

# Package ‘hyperdraw’

May 17, 2024

**Version** 1.57.0

**Depends** R (>= 2.9.0)

**Imports** methods, grid, graph, hypergraph, Rgraphviz, stats4

**SystemRequirements** graphviz

**Title** Visualizing Hypergraphs

**Author** Paul Murrell

**Maintainer** Paul Murrell <p.murrell@auckland.ac.nz>

**Description** Functions for visualizing hypergraphs.

**License** GPL (>= 2)

**Collate** AllClasses.R affine.R draw.R graphBPH.R grid.R hypergraph.R  
legacy.R node.R RagraphBPH.R

**biocViews** Visualization, GraphAndNetwork

**git\_url** <https://git.bioconductor.org/packages/hyperdraw>

**git\_branch** devel

**git\_last\_commit** ea89127

**git\_last\_commit\_date** 2024-04-30

**Repository** Bioconductor 3.20

**Date/Publication** 2024-05-17

## Contents

graphBPH . . . . .	2
graphBPH-class . . . . .	3
graphLayout . . . . .	4
RagraphBPH-class . . . . .	6

<b>Index</b>	<b>8</b>
--------------	----------

---

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 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 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)

```

# Index

- \* **classes**
  - graphBPH, 2
  - graphBPH-class, 3
  - RagraphBPH-class, 6
- \* **dplot**
  - graphLayout, 4

agopen, 4, 5

edgeData<- , RagraphBPH, character , character , character , ANY-method  
(RagraphBPH-class), 6

edgeDataDefaults<- , RagraphBPH, character , ANY-method  
(RagraphBPH-class), 6

graphBPH, 2, 7

graphBPH, graphNEL, character-method  
(graphBPH), 2

graphBPH, Hypergraph, missing-method  
(graphBPH), 2

graphBPH-class, 3

graphData<- , RagraphBPH, character , ANY-method  
(RagraphBPH-class), 6

graphDataDefaults<- , RagraphBPH, character , ANY-method  
(RagraphBPH-class), 6

graphLayout, 4, 4, 7

graphLayout, graphBPH, character-method  
(graphBPH-class), 3

graphLayout, graphBPH, missing-method  
(graphBPH-class), 3

graphNEL, 4

GraphvizLayouts, 5

nodeData<- , RagraphBPH, character , character , ANY-method  
(RagraphBPH-class), 6

nodeDataDefaults<- , RagraphBPH, character , ANY-method  
(RagraphBPH-class), 6

plot, graphBPH, ANY-method  
(graphBPH-class), 3

plot, RagraphBPH, ANY-method  
(RagraphBPH-class), 6

Ragraph, 7

RagraphBPH, 4

RagraphBPH (RagraphBPH-class), 6

RagraphBPH-class, 6