
notation a string vector created by notation_vec() that identifies the notation for row or column names.

Value
a matrix created from vector a.

Examples
v <- matrix(c(1,
  2,
  3,
  4),
  nrow = 4, ncol = 1, dimnames = list(c("p1 -> i1",
"p2 -> i1",
"p1 -> i2",
"p2 -> i2"),
setrowtype("Products -> Industries")
# Default separator is " -> ".
matricize_byname(v, notation = arrow_notation())
matrixproduct_byname  Name-wise matrix multiplication

Description

Name-wise matrix multiplication

Usage

matrixproduct_byname(...)  

Arguments

...  

operands; constants, matrices, or lists of matrices

Multiplies operands from left to right. Performs a union and sorting of multiplicand rows and multiplier columns by name prior to multiplication. Zeroes are inserted for missing matrix elements. Doing so ensures that the dimensions of multiplicand and multiplier matrices will be conformable. I.e., the number of columns in multiplicand will equal the number of rows in multiplier, so long as the column names of multiplicand are unique and the row names of multiplier are unique. If column type of the multiplicand is not same as row type of the multiplier on any step of the multiplication, the function will fail. The result is matrix product with row names from the first multiplicand and column names from the last multiplier.

Value

A matrix representing the name-wise product of operands

Examples

library(dplyr)
V <- matrix(1:6, ncol = 3, dimnames = list(c("i1", "i2"), c("c1", "c2", "c3"))) %>%
  setrowtype("Industries") %>% setcoltype("Commodities")
G <- matrix(1:4, ncol = 2, dimnames = list(c("c2", "c1"), c("i2", "i1"))) %>%
  setrowtype("Commodities") %>% setcoltype("Industries")
Z <- matrix(11:14, ncol = 2, dimnames = list(c("i1", "i2"), c("s1", "s2"))) %>%
  setrowtype("Industries") %>% setcoltype("Sectors")
# Succeeds because G is completed to include a row named c3 (that contains zeroes).
matrixproduct_byname(V, G)
## Not run: V %*% G  # Fails because E lacks a row named c3.
matrixproduct_byname(V, G, Z)
# This also works with lists
matrixproduct_byname(list(V,V), list(G,G))
DF <- data.frame(V = I(list()), G = I(list()))
DF[1,"V"] <- V
DF[2,"V"] <- V
DF[1,"G"] <- G
DF[2,"G"] <- G
**mean_byname**

Name- and element-wise arithmetic mean of matrices

**Description**

Gives the arithmetic mean of operands in ....

**Usage**

```r
mean_byname(...)```

**Arguments**

```r
...      operands: constants, matrices, or lists of matrices
```

**Details**

This function performs a union and sorting of row and column names prior to performing arithmetic mean. Zeroes are inserted for missing matrix elements.

**Value**

name-wise arithmetic mean of operands.

**Examples**

```r
library(dplyr)
mean_byname(100, 50)
mean_byname(10, 20, 30)
commoditynames <- c("c1", "c2")
industrynames <- c("i1", "i2")
U <- matrix(1:4, ncol = 2, dimnames = list(commoditynames, industrynames)) %>%
  setrowtype("Commodities") %>% setcoltype("Industries")
G <- matrix(rev(1:4), ncol = 2, dimnames = list(rev(commoditynames), rev(industrynames))) %>%
  setrowtype("Commodities") %>% setcoltype("Industries")
(U + G) / 2 # Non-sensical. Row and column names not respected.
mean_byname(U, G) # Row and column names respected! Should be 1, 2, 3, and 4.
mean_byname(U, G, G)
mean_byname(100, U)
mean_byname(100, 50, U)
mean_byname(10, G)
# This also works with lists
mean_byname(list(100, 100), list(50, 50))
mean_byname(list(U,U), list(G,G))
DF <- data.frame(U = I(list()), G = I(list()))
DF[[1,"U"]] <- U
DF[[2,"U"]] <- U
```
naryapplylogical_byname

Apply a function logically to numbers, matrices, or lists of numbers or matrices

Description

Operands should be logical, although numerical operands are accepted. Numerical operands are interpreted as 0 is FALSE, and any other number is TRUE.

Usage

naryapplylogical_byname(
  FUN,
  ..., 
  .FUNdots = NULL,
  match_type = c("all", "matmult", "none"),
  set_rowcoltypes = TRUE,
  .organize = TRUE
)

Arguments

- **FUN**: a binary function (that returns logical values) to be applied over operands
- **...**: operands; constants, matrices, or lists of matrices
- **.FUNdots**: a list of additional named arguments passed to FUN.
- **match_type**: one of "all", "matmult", or "none". When ... are matrices, "all" (the default) indicates that rowtypes of all ... matrices must match and coltypes of all ... matrices must match. If "matmult", the coltype of the first operand must match the rowtype of the second operand for every sequential invocation of FUN. If "none", neither coltypes nor rowtypes are checked by naryapply_byname().
- **set_rowcoltypes**: tells whether to apply row and column types from operands in ... to the output of each sequential invocation of FUN. Set TRUE (the default) to apply row and column types. Set FALSE, to not apply row and column types to the output.
- **.organize**: a boolean that tells whether or not to automatically complete operands in ... relative to each other and sort the rows and columns of the completed matrices. This organizing is done on each sequential invocation of FUN. Normally, this should be TRUE (the default). However, if FUN takes over this responsibility, set to FALSE.
**naryapply_byname**

**Details**

This function is not exported, thereby retaining the right to future changes.

**Value**

the result of `FUN` applied logically to ...

**Examples**

```r
matsbyname:::naryapplylogical_byname("&", TRUE, TRUE, TRUE)
matsbyname:::naryapplylogical_byname("&", TRUE, TRUE, FALSE)
```

**Description**

Applies `FUN` to all operands in .... Other arguments have similar meaning as `binaryapply_byname()`.

See details for more information.

**Usage**

```r
naryapply_byname(
  FUN,
  ..., .FUNdots = NULL,
  match_type = c("all", "matmult", "none"),
  set_rowcoltypes = TRUE,
  .organize = TRUE
)
```

**Arguments**

- `FUN` a binary function to be applied "by name" to all operands in ....
- `...` the operands for `FUN`.
- `.FUNdots` a list of additional named arguments passed to `FUN`.
- `match_type` one of "all", "matmult", or "none". When ... are matrices, "all" (the default) indicates that rowtypes of all ... matrices must match and coltypes of all ... matrices must match. If "matmult", the coltype of the first operand must match the rowtype of the second operand for every sequential invocation of `FUN`. If "none", neither coltypes nor rowtypes are checked by `naryapply_byname()`.
- `set_rowcoltypes` tells whether to apply row and column types from operands in ... to the output of each sequential invocation of `FUN`. Set `TRUE` (the default) to apply row and column types. Set `FALSE`, to not apply row and column types to the output.
.organize a boolean that tells whether or not to automatically complete operands in ... relative to each other and sort the rows and columns of the completed matrices. This organizing is done on each sequential invocation of FUN. Normally, this should be TRUE (the default). However, if FUN takes over this responsibility, set to FALSE.

Details

If only one ... argument is supplied, FUN must be capable of handling one argument, and the call is routed to unaryapply_byname(). When set_rowcoltypes is TRUE, the rowcoltypes argument of unaryapply_byname() is set to "all", but when set_rowcoltypes is FALSE, the rowcoltypes argument of unaryapply_byname() is set to "none". If finer control is desired, the caller should use unaryapply_byname() directly. If more than one argument is passed in ..., FUN must be a binary function, but its use in by napply_byname() is "n-ary." Arguments match_type, set_rowcoltypes, and .organize have same meaning as for binaryapply_byname(). Thus, all of the operands in ... must obey the rules of type matching when match_type is TRUE.

napply_byname() and cumapply_byname() are similar. Their differences can be described by considering a data frame. napply_byname() applies FUN to several columns (variables) of the data frame. For example, sum_byname() applied to several variables gives another column containing the sums across each row of the data frame. cumapply_byname() applies FUN to successive entries in a single column. For example sum_byname() applied to a single column gives the sum of all numbers in that column.

Value

the result of applying FUN to all operands in ...

Examples

napply_byname(FUN = sum_byname, 2, 3)
napply_byname(FUN = sum_byname, 2, 3, 4, -4, -3, -2)
# Routes to unaryapply_byname
napply_byname(FUN = `^`, list(1,2,3), .FUNdots = list(2))
\textbf{nrow\_byname} \hspace{1cm} \textit{Get the number of rows in a "byname" matrix.}

\begin{description}
\item[Description] The function \texttt{nrow\_byname} gets the number of rows in a "byname" matrix, or for each "byname" matrix contained in a column of a data frame.
\end{description}
Usage

\texttt{nrowbyname(a)}

Arguments

\texttt{a} \hspace{1cm} A matrix or a column of a data frame populated with "byname" matrices.

Value

The number of rows of the matrix, or a list containing the number of rows in each of the matrices contained in the column of a data frame.

Examples

\begin{verbatim}
productnames <- c("p1", "p2")
industrynames <- c("i1", "i2")
U <- matrix(1:4, ncol = 2, dimnames = list(productnames, industrynames))
  %>%
  setrowtype("Products")
  %>%
  setcoltype("Industries")
productnames <- c("p1", "p2")
industrynames <- c("i1", "i2", "i3")
U2 <- matrix(1:3, ncol = length(industrynames),
             nrow = length(productnames),
             dimnames = list(productnames, industrynames))
  %>%
  setrowtype("Products")
  %>%
  setcoltype("Industries")
productnames <- c("p1", "p2", "p3")
industrynames <- c("i1", "i2", "i3", "i4")
U3 <- matrix(1:4, ncol = length(industrynames),
             nrow = length(productnames),
             dimnames = list(productnames, industrynames))
  %>%
  setrowtype("Products")
  %>%
  setcoltype("Industries")
dfUs <- data.frame(
  year = numeric(),
  matrix_byname = I(list()))
dfUs[[1, "matrix_byname"]][] <- U
dfUs[[2, "matrix_byname"]][] <- U2
dfUs[[3, "matrix_byname"]][] <- U3
dfUs[[1, "year"]][] <- 2000
dfUs[[2, "year"]][] <- 2001
dfUs[[3, "year"]][] <- 2002
number_rows <- matsbyname::nrowbyname(dfUs$matrix_byname)
\end{verbatim}
Description

Organizes arguments of binary (2 arguments) _byname functions. Actions performed are:

- if only one argument is a list, make the other argument also a list of equal length.
- if both arguments are lists, ensure that they are same length.
- if one argument is a matrix and the other is a constant, make the constant into a matrix.
- ensures that row and column types match for typematch_margins.
- ensures that list item names match if both a and b are lists; no complaints are made if neither a nor b has names.
- completes and sorts the matrices.

Usage

organize_args(a, b, match_type = "all", fill)

Arguments

- a: the first argument to be organized
- b: the second argument to be organized
- match_type: one of "all", "matmult", "none". When both a and b are matrices, "all" (the default) indicates that rowtypes of a must match rowtypes of b and coltypes of a must match coltypes of b. If "matmult", coltypes of a must match rowtypes of b.
- fill: a replacement value for a or b if either is missing or NULL.

Value

a list with two elements (named a and b) containing organized versions of the arguments

<table>
<thead>
<tr>
<th>pow_byname</th>
<th>Powers of matrix elements</th>
</tr>
</thead>
</table>

Description

Gives the result of raising all elements of a matrix or list of matrices to a power.

Usage

pow_byname(a, pow)

Arguments

- a: a matrix of list of matrices
- pow: the power to which elements of a will be raised
Prepare the .FUNdots argument for *apply_byname functions.

Description

This is a helper function for the various *apply_byname functions.

Usage

prepare_.FUNdots(a, .FUNdots)

Arguments

a the main argument to an *apply_byname function.

.FUNdots a list of additional arguments to be applied to FUN in one of the *apply_byname functions.

Details

We have four cases between a and any single item of .FUNdots:

- both a and the item of .FUNdots are lists
  - if the item of .FUNdots (a list itself) has length different from 1 or length(a), throw an error
  - if the item of .FUNdots (a list itself) has length 1, replicate the single item to be a list of length = length(a)
  - if the item of .FUNdots (a list itself) has length = length(a), use the item of .FUNdots as is
• a is a list but the item (argument) of .FUNdots is NOT a list
  – if the item of .FUNdots (which is not a list) has length != 1, throw an error, because there
    is ambiguity how the item of .FUNdots should be treated.
  – if the item of .FUNdots (which is not a list) has length = 1, replicate that single item to be
    a list of length = length(a)
• a is NOT a list, but the item of .FUNdots IS a list
  – pass the argument along and hope for the best. This situation is probably an error. If so,
    it will become apparent soon.
• neither a nor the item of .FUNdots is a list
  – a should have length = 1, but a single matrix reports its length as the number of elements
    of the matrix. So, we can’t check length in this situation.
  – the item of .FUNdots is assumed to have length 1 and passed along

Value

a reconfigured version of .FUNdots, ready for use by an *apply_byname function.

• both a and the item of .FUNdots are lists
  – if the item of .FUNdots (a list itself) has length different from 1 or length(a), throw an
    error
  – if the item of .FUNdots (a list itself) has length 1, replicate the single item to be a list of
    length = length(a)
  – if the item of .FUNdots (a list itself) has length = length(a), use the item of .FUNdots as
    is
• a is NOT a list, but the item of .FUNdots IS a list
  – pass the argument along and hope for the best. This situation is probably an error. If so,
    it will become apparent soon.
• a is a list but the item (argument) of .FUNdots is NOT a list This situation could be ambiguous.
  Let’s say the list of a values has length 2, and an argument margin = c(1,2). Should margin =
  1 be applied to a[[1]] and margin = 2 be applied to a[[2]]? Or should margin = c(1,2) be
  applied to both a[[1]] and a[[2]]? This ambiguity should be handled by using the function
  prep_vector_arg() within the function that calls unaryapply_byname(). For an example,
  see identify_byname(). When the arguments are coming in from a data frame, there will be
  no ambiguity, but the information will not be coming .FUNdots[[i]] as a list. Optimizing
  for the data frame case, this function allows vectors of length equal to the length of the list
  a, interpreting such vectors as applying in sequence to each a in turn. So the algorithm is as
  follows:
  – if a non-NULL item of .FUNdots (which is not a list) has length other than 1 or length(a),
    throw an error.
  – if a non-NULL item of .FUNdots (which is not a list) has length = 1, replicate that single
    item to be a list of length = length(a).
  – if a non-NULL item of .FUNdots (which is not a list) has length = length(a), leave it as-is.
• neither a nor the item of .FUNdots is a list
  – a should have length = 1, but a single matrix reports its length as the number of elements
    of the matrix. So, we can’t check length in this situation.
  – the item of .FUNdots is assumed to have length 1 and passed along
**prodall_byname**

**Description**

This function is equivalent to `a %>% rowprods_byname() %>% colprods_byname()`, but returns a single numeric value instead of a 1x1 matrix.

**Usage**

```
prodall_byname(a)
```

---

**prep_vector_arg**

**Prepare a vector argument**

**Description**

This is a helper function for many *_byname functions.

**Usage**

```
prep_vector_arg(a, vector_arg)
```

**Arguments**

- `a`: a matrix or list of matrices
- `vector_arg`: the vector argument over which to apply a calculation

**Details**

It is potentially ambiguous to specify a vector or matrix argument, say, `margin = c(1, 2)` when applying the * _byname functions to unary list of a. Rather, one should specify, say, `margin = list(c(1, 2))` to avoid ambiguity. If `a` is a list, `vector_arg` is not a list and has length > 1 and length not equal to the length of `a`, this function returns a list value for `vector_arg`. If `a` is not a list and `vector_arg` is a list, this function returns an un-recursive, unlisted version of `vector_arg`.

Note that if `vector_arg` is a single matrix, it is automatically enclosed by a list when `a` is a list.

**Value**

`vector_arg`, possibly modified when `a` is a list

**Examples**

```
m <- matrix(c(2, 2))
matsbyname:::prep_vector_arg(list(m, m), vector_arg = c(1,2))
```
quotient_byname

Arguments

a the matrix whose elements are to be multiplied

Value

the product of all elements in a as a numeric.

Examples

```r
library(dplyr)
M <- matrix(2, nrow=2, ncol=2, dimnames = list(paste0("i", 1:2), paste0("c", 1:2))) %>%
  setrowtype("Industry") %>% setcoltype("Product")
prodall_byname(M)
rowprods_byname(M) %>% colprods_byname
# Also works for lists
prodall_byname(list(M,M))
DF <- data.frame(M = I(list()))
DF[[1,"M"]] <- M
DF[[2,"M"]] <- M
prodall_byname(DF$M[[1]])
prodall_byname(DF$M)
res <- DF %>% mutate(
  prods = prodall_byname(M)
)
res$prods
```

Description

Element-wise division of two matrices.

Usage

quotient_byname(dividend, divisor)

Arguments

<table>
<thead>
<tr>
<th>Argument</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dividend</td>
<td>Dividend matrix or constant</td>
</tr>
<tr>
<td>divisor</td>
<td>Divisor matrix or constant</td>
</tr>
</tbody>
</table>

Details

Performs a union and sorting of names of rows and columns for both dividend and divisor prior to element division. Zeroes are inserted for missing matrix elements. Doing so ensures that the dimensions of the dividend and divisor will be conformable.
rename_to_pref_suff_byname

Rename matrix rows and columns by prefix and suffix

Description

It can be convenient to rename rows or columns of matrices based on retaining prefixes or suffixes. This function provides that capability.

Usage

rename_to_pref_suff_byname(a, keep, margin = c(1, 2), notation)

Arguments

a          a matrix or list of matrices whose rows or columns will be renamed.
keep       one of "prefix" or "suffix" indicating which part of the row or column name to retain.
margin     one of 1, 2, or c(1, 2) where 1 indicates rows and 2 indicates columns.
notation   See notation_vec().
Details
A prefix is defined by an opening string (prefix_open) and a closing string (prefix_close). A suffix is defined by an opening string (suffix_open) and a closing string (suffix_close). If sep is provided and none of prefix_open, prefix_close, suffix_open, and suffix_close are provided, default arguments become: * prefix_open: "", * prefix_close: sep, * suffix_open: sep, and * suffix_close: "".
The keep parameter tells which portion to retain (prefixes or suffixes).
If prefixes or suffixes are not found in a row and/or column name, that name is unchanged.

Value
a with potentially different row or column names.

Examples
m <- matrix(c(1, 2, 3, 4, 5, 6), nrow = 3, byrow = TRUE, dimnames = list(c("a -> b", "r2", "r3"), c("a -> b", "c -> d")))
rename_to_pref_suff_byname(m, keep = "prefix", notation = arrow_notation())
rename_to_pref_suff_byname(m, keep = "suffix", notation = arrow_notation())

Description
In a matrix or within matrices in a list, replace all NaN matrix values with val.

Usage
replaceNaN_byname(a, val = 0)

Arguments
a a matrix of list of matrices in which NaN will be replaced by val
val NaNs are replace by val

Value
a matrix or list of matrices in which all NaN are replaced by val

Examples
suppressWarnings(a <- matrix(c(1, sqrt(-1))))
replaceNaN_byname(a)
replaceNaN_byname(a, 42)
Description

It is often convenient to represent row and column names with notation that includes a prefix and a suffix, with corresponding separators or start-end string sequences. There are several functions that call notation_vec() to generate specialized versions or otherwise manipulate row and column names on their own or as row or column names.

- notation_vec() Builds a vector of notation symbols in a standard format that is used by matsbyname in several places. By default, it builds a list of notation symbols that provides an arrow separator (" -> ") between prefix and suffix.
- arrow_notation() Builds a list of notation symbols that provides an arrow separator (" -> ") between prefix and suffix.
- paren_notation() Builds a list of notation symbols that provides parentheses around the suffix ("prefix (suffix)").
- bracket_notation() builds a list of notation symbols that provides square brackets around the suffix ("prefix [suffix]").
- split_pref_suff() Splits prefixes from suffixes, returning each in a list with names pref and suff. If no prefix or suffix delimiters are found, x is returned in the pref item, unmodified, and the suff item is returned as "" (an empty string). If there is no prefix, and empty string is returned for the pref item. If there is no suffix, and empty string is returned for the suff item.
- paste_pref_suff() paste0's prefixes and suffixes, the inverse of split_pref_suff().
- flip_pref_suff() Switches the location of prefix and suffix, such that the prefix becomes the suffix, and the suffix becomes the prefix. E.g., "a -> b" becomes "b -> a" or "a [b]" becomes "b [a]."
- keep_pref_suff() Selects only prefix or suffix, discarding notational elements and the rejected part.
- switch_notation() Switches from one type of notation to another based on the from and to arguments. Optionally, prefix and suffix can be flipped.
- switch_notation_byname() Switches matrix row and/or column names from one type of notation to another based on the from and to arguments. Optionally, prefix and suffix can be flipped.

If sep only is specified (default is " -> "), pref_start, pref_end, suff_start, and suff_end are set appropriately.

None of the strings in a notation vector are considered part of the prefix or suffix. E.g., "a -> b" in arrow notation means that "a" is the prefix and "b" is the suffix.
Usage

notation_vec(  
    sep = " -> ",  
    pref_start = "",  
    pref_end = "",  
    suff_start = "",  
    suff_end = ""
)

arrow_notation()  
paren_notation(suff_start = " (", suff_end = ")")  
bracket_notation(suff_start = " [", suff_end = "]")  

split_pref_suff(x, notation = arrow_notation())  
paste_pref_suff(  
    ps = list(pref = pref, suff = suff),  
    pref = NULL,  
    suff = NULL,  
    notation = arrow_notation()
)

flip_pref_suff(x, notation = arrow_notation())  
keep_pref_suff(x, keep = c("pref", "suff"), notation)  

switch_notation(x, from, to, flip = FALSE)  
switch_notation_byname(a, margin = c(1, 2), from, to, flip = FALSE)

Arguments

  sep     A string separator between prefix and suffix. Default is " -> ".
  pref_start     A string indicating the start of a prefix. Default is NULL.
  pref_end     A string indicating the end of a prefix. Default is the value of sep.
  suff_start     A string indicating the start of a suffix. Default is the value of sep.
  suff_end     A string indicating the end of a suffix. Default is NULL.
  x     A string or list of strings to be operated upon.
  notation     A notation vector generated by one of the *_notation() functions, such as notation_vec(), arrow_notation(), or bracket_notation(). Default is arrow_notation().
  ps     A list of prefixes and suffixes in which each item of the list is itself a list with two items named pref and suff.
  pref     A string or list of strings that are prefixes. Default is NULL.
  suff     A string or list of strings that are suffixes. Default is NULL.
keep
from
The notation to switch away from.
to
The notation to switch to.
flip
A boolean that tells whether to also flip the notation. Default is FALSE.
a
A matrix or list of matrices whose row and/or column notation is to be changed.
margin
1 for rows, 2 for columns, or c(1,2) for both rows and columns. Default is c(1,2).

Value

For notation_vec(), arrow_notation(), and bracket_notation(), a string vector with named items pref_start, pref_end, suff_start, and suff_end; For split_pref_suff(), a string list with named items pref and suff. For paste_pref_suff(), split_pref_suff(), and switch_notation(), a string list in notation format specified by various notation arguments, including from, and to.

For keep_pref_suff, one of the prefix or suffix or a list of prefixes or suffixes. For switch_row_col_notation_byname(), matrices with row and column names with switched notation, per arguments.

Examples

notation_vec()
arow_notation()
bracket_notation()
split_pref_suff("a -> b", notation = arrow_notation())
flip_pref_suff("a [b]", notation = bracket_notation())
keep_pref_suff("a -> b", keep = "suff", notation = arrow_notation())
switch_notation("a -> b", from = arrow_notation(), to = bracket_notation())
switch_notation("a -> b", from = arrow_notation(), to = bracket_notation(),
flip = TRUE)
m <- matrix(c(1, 2,
3, 4), nrow = 2, ncol = 2, byrow = TRUE,
dimnames = list(c("b [a]", "d [c]"), c("f [e]", "h [g]"))) %>%
setrowtype("Products [Industries]") %>% setcoltype("Industries [Products]")
m
switch_notation_byname(m, from = bracket_notation(), to = arrow_notation(),
flip = TRUE)
# Also works for lists.
# Note that margin must be specified as a list here.
switch_notation_byname(list(m, m), margin = list(c(1, 2)),
from = bracket_notation(),
to = arrow_notation(), flip = TRUE)

rowprods_byname
Row products, sorted by name

Description

Calculates row products (the product of all elements in a row) for a matrix. An optional colname for the resulting column vector can be supplied. If colname is NULL or NA (the default), the column name is set to the column type as given by coltype(a).
#### Usage

rowprods_byname(a, colname = NA)

#### Arguments

- **a**: a matrix or list of matrices from which row products are desired.
- **colname**: name of the output column containing row products

#### Value

A column vector of type matrix containing the row products of a.

#### Examples

```r
library(dplyr)
M <- matrix(c(1:6), ncol = 2, dimnames = list(paste0("i", 3:1), paste0("c", 1:2))) %>%
  setrowtype("Industries") %>%
  setcoltype("Products")
rowprods_byname(M)

# This also works with lists
rowprods_byname(list(M, M))
rowprods_byname(list(M, M), "E.ktoe")
rowprods_byname(list(M, M), NA)
rowprods_byname(list(M, M), NULL)

DF <- data.frame(M = I(list()))
DF[,1,"M"] <- M
DF[,2,"M"] <- M
rowprods_byname(DF[,1,"M"])
rowprods_byname(DF$M)
ans <- DF %>%
  mutate(rs = rowprods_byname(M))
ans
ans$rs[[1]]
# Nonsensical
## Not run: rowprods_byname(NULL)
```

---

#### Description

Calculates row sums for a matrix by post-multiplying by an identity vector (containing all 1’s). In contrast to rowSums (which returns a numeric result), the return value from rowsums_byname is a matrix. An optional colname for the resulting column vector can be supplied. If colname is NULL or NA (the default), the column name is set to the column type as given by coltype(a). If colname is set to NULL, the column name is returned empty.

#### Usage

rowsums_byname(a, colname = NA)
Arguments

- **a**: A matrix or list of matrices from which row sums are desired.
- **colname**: The name of the output column containing row sums.

Value

A column vector of type `matrix` containing the row sums of `m`

Examples

```r
library(dplyr)

m <- matrix(c(1:6), ncol = 2, dimnames = list(paste0("i", 3:1), paste0("c", 1:2))) %>%
  setrowtype("Industries") %>% setcoltype("Commodities")

rowsums_byname(m)
rowsums_byname(m, "E.ktoe")

# This also works with lists
rowsums_byname(list(m, m))
rowsums_byname(list(m, m), "E.ktoe")
rowsums_byname(list(m, m), NA)
rowsums_byname(list(m, m), NULL)

DF <- data.frame(m = I(list()))

DF[[1,"m"]][1] <- m
DF[[2,"m"]][1] <- m
rowsums_byname(DF$`m[[1]]")
rowsums_byname(DF$`m")
ans <- DF %>% mutate(rs = rowsums_byname(m))
ans

ans$rs[[1]]

# Nonsensical
## Not run: rowsums_byname(NULL)
```

---

<table>
<thead>
<tr>
<th>rowtype</th>
<th>Row type</th>
</tr>
</thead>
</table>

Description

Extracts row type of `a`.

Usage

`rowtype(a)`

Arguments

- **a**: the object from which you want to extract row types
Value

the row type of a

Examples

library(dplyr)
commoditynames <- c("c1", "c2")
industrynames <- c("i1", "i2")
U <- matrix(1:4, ncol = 2, dimnames = list(commoditynames, industrynames)) %>%
  setrowtype(rowtype = "Commodities") %>%
  setcoltype("Industries")
rowtype(U)
# This also works for lists
rowtype(list(U, U))

samestructure_byname

Test whether matrices or lists of matrices have same structure

Description

Matrices are said to have the same structure if row and column types are identical and if row and
column names are identical. Values can be different.

Usage

samestructure_byname(...)

Arguments

... operand to be compared

Value

TRUE if all operands have the same structure, FALSE otherwise.

Examples

samestructure_byname(2, 2)
productnames <- c("p1", "p2")
industrynames <- c("i1", "i2")
U <- matrix(1:4, ncol = 2, dimnames = list(productnames, industrynames)) %>%
  setrowtype("Products") %>%
  setcoltype("Industries")
samestructure_byname(U, U)
samestructure_byname(U, U %>% setrowtype("row"))
samestructure_byname(U %>% setcoltype("col"), U)
# Also works with lists
samestructure_byname(list(U, U), list(U, U))
select_cols_byname  
Select columns of a matrix (or list of matrices) by name

Description
Arguments indicate which columns are to be retained and which are to be removed. For maximum flexibility, arguments are extended regex patterns that are matched against column names.

Usage
select_cols_byname(a, retain_pattern = "^\^", remove_pattern = "$\^")

Arguments
a  
a matrix or a list of matrices
retain_pattern  
an extended regex or list of extended regular expressions that specifies which columns of `a` to retain. Default pattern (\$^) retains nothing.
remove_pattern  
an extended regex or list of extended regular expressions that specifies which columns of `a` to remove. Default pattern (\$^) removes nothing.

Details
If `a` is NULL, NULL is returned.
Patterns are compared against column names using extended regex. If no column names of `a` match the `retain_pattern`, NULL is returned. If no column names of `a` match the `remove_pattern`, `a` is returned.
Retaining columns takes precedence over removing columns, always.
Some typical patterns are:
• \(^Electricity\|Oil\): column names that are EXACTLY Electricity or Oil.
• \(^Electricity\|Oil\): column names that START WITH Electricity or Oil.
• \(Electricity\|Oil\): column names that CONTAIN Electricity or Oil anywhere within them.

Given a list of column names, a pattern can be constructed easily using the `make_pattern` function. `make_pattern` escapes regex strings using `escapeRegex`. This function assumes that `retain_pattern` and `remove_pattern` have already been suitably escaped.
Note that the default `retain_pattern` and `remove_pattern` (\$\^) retain nothing and remove nothing.
Note that if all columns are removed from `a`, NULL is returned.

Value
a matrix that is a subset of `a` with columns selected by `retain_pattern` and `remove_pattern`.
select_rows_byname

Examples

m <- matrix(1:16, ncol = 4, dimnames=list(c(paste0("i", 1:4)), paste0("p", 1:4))) %>%
setrowtype("Industries") %>% setcoltype("Commodities")
select_cols_byname(m, retain_pattern = make_pattern(c("p1", "p4"), pattern_type = "exact"))
select_cols_byname(m, remove_pattern = make_pattern(c("p1", "p3"), pattern_type = "exact"))
# Also works for lists and data frames
select_cols_byname(list(m, m), retain_pattern = "^p1$|^p4$")

select_rows_byname

Select (or de-select) rows of a matrix (or list of matrices) by name

Description

Arguments indicate which rows are to be retained and which are to be removed. For maximum
flexibility, arguments are extended regex patterns that are matched against row names.

Usage

select_rows_byname(a, retain_pattern = "\$^", remove_pattern = "\$^")

Arguments

a a matrix or a list of matrices
retain_pattern an extended regex or list of extended regular expressions that specifies which
rows of m to retain. Default pattern ($^) retains nothing.
remove_pattern an extended regex or list of extended regular expressions that specifies which
rows of m to remove Default pattern ($^) removes nothing.

Details

If a is NULL, NULL is returned.
Patterns are compared against row names using extended regex. If no row names of m match the
retain_pattern, NULL is returned. If no row names of m match the remove_pattern, m is returned.
Note that the default retain_pattern and remove_pattern ($^) retain nothing and remove noth-
ing.
Retaining rows takes precedence over removing rows, always.
Some typical patterns are:

• ^Electricity$|^Oil$: row names that are EXACTLY Electricity or EXACTLY Oil.
• ^Electricity|Oil: row names that START WITH Electricity or START WITH Oil.
• Electricity|Oil: row names that CONTAIN Electricity or CONTAIN Oil anywhere
  within them.

Given a list of row names, a pattern can be constructed easily using the make_pattern function.
make_pattern escapes regex strings using Hmisc::escapeRegex(). This function assumes that
retain_pattern and remove_pattern have already been suitably escaped.
Note that if all rows are removed from a, NULL is returned.
setcolnames_byname

Value

A matrix that is a subset of \( m \) with rows selected by \texttt{retain_pattern} and \texttt{remove_pattern}.

Examples

\[
m <- \text{matrix}(1:16, \text{ncol} = 4, \text{dimnames}=\text{list(c(paste0("i", 1:4)), paste0("p", 1:4)))} \%
\text{setrowtype("Industries")} \%
\text{setcoltype("Commodities")}
\text{select_rows_byname}(m, \text{retain_pattern} = \text{make_pattern}(\text{c("i1", "i4"), \text{pattern_type = "exact")})
\text{select_rows_byname}(m, \text{remove_pattern} = \text{make_pattern}(\text{c("i1", "i3"), \text{pattern_type = "exact")})
# Also works for lists and data frames
\text{select_rows_byname}(\text{list}(m,m), \text{retain_pattern} = \text{"^i1|!i4"})
\]

setcolnames_byname

Sets column names

Description

Sets column names in a way that is amenable to use in piping operations in a functional programming way. If \( a \) is \texttt{NULL}, \texttt{NULL} is returned. If \( a \) is a constant, it is converted to a matrix and \texttt{colnames} are applied. If \( a \) is a matrix, \texttt{colnames} should be a vector of new column names that is as long as the number of columns in \( a \). If \( a \) is a list of matrices, \texttt{colnames} can also be a list, and it should be as long as \( a \). Or \texttt{colnames} can be a vector of column names which will be applied to every matrix in the list of \( a \). Each item in the list should be a vector containing column names for the corresponding matrix in \( a \).

Usage

\texttt{setcolnames_byname}(a, \text{colnames})

Arguments

\begin{itemize}
\item \texttt{a} \hspace{1cm} A matrix or a list of matrices in which column names are to be set
\item \texttt{colnames} \hspace{1cm} A vector of new column names or a list of vectors of new column names
\end{itemize}

Value

A copy of \( a \) with new column names

Examples

\[
m <- \text{matrix}(c(1:6), \text{nrow} = 2, \text{dimnames} = \text{list(paste0("i", 1:2), paste0("c", 1:3)))} \%
\text{setrowtype("Industries")} \%
\text{setcoltype("Commodities")}
\text{setcolnames_byname}(m, \text{c("a", "b", "c")})
\]
setcoltype  

Sets column type for a matrix or a list of matrices

Description

This function is a wrapper for `attr` so that setting can be accomplished by the pipe operator (%>%). Column types are strings stored in the `coltype` attribute.

Usage

`setcoltype(a, coltype)`

Arguments

- `a`: the matrix on which column type is to be set
- `coltype`: the type of item stored in columns

Details

# If `is.null(coltype)`, the coltype attribute is deleted and subsequent calls to `coltype` will return `NULL`.

Value

`a` with `coltype` attribute set.

Examples

```r
library(dplyr)
commoditynames <- c("c1", "c2")
industrynames <- c("i1", "i2")
U <- matrix(1:4, ncol = 2, dimnames = list(commoditynames, industrynames))
U %>% setcoltype("Industries")
# This also works for lists
setcoltype(list(U,U), coltype = "Industries")
setcoltype(list(U,U), coltype = list("Industries", "Industries"))
DF <- data.frame(U = I(list()))
DF[1,"U"] <- U
DF[2,"U"] <- U
setcoltype(DF$U, "Industries")
DF <- DF %>% mutate(newcol = setcoltype(U, "Industries"))
DF$newcol[[1]]
DF$newcol[[2]]
```
**setrownames_byname**  
*Sets row names*

**Description**

Sets row names in a way that is amenable to use in piping operations in a functional programming way. If `a` is NULL, NULL is returned. If `a` is a constant, it is converted to a matrix and `rownames` are applied. If `a` is a matrix, `rownames` should be a vector of new row names that is as long as the number of rows in `a`. If `a` is a list of matrices, `rownames` can also be a list, and it should be as long as `a`. Or `rownames` can be a vector of row names which will be applied to every matrix in the list of `a`. Each item in the list should be a vector containing row names for the corresponding matrix in `a`.

**Usage**

```r
setrownames_byname(a, rownames)
```

**Arguments**

- `a`  
  A matrix or a list of matrices in which row names are to be set

- `rownames`  
  A vector of new row names or a list of vectors of new row names

**Value**

A copy of `m` with new row names

**Examples**

```r
library(dplyr)
m <- matrix(c(1:6), nrow = 2, dimnames = list(paste0("i", 1:2), paste0("c", 1:3)))  
%>% setrowtype("Industries") %>% setcoltype("Commodities")  
setrownames_byname(m, c("a", "b"))

setrownames_byname(m %>% setrowtype("Industries") %>% setcoltype("Commodities"), c("c", "d"))
m %>% setrownames_byname(NULL)
m %>% setrownames_byname(c(NA, NA))
2 %>% setrownames_byname("row")
# This also works for lists
setrownames_byname(list(m,m), list(c("r1", "r2")))
DF <- data.frame(m = I(list()))
DF[[1,"m"]] <- m
DF[[2,"m"]] <- m
setrownames_byname(DF$m, list(c("r1", "r2")))
setrownames_byname(DF$m, list(c("c", "d")))
DF <- DF %>% mutate(m = setrownames_byname(m, list(c("r1", "r2"))))
DF$m[m[1]]
```
setrowtype

Sets row type for a matrix or a list of matrices

Description

This function is a wrapper for attr so that setting can be accomplished by the pipe operator (%>%). Row types are strings stored in the rowtype attribute.

Usage

setrowtype(a, rowtype)

Arguments

a      the matrix on which row type is to be set
rowtype the type of item stored in rows

Details

If is.null(rowtype), the rowtype attribute is deleted and subsequent calls to rowtype will return NULL.

Value

a with rowtype attribute set to rowtype.

Examples

library(dplyr)
commoditynames <- c("c1", "c2")
industrynames <- c("i1", "i2")
U <- matrix(1:4, ncol = 2, dimnames = list(commoditynames, industrynames))
U %>% setrowtype("Commodities")
# This also works for lists
setrowtype(list(U,U), rowtype = "Commodities")
setrowtype(list(U,U), rowtype = list("Commodities", "Commodities"))
DF <- data.frame(U = I(list()))
DF[[1,"U"]]<- U
DF[[2,"U"]]<- U
setrowtype(DF$U, "Commodities")
DF <- DF %>% mutate(newcol = setrowtype(U, "Commodities"))
DF$newcol[[1]]
DF$newcol[[2]]
sort_rows_cols

Sorts rows and columns of a matrix

Description

Checks that row names are unique and that column names are unique. Then, sorts the rows and columns in a way that ensures any other matrix with the same row and column names will have the same order.

Usage

```
sort_rows_cols(a, margin = c(1, 2), roworder = NA, colorder = NA)
```

Arguments

- `a`:
  A matrix or data frame whose rows and columns are to be sorted

- `margin`:
  Specifies the subscript(s) in `a` over which sorting will occur. `margin` has nearly the same semantic meaning as in `apply`. For rows only, give 1; for columns only, give 2; for both rows and columns, give `c(1, 2)`, the default value.

- `roworder`:
  Specifies the order for rows with default `sort(rownames(a))`. If `NA` (the default), default sort order is used. Unspecified rows are removed from the output, thus providing a way to delete rows from `a`. Extraneous row names (row names in `roworder` that do not appear in `a`) are ignored.

- `colorder`:
  Specifies the order for columns with default `sort(colnames(a))`. If `NA` (the default), default sort order is used. Unspecified columns are removed from the output, thus providing a way to delete columns from `a`. Extraneous column names (column names in `colorder` that do not appear in `a`) are ignored.

Details

Default sort order is given by `base::sort()` with `decreasing = FALSE`.

Value

A modified version of `a` with sorted rows and columns

Examples

```
m <- matrix(c(1:6), nrow=3, dimnames = list(c("r3", "r5", "r1"), c("c4", "c2")))
sort_rows_cols(m)
sort_rows_cols(t(m))
sort_rows_cols(m, margin=1) # Sorts rows
sort_rows_cols(m, margin=2) # Sorts columns
v <- matrix(c(1:5), ncol=1, dimnames=list(rev(paste0("r", 1:5)), "c1")) # Column vector
sort_rows_cols(v)
sort_rows_cols(v, margin = 1) # Sorts rows
sort_rows_cols(v, margin = 2) # No effect: only one column
```
r <- matrix(c(1:4), nrow=1, dimnames=list("r1", rev(paste0("c", 1:4)))) # Row vector
sort_rows_cols(r) # Sorts columns
n <- matrix(c(1,2), nrow = 1, dimnames = list(NULL, c("c2", "c1"))) # No row name
sort_rows_cols(n) # Sorts columns, because only one row.
# Also works with lists
sort_rows_cols(list(m,m)) # Sorts rows and columns for both m's.
# Sort rows only for first one, sort rows and columns for second one.
# Row order is applied to all m's. Column order is natural.
sort_rows_cols(a = list(m,m), margin = 1, roworder = list(c("r5", "r3", "r1")))
# Columns are sorted as default, because no colorder is given.
# roworder is ignored.
sort_rows_cols(a = list(m,m), margin = 2, roworder = list(c("r5", "r3", "r1")))
# Both columns and rows sorted, rows by the list, columns in natural order.
sort_rows_cols(a = list(m,m), margin = c(1,2), roworder = list(c("r5", "r3", "r1")))

sumall_byname

**Sum of all elements in a matrix**

**Description**

This function is equivalent to `a %>% rowsums_byname() %>% colsums_byname()`, but returns a single numeric value instead of a 1x1 matrix.

**Usage**

`sumall_byname(a)`

**Arguments**

- `a` the matrix whose elements are to be summed

**Value**

the sum of all elements in `a` as a numeric

**Examples**

```r
library(dplyr)
m <- matrix(2, nrow=2, ncol=2, dimnames = list(paste0("i", 1:2), paste0("c", 1:2))) %>%
  setrowtype("Industry") %>% setcoltype("Commodity")
sumall_byname(m)
rowsums_byname(m) %>% colsums_byname
# Also works for lists
sumall_byname(list(m,m))
DF <- data.frame(m = I(list()))
DF[[1,"m"]]<- m
DF[[2,"m"]]<- m
sumall_byname(DF$m[[1]])
sumall_byname(DF$m)
res <- DF %>% mutate(
```
sums = sumallbyname(m)
)
res$sums

sumbyname

Name-wise addition of matrices

Description
Performs a union and sorting of addend and augend row and column names prior to summation. Zeroes are inserted for missing matrix elements. Treats missing or NULL operands as 0.

Usage
sumbyname...

Arguments
... operands: constants, matrices, or lists of matrices

Value
A matrix representing the name-wise sum of addend and augend

Examples
library(dplyr)
sumbyname(2, 2)
sumbyname(2, 2, 2)
sumbyname(2, 2, -2, -2)
productnames <- c("p1", "p2")
industrynames <- c("i1", "i2")
U <- matrix(1:4, ncol = 2, dimnames = list(productnames, industrynames)) %>%
  setrowtype("Products") %>%
  setcoltype("Industries")
Y <- matrix(1:4, ncol = 2, dimnames = list(rev(productnames), rev(industrynames))) %>%
  setrowtype("Products") %>%
  setcoltype("Industries")
sumbyname(U, 100)
sumbyname(200, Y)
U + Y # Non-sensical. Row and column names not respected.
sumbyname(U, U)
sumbyname(U, Y)
sumbyname(U, U, Y, Y)
Y <- matrix(1:4, ncol = 2, dimnames = list(industrynames, productnames)) %>%
  setrowtype("Industries") %>%
  setcoltype("Products")
U + V # row and column names are non-sensical and blindly taken from first argument (U)
## Not run: sumbyname(U, V) # Fails, because row and column types are different
# This also works with lists
sumbyname(list(U, U), list(Y, Y))
sumbyname(list(U, U), list(100, 100))
sumbyname(list(U, U), as.list(rep_len(100, 2)))
DF <- data.frame(U = I(list()), Y = I(list()))
DF[1,"U"] <- U
DF[2,"U"] <- U
DF[1,"Y"] <- Y
DF[2,"Y"] <- Y
sum_byname(DF$U, DF$Y)
DF %>% mutate(sums = sum_byname(U, Y))
sum_byname(U) # If only one argument, return it.
sum_byname(2, NULL) # Gives 2
sum_byname(2, NA) # Gives NA
sum_byname(NULL, 1) # Gives 1
sum_byname(list(NULL, 1), list(1, 1))
DF2 <- data.frame(U = I(list()), Y = I(list()))
DF2[[1,"U"]]<- NULL
DF2[[2,"U"]]<- U
DF2[[1,"Y"]]<- Y
DF2[[2,"Y"]]<- Y
sum_byname(DF2$U, DF2$Y)
DF3 <- DF2 %>% mutate(sums = sum_byname(U, Y))
DF3
DF3$sums[[1]]
DF3$sums[[2]]

transpose_byname  

Transpose a matrix by name

Description

Gives the transpose of a matrix or list of matrices

Usage

transpose_byname(a)

Arguments

a  
the matrix to be transposed

Value

the transposed matrix

Examples

m <- matrix(c(11,21,31,12,22,32), ncol = 2, dimnames = list(paste0("i", 1:3), paste0("c", 1:2))) %>%
  setrowtype("Industry") %>%
  setcoltype("Commodity")
transpose_byname(m)
transpose_byname(list(m,m))
unaryapply_byname  Apply a unary function by name

Description

FUN is applied to a using additional arguments .FUNdots to FUN. If a is a list, the names of a are applied to the output.

Usage

unaryapply_byname(
  FUN,
  a,
  .FUNdots = NULL,
  rowcoltypes = c("all", "transpose", "row", "col", "none")
)

Arguments

FUN               a unary function to be applied "by name" to a.
 a                the argument to FUN.
 .FUNdots         a list of additional named arguments passed to FUN.
 rowcoltypes      a string that tells how to transfer row and column types of a to output. See details.

Details

Note that .FUNdots can be a rectangular two-dimensional list of arguments to FUN. If so, .FUNdots is interpreted as follows:

• The first dimension of .FUNdots contains named arguments to FUN.
• The second dimension of .FUNdots contains unique values of the named arguments to be applied along the list that is a.

The length of the first dimension of .FUNdots is the number of arguments supplied to FUN. The length of the second dimension of .FUNdots must be equal to the length of a.

See prepare_.FUNdots() for more details on the .FUNdots argument.

Options for the rowcoltypes argument are:

• "all": transfer both row and column types of a directly to output.
• "transpose": rowtype of a becomes coltype of output; coltype of a becomes rowtype of output. "transpose" is helpful for FUNs that transpose a upon output.
• "row": rowtype of a becomes both rowtype and coltype of output.
• "col": coltype of a becomes both rowtype and coltype of output.
• "none": rowtype and coltype not set by unaryapply_byname. Rather, FUN will set rowtype and coltype.

Note that rowcoltypes should not be a vector or list of strings. Rather, it should be a single string.
vectorize_byname

Value

the result of applying FUN "by name" to a.

Examples

```r
productnames <- c("p1", "p2")
industrynames <- c("i1", "i2")
U <- matrix(1:4, ncol = 2, dimnames = list(productnames, industrynames))
  %>% setrowtype("Products")
  %>% setcoltype("Industries")
difference_byname(0, U)
unaryapply_byname("-", U)
```

---

vectorize_byname  Vectorize a matrix

Description

Converts a matrix into a column vector. Each element of the matrix becomes an entry in the column vector, with rows named via the notation argument. Callers may want to transpose the matrix first with transpose_byname().

Usage

```r
vectorize_byname(a, notation)
```

Arguments

<table>
<thead>
<tr>
<th>a</th>
<th>the matrix to be vectorized.</th>
</tr>
</thead>
<tbody>
<tr>
<td>notation</td>
<td>a string vector created by notation_vec().</td>
</tr>
</tbody>
</table>

Details

The notation argument is also applied to rowtype and coltype attributes.

Value

a column vector containing all elements of a, with row names assigned as "rowname sep colname".

Examples

```r
m <- matrix(c(1, 5, 4, 5),
            nrow = 2, ncol = 2, byrow = TRUE,
            dimnames = list(c("p1", "p2"), c("i1", "i2")))
  %>% setrowtype("Products")
  %>% setcoltype("Industries")
m
vectorize_byname(m, notation = arrow_notation())
```

# If a single number is provided, the number will be returned as a 1x1 column vector
# with some additional attributes.
vectorizebyname(42, notation = arrow_notation())
attributes(vectorizebyname(42, notation = arrow_notation()))
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