Package ‘mathgraph’

February 20, 2015

Version 0.9-11
Date 2012-10-30
Title Directed and undirected graphs
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License file LICENSE
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Depends R (>= 2.1.1)
Repository CRAN
Date/Publication 2013-12-11 09:00:29
NeedsCompilation no
License_restricts_use yes

R topics documented:

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Description

Returns an object of class "adjamat" which is the adjacency matrix of a numbered graph.

Usage

adjamat(x, ...)
## S3 method for class 'mathgraph'
adjamat(x, general=FALSE, ...)

is.adjamat(x)

Arguments

x               an object of class "mathgraph".

general         logical flag, if TRUE, then multiple edges or arcs between the same nodes are counted; otherwise, there is a 1 no matter how many edges or arcs there are.

...             other arguments for generic function.

Details

adjamat is a generic function with a method for class "mathgraph".

Value

An object of class "adjamat" which is a square matrix with as many rows and columns as there are nodes in the numbered graph.
The i,j element is an indicator of an arc from node i to node j. An undirected edge between nodes i and j contributes a 1 to both the i,j element and the j,i element.

is.adjamat is the membership function for this class.

BUGS

The general argument to adjamat.mathgraph is not functional.

Note


Author(s)

Nick Efthymiou
alldirected

References

See Also
mathgraph, incidmat, getpath, adjamat

Examples
adjamat(mathgraph(~ 1:3 * 3:5, dir=TRUE))

Description
Returns a "mathgraph" object which has all edges directed.

Usage
alldirected(x, ...)

Arguments
x an object representing a mathematical graph.
... other arguments for derived functions.

Details
The default method merely creates an error.

Value
A "mathgraph" object with any undirected edges in the input split into two arcs.

Author(s)
Nick Efthymiou

References
S Poetry, Patrick J. Burns, Section 13.3, p. 305

See Also
mathgraph
Examples

my.graph <- mathgraph(~ 1:3 / 2:4) # undirected graph with 3 edges
alldirected(my.graph) # directed graph with 6 arcs

commontail Common Strings in Tail

Description

Takes a list of character vectors and returns the longest vector of strings that is common to the ends of all of the components in the list.

Usage

commontail(x)

Arguments

x

list of character vectors.

Details

This is useful to get the class that is common to a number of objects.

Value

a character vector containing the common elements of the tails of all the components in x.

The result is NULL if there are no common elements.

Author(s)

Nick Efthymiou

References

S Poetry, Patrick J. Burns

See Also

inherits, intersect

Examples

commontail(list(c("subA", "cls1"), c("subB", "subA", "cls1")))
commontail(list(c("subA", "cls2"), c("subB", "subA", "cls1")))
getpath

Find a Path in a Mathematical Graph

Description

Returns a path, if it exists, from the start to the end.

Usage

getpath(x, start, end, ...)
  ## S3 method for class 'mathgraph'
  getpath(x, start, end, ...)

Arguments

x an object representing a mathematical graph.
start character string or integer giving the starting node.
end character string or integer giving the ending node.
... generic arguments.

Details

getpath is a generic function with methods for "mathgraph", "incidmat" and "adjamat". The default method converts x to class "incidmat".
getpath.adjamat is an implementation of algorithm 2.2 in Chachra, Ghare and Moore (1979) and getpath.incidmat is an implementation of their algorithm 2.3.
The distinction between non-existent paths and paths of length zero may be useful in some situations.

Value

When at least one path exists, a "mathgraph" object containing the edges within the first path found; this may be an empty mathgraph if start and end are equal.
When no path exists, returns NULL.

Note

S Poetry, Patrick J. Burns, Section 13.3

Author(s)

Nick Efthymiou

References

See Also

mathgraph, incidmat, adjamat

Examples

getpath(mathgraph(~ 1:3 / 3:5), 1, 5) # returns a path
getpath(mathgraph(~ 1:3 / 3:5), 1, 4) # no path, returns NULL
getpath(mathgraph(~ 1:3 / 3:5), 1, 1) # returns mathgraph()

---

incidmat    Incidence Matrix for a Mathematical Graph

Description

Returns an object of class "incidmat" which is a matrix indicating the start and end node for each edge in the graph.

Usage

incidmat(x, ...)  
## S3 method for class 'mathgraph'
incidmat(x, expand=TRUE, general=FALSE, ...)

is.incidmat(x)

Arguments

- `x` object representing a mathematical graph.
- `expand` logical flag: if TRUE, then undirected edges are represented by two columns in the output. If FALSE, then both non-zero elements of an undirected edge are positive.
- `general` logical flag: if TRUE, then there is a non-zero entry in a column representing a loop.
- `...` generic arguments.

Details

The `incidmat` function is generic, with a method for class "mathgraph". `is.incidmat` is the membership function for this class.

Value

an object of class "incidmat" which is a matrix with rows representing nodes and columns representing edges.
Generally speaking, there is a 1 in the location where an edge begins and a -1 in the location where it ends.
Frank Harary defines incidence matrix with expand = FALSE.
Note


Author(s)

Nick Efthymiou

References


See Also

adjamat, mathgraph, getpath, incidmat

Examples

incidmat(mathgraph(~ 1:S / S:UL dir(TRUE))
incidmat(mathgraph(~ 1:S / S:UL dir(FALSE))
incidmat(mathgraph(~ 1:S / S:UL dir(FALSE), expand=FALSE)

justify

Justify Elements of a Vector

Description

Returns a vector like the input, but each string may have added blank spaces at the start and/or end.

Usage

justify(x, type = "r")

Arguments

x a character vector.
type a string giving the type of justification.
    This may be an abbreviation of one of "right", "left", "center".

Value

a character vector like x, except all elements have the same number of characters, and the text is lined up along one edge, or centered.
mathgraph

Author(s)
Nick Efthymiou

References
S Poetry, Patrick J. Burns

See Also
format, substring, paste

Examples

data(freeny)
as.matrix(justify(dimnames(freeny.x)[[2]], "r"))
as.matrix(justify(dimnames(freeny.x)[[2]], "l"))
as.matrix(justify(dimnames(freeny.x)[[2]], "c"))

Description
Create an object of class "mathgraph" which represents a mathematical graph.

Usage
mathgraph(formula, directed = FALSE, data = sys.parent())
## S3 method for class 'mathgraph'
length(x)
## S3 method for class 'mathgraph'
c(...)

is.mathgraph(x)

Arguments

formula a formula containing just the right-side.
Special operators in the formula are + which separates terms, / which puts an
edge between corresponding elements of the two vectors on which it is operat-
ing, and * which puts an edge between every pair of elements in the two vectors
on which it is operating.
directed logical flag: if TRUE, then all edges that are created are directed, otherwise they
are undirected.
data the frame in which to find objects referenced in the formula. This can be either
the number of a memory frame, or a list or data frame containing the data.
... objects to be concatenated.
x object of class "mathgraph".
Details

Mathematical graphs consist of a set of nodes (vertices) and edges. Edges go between two nodes. An edge that is directed is often called an arc.

Terms in the formula (delimited by \(*\) may be either calls to \(*\) or \(/\), or objects that are already of class "mathgraph".

Two other representations of graphs are adjacency matrices and incidence matrices. The functions to convert "mathgraph" objects to these are adjamat and incidmat, respectively. Most algorithms for mathematical graphs are in terms of incidence matrices or adjacency matrices.

The generic functions that have a method for class "mathgraph" include: \([\), \(c\), \(length\), \(names\), \(plot\), \(print\), \(unique\).

is.mathgraph is the membership function for this class.

Value

an object of class mathgraph which is a two-column matrix of nodes along with an additional attribute called "directed" which is a logical vector stating whether or not each edge is directed. An edge (row of the matrix) that is directed goes from the node in the first column to the node in the second column.

Note


Author(s)

Nick Efthymiou

References


See Also

adjamat, incidmat, getpath

Examples

mathgraph(~ 1:3 / 2:4) # graph with 3 edges
mathgraph(~ 1:3 * 2:4) # graph with 9 edges
mathgraph(~ 1:3 / 2:4, dir=TRUE) # directed graph with 3 edges

# graph with some edges directed, some not
c(mathgraph(~ 1:3 * 2:4), mathgraph(~ c(3,1) / c(2,4), dir=TRUE))
names.mathgraph

Edge Names in a Mathematical Graph

Description
Sets or returns the names (corresponding to the edges) of a mathematical graph represented by a mathgraph object.

Usage
## S3 method for class 'mathgraph'
names(x)
## S3 replacement method for class 'mathgraph'
names(x) <- value

Arguments
x 
an object inheriting from mathgraph.
value 
a value to be assigned to the names of the mathgraph.

Details
In the assignment form, the names are created or changed.

Value
Character vector of the names.

Author(s)
Nick Efthymiou

References

See Also
mathgraph
Examples

jjm <- mathgraph(~ 1:3 * 2:4)
jjm
names(jjm) <- letters[1:length(jjm)]
jjm
names(jjm)

plot.mathgraph       Plot a Mathematical Graph

Description

Very crude plotting method for mathgraph class.

Usage

## S3 method for class 'mathgraph'
plot(x, ...)

Arguments

x     an object that inherits from mathgraph.
...

Details

A representation of the mathematical graph is produced on the current graphics device.

BUGS

Needs to be smarter, and allow the user some control.

Author(s)

Nick Efthymiou

References

S Poetry, Patrick J. Burns, Section 13.3

See Also

mathgraph, plot.par

Examples

plot(mathgraph(~ 1:3 * 2:4), main="Graph K4")
print.mathgraph

Print a Mathematical Graph

Description

Prints a representation of the graph.

Usage

```r
## S3 method for class 'mathgraph'
print(x, prefix.node = if (is.character(x)) "" else "node", ...)
```

Arguments

- `x` an object inheriting from mathgraph which represents a mathematical graph.
- `prefix.node` a string to put in front of each node named. The default is an empty string if the nodes are character and the string "node" if they are not.
- `...` other arguments to print may be given, but are not used.

Details

The object is printed.

A ‘-’ between nodes means an undirected edge, while a single arrow means a directed edge.

Value

the input x is returned invisibly.

Note

The format is consistent with the dot graph language.

Author(s)

Nick Efthymiou

References

S Poetry, Patrick J. Burns, Section 13.3, Mathematical Graphs

See Also

mathgraph, names.mathgraph
**Examples**

```
mathgraph(~ 1:3 / 2:4)
mathgraph(~ 1:3 / 2:4, dir=TRUE)
jjm <- mathgraph(~ letters[1:3] * letters[2:4])
jjm
names(jjm) <- LETTERS[1:9]
jjm
```

---

**Description**

Sorts nodes within undirected edges and/or edges by nodes.

**Usage**

```
sortmathgraph(x, nodes = TRUE, edges = TRUE)
```

**Arguments**

- `x` an object that inherits from `mathgraph`.
- `nodes` logical value; if TRUE, then the nodes within undirected edges are sorted.
- `edges` logical value; if TRUE, then the edges are sorted by the first node with ties broken by the second node.

**Value**

an object that represents the same graph as the input, but with some rearrangement.

**Author(s)**

Nick Efthymiou

**References**


**See Also**

`mathgraph`

**Examples**

```
jjm <- c(mathgraph(~ 4:2 * 1:3), mathgraph(~ 3:5 / 1:3))
sortmathgraph(jjm)
sortmathgraph(jjm, node=FALSE)
sortmathgraph(jjm, edge=FALSE)
```
stable.apply  Apply with Stable Dimensions

Description

Does the same thing as apply except that when the function returns a vector, the dimensions are put back the way they started.

Usage

stable.apply(X, MARGIN, FUN, ...)

Arguments

- **X**: same as in apply.
- **MARGIN**: same as in apply.
- **FUN**: same as in apply.
- **...**: same as in apply.

Value

When FUN returns a scalar or when MARGIN has a length that is not one less than the number of dimensions in X, then the same as apply.

Otherwise, an array similar to the result of apply, but with the dimensions permuted to correspond to the dimensions of X.

Author(s)

Nick Efthymiou

References


See Also

apply, aperm

Examples

data(freeny)
stable.apply(freeny$x, 1, sort)
# compare to:
apply(freeny$x, 1, sort)
Description

Returns a mathgraph object that may have fewer edges than the input.

Usage

```r
## S3 method for class 'mathgraph'
unique(x, incomparables = FALSE, ...)
```

Arguments

- `x`: an object that inherits from mathgraph.
- `incomparables`: a vector of values that cannot be compared. The only possible value is FALSE, meaning that all values can be compared.
- `...`: other arguments for generic function.

Value

An object that is the same class as the input `x`, but redundant edges are removed.

Author(s)

Nick Efthymiou

References

S Poetry, Patrick J. Burns, Section 13.3

See Also

`mathgraph`

Examples

```r
unique( c(mathgraph(~ 1:2+2:3), mathgraph(~ 1/3)) )
```
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