

# Package ‘bratteli’

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**Title** Deal with Bratteli Graphs

**Version** 1.0.0

**Description** Utilities for Bratteli graphs. A tree is an example of a Bratteli graph. The package provides a function which generates a 'LaTeX' file that renders the given Bratteli graph. It also provides functions to compute the dimensions of the vertices, the intrinsic kernels and the intrinsic distances. Intrinsic kernels and distances were introduced by Vershik (2014) <[doi:10.1007/s10958-014-1958-0](https://doi.org/10.1007/s10958-014-1958-0)>.

**License** GPL-3

**URL** <https://github.com/stla/bratteliR>

**BugReports** <https://github.com/stla/bratteliR/issues>

**Imports** data.table, diagram, gmp, kantorovich, utils

**Encoding** UTF-8

**RoxygenNote** 7.2.3

**NeedsCompilation** no

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**Repository** CRAN

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bratteliDimensions     *Bratteli dimensions*

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### Description

Dimensions of the vertices of a Bratteli graph.

### Usage

```
bratteliDimensions(Mn, N)
```

### Arguments

Mn                    a function returning for each integer n the incidence matrix between levels n and n+1; the matrix Mn(0) must have one and only one row

N                     the level up to which the dimensions are wanted

### Value

The dimensions of the vertices in a list.

### Examples

```
# the Pascal graph ####
Pascal <- function(n) {
  M <- matrix(0, nrow = n+1, ncol = n+2)
  for(i in 1:(n+1)) {
    M[i, ][c(i, i+1L)] <- 1
  }
  M
}
bratteliDimensions(Pascal, 4)

# the Euler graph ####
Euler <- function(n) {
  M <- matrix(0, nrow = n+1, ncol = n+2)
  for(i in 1:(n+1)) {
    M[i, ][c(i, i+1L)] <- c(i, n+2-i)
  }
  M
}
bratteliDimensions(Euler, 4)
```

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bratteliDistances      *Intrinsic distances*

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## Description

Intrinsic distances on a Bratteli graph

## Usage

```
bratteliDistances(Mn, N)
```

## Arguments

**Mn**                    a function returning for each integer  $n$  the incidence matrix between levels  $n$  and  $n+1$ ; the matrix  $Mn(0)$  must have one and only one row

**N**                      the level up to which the distances are wanted

## Value

The distance matrices in a list.

## Examples

```
# the Pascal graph ####
Pascal <- function(n) {
  M <- matrix(0, nrow = n+1, ncol = n+2)
  for(i in 1:(n+1)) {
    M[i, ][c(i, i+1L)] <- 1
  }
  M
}
bratteliDistances(Pascal, 4)

# the Euler graph ####
Euler <- function(n) {
  M <- matrix(0, nrow = n+1, ncol = n+2)
  for(i in 1:(n+1)) {
    M[i, ][c(i, i+1L)] <- c(i, n+2-i)
  }
  M
}
bratteliDistances(Euler, 4)
```

bratteliGraph

*LaTeX code drawing a Bratteli graph***Description**

Generate a LaTeX file containing TikZ code that renders a picture of a Bratteli graph.

**Usage**

```
bratteliGraph(
  outfile,
  Mn,
  N,
  edgelabels = NA,
  vertexlabels = "colnames",
  colorpath = NA,
  rootlabel = "\\varnothing",
  latex = TRUE,
  xscale = 50,
  yscale = 50,
  bending = 1,
  hor = FALSE,
  mirror = FALSE,
  northsouth = FALSE
)
```

**Arguments**

outfile	path to the output file
Mn	a function returning for each integer n the incidence matrix between levels n and n+1; the matrix Mn(0) must have one and only one row
N	the level up to which the graph is wanted
edgelabels	"default", "letters", "order", "kernels", NA, or a <i>vectorized</i> function with four arguments: the level of the graph, the index of the "from" vertex, the index of the "to" vertex, and the index of the edge among the multiple edges, if there are multiple edges
vertexlabels	"colnames" to use the column names of the matrices, "dims" to use the dimensions of the vertices, NA, or a function with one argument, the level of the graph, returning for level n the vector of labels at the n-th level
colorpath	an index of a path to be colored, or NA
rootlabel	a label for the root vertex of the graph
latex	Boolean, whether to enclose all labels between dollars
xscale, yscale	scaling factors for the graph
bending	curvature when there are multiple edges

hor	Boolean, whether to render a horizontal graph
mirror	Boolean, whether to "reverse" the graph
northsouth	Boolean, whether to draw the edges with endpoints at the bottom and the top of the vertex labels

**Value**

No return value; called to generate the LaTeX file.

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bratteliKernels	<i>Bratteli kernels</i>
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**Description**

Central kernels of a Bratteli graph.

**Usage**

```
bratteliKernels(Mn, N)
```

**Arguments**

Mn	a function returning for each integer n the incidence matrix between levels n and n+1; the matrix Mn(0) must have one and only one row
N	the level up to which the kernels are wanted

**Value**

The kernels in a list.

**Examples**

```
# the Pascal graph ####
Pascal <- function(n) {
  M <- matrix(0, nrow = n+1, ncol = n+2)
  for(i in 1:(n+1)) {
    M[i, ][c(i, i+1L)] <- 1
  }
  M
}
bratteliKernels(Pascal, 4)

# the Euler graph ####
Euler <- function(n) {
  M <- matrix(0, nrow = n+1, ncol = n+2)
  for(i in 1:(n+1)) {
    M[i, ][c(i, i+1L)] <- c(i, n+2-i)
  }
}
```

```
    M
  }
bratteliKernels(Euler, 4)
```

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