# Package 'hyperdraw'

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**SystemRequirements** graphviz

**Title** Visualizing Hypergaphs

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**Description** Functions for visualizing hypergraphs.

**License** GPL (>= 2)

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## Contents

graphBPH *Constructor for graphBPH objects*

## Description

A convenience constructor for graphBPH-class objects. This is a generic function.

## Usage

```
graphBPH(graph, edgeNodePattern, ...)
```

## Arguments

| | |
|---|---|
| graph | Some form of graph that is to be converted into a graphBPH object. |
| edgeNodePattern | A regular expression used to distinguish between normal nodes and edge nodes. |
| ... | Potential arguments to other methods. |

## Value

An object of class graphBPH-class

## Methods

**graphBPH** signature(graph = "graphNEL", edgeNodePattern = "character"): create a graphBPH object from a (directed) graphNEL object.

**graphBPH** signature(graph = "Hypergraph", edgeNodePattern = "missing"): create a graphBPH object from a Hypergraph object (where all Hyperedges are DirectedHyperedges).

## Author(s)

Paul Murrell

## References

Falcon, S. and Gentleman, R. **hypergraph**: A package providing hypergraph data structures.

Gentleman, R. and Whalen, E. and Huber, W. and Falcon, S. **graph**: A package to handle graph data structures.

## See Also

graphBPH-class

graphBPH-class *Class "graphBPH"*

## Description

A bipartite representation of a hypergraph. The purpose of this class is to support visualization of the hypergraph; it is not intended for analysis or manipulation of the hypergraph.

## Objects from the Class

Objects can be created by calls of the form `new("graphBPH", graph, edgeNodePattern, ...)`. There is also a convenience function `graphBPH()`.

A `graphBPH` object consists of a `graphNEL` object, which must obey some strict rules:

- nodes in the graph are divided into two sets: normal nodes and edge-nodes,
- all edges in the graph must connect a normal node to an edge node,
- the graph must be a directed graph.

The `edgeNodePattern` is a regular expression that is used to define the set of edge-nodes.

## Slots

`graph`**:** Object of class `graphNEL`. This graph must obey the constraints described above.

`edgeNodePattern`**:** Object of class `character`. The regular expression used to define edge-nodes.

`nodes`**:** Object of class `character`. Records which nodes in the graph are normal nodes.

`edgeNodes`**:** Object of class `character`. Records which nodes in the graph are edge-nodes.

`edgeNodeIO`**:** Object of class `list`. Records information about which edges enter and exit each edge-node.

## Methods

**plot** `signature(x = "graphBPH", y = "ANY")`: draw a representation of the hypergraph where edges between normal nodes in the graph pass through an intermediate edge-node in a nice smooth curve.

**graphLayout** `signature(graph = "graphBPH", layoutType = "missing")`: convert the `graphBPH` object to a `RagraphBPH` object (using a default layout method).

**graphLayout** `signature(graph = "graphBPH", layoutType = "character")`: convert the `graphBPH` object to a `RagraphBPH` object (using the specified layout method).

## Author(s)

Paul Murrell

## References

Gansner, E.R. and and North, S.C. (1999) An open graph visualization system and its applications to software engineering, *Software - Practice and Experience*, 30:1203–1233.

Gentleman, R. and Whalen, E. and Huber, W. and Falcon, S. **graph**: A package to handle graph data structures.

Gentry, J. and Long, L. and Gentleman, R. and Falcon, S. and Hahne, F. and Sarkar, D. and Hansen, K. **Rgraphviz**: Provides plotting capabilities for R graph objects.

## See Also

agopen, graphLayout and graphNEL RagraphBPH

## Examples

```
nodes <- c(LETTERS[1:5], paste("R", 1:3, sep=""))
testgnel <- new("graphNEL",
                nodes=nodes,
                edgeL=list(
                  A=list(edges=c("R1", "R2")),
                  B=list(edges="R2"),
                  C=list(),
                  D=list(edges="R3"),
                  E=list(),
                  R1=list(edges="B"),
                  R2=list(edges=c("C", "D")),
                  R3=list(edges="E")),
                edgemode="directed")
testbph <- graphBPH(testgnel, "^R")
plot(testbph)

# A Hypergraph equivalent
require(hypergraph)
dh1 <- DirectedHyperedge("A", "B", "R1")
dh2 <- DirectedHyperedge(c("A", "B"), c("C", "D"), "R2")
dh3 <- DirectedHyperedge("D", "E", "R3")
hg <- Hypergraph(LETTERS[1:5], list(dh1, dh2, dh3))
plot(graphBPH(hg))
```

---

# graphLayout *Layout a graph.*

---

## Description

This function is designed to layout a graph using the **Rgraphviz** package. The **hyperdraw** package makes this a generic function with a method for graphBPH objects. The function of the same name in the **Rgraphviz** package is used as a method for Ragraph objects.

## Usage

```
graphLayout(graph, layoutType, ...)
```

## Arguments

| | |
|---|---|
| graph | An graphBPH object, which is to be laid out. |
| layoutType | The layout method (e.g., dot or neato). |
| ... | These arguments will be passed to the agopen() function. |

## Value

An RagraphBPH object.

## Author(s)

Paul Murrell

## References

Gansner, E.R. and and North, S.C. (1999) An open graph visualization system and its applications to software engineering, *Software - Practice and Experience*, 30:1203–1233.

Gentry, J. and Long, L. and Gentleman, R. and Falcon, S. and Hahne, F. and Sarkar, D. and Hansen, K. **Rgraphviz**: Provides plotting capabilities for R graph objects.

## See Also

agopen and GraphvizLayouts

## Examples

```
nodes <- c(LETTERS[1:5], paste("R", 1:3, sep=""))
testgnel <- new("graphNEL",
                nodes=nodes,
                edgeL=list(
                  A=list(edges=c("R1", "R2")),
                  B=list(edges="R2"),
                  C=list(),
                  D=list(edges="R3"),
                  E=list(),
                  R1=list(edges="B"),
                  R2=list(edges=c("C", "D")),
                  R3=list(edges="E")),
                edgemode="directed")
testbph <- new("graphBPH", testgnel, "^R")
testrabph <- graphLayout(testbph)
```

RagraphBPH-class *Class "RagraphBPH"*

## Description

The purpose of this class is to represent a laid out version of a graphBPH object. The laying out is performed by the **Rgraphviz** package. This is an intermediate step in the process of drawing a graphBPH object.

## Objects from the Class

Objects of this class should be created via the graphLayout() function.

## Slots

graph: Object of class Ragraph. The laid out graph.

allNodes: Object of class character. The names of all nodes in the graph.

nodes: Object of class character. Records normal nodes in the graph.

edgeNodes: Object of class character. Records edge-nodes in the graph.

edgeNodeIO: Object of class list. Records which edges enter and exit each edge-node.

## Methods

**plot** signature(x = "RagraphBPH", y = "ANY"): draw a representation of the hypergraph where edges between normal nodes in the graph pass through an intermediate edge-node in a nice smooth curve.

**edgeDataDefaults<-** signature(self = "RagraphBPH", attr = "character", value = "ANY"): set the default drawing attributes for all edges.

**edgeData<-** signature(self = "RagraphBPH", from = "character", to = "character", attr = "character", value = "ANY"): set a specific drawing attribute for one or more edges.

**nodeDataDefaults<-** signature(self = "RagraphBPH", attr = "character", value = "ANY"): set the default drawing attributes for all nodes.

**nodeData<-** signature(self = "RagraphBPH", n = "character", attr = "character", value = "ANY"): set a specific attribute for one or more nodes.

**graphDataDefaults<-** signature(self = "RagraphBPH", attr = "character", value = "ANY"): set the default drawing attributes for the graph.

**graphData<-** signature(self = "RagraphBPH", n = "character", attr = "character", value = "ANY"): set a specific attribute for the graph.

## Author(s)

Paul Murrell

## See Also

graphLayout, graphBPH, and Ragraph

## Examples

```
nodes <- c(LETTERS[1:5], paste("R", 1:3, sep=""))
testgnel <- new("graphNEL",
                nodes=nodes,
                edgeL=list(
                  A=list(edges=c("R1", "R2")),
                  B=list(edges="R2"),
                  C=list(),
                  D=list(edges="R3"),
                  E=list(),
                  R1=list(edges="B"),
                  R2=list(edges=c("C", "D")),
                  R3=list(edges="E")),
                edgemode="directed")
testbph <- graphBPH(testgnel, "^R")
testrabph <- graphLayout(testbph)
edgeDataDefaults(testrabph, "lwd") <- 1
edgeData(testrabph, c("A", "R1"), c("R1", "B"), "lwd") <- c("3", 5)
edgeDataDefaults(testrabph, "color") <- "black"
edgeData(testrabph, c("A", "R1"), c("R1", "B"), "color") <- "red"
nodeDataDefaults(testrabph, "margin") <- 'unit(2, "mm")'
nodeDataDefaults(testrabph, "shape") <- "circle"
plot(testrabph)
graphDataDefaults(testrabph, "arrowLoc") <- "middle"
graphData(testrabph, "arrowLoc") <- "end"
plot(testrabph)
graphData(testrabph, "arrowLoc") <- "none"
plot(testrabph)
```

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