Package ‘ggsector’

Title Draw Sectors

Version 1.6.6

Description Some useful functions that can use 'grid' and 'ggplot2' to plot sectors and interact with 'Seurat' to plot gene expression percentages. Also, there are some examples of how to draw sectors in 'ComplexHeatmap'.

License Artistic-2.0

Encoding UTF-8

RoxygenNote 7.2.1

Suggests ComplexHeatmap, knitr, rmarkdown, reshape2, utils

Depends ggplot2, grid

Imports dplyr, magrittr, Matrix, prettydoc, rlang, Seurat, stats, tibble, tidyr

VignetteBuilder knitr

BugReports https://github.com/yanpd01/ggsector

NeedsCompilation no

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**draw_key_sector**

**Description**

`draw_key_sector`

**Usage**

`draw_key_sector(data, params, size)`

**Arguments**

- **data**: A single row data frame containing the scaled aesthetics to display in this key
- **params**: A list of additional parameters supplied to the geom.
- **size**: Width and height of key in mm.

**Value**

`ggplot legend`

---

**GeomSectorPanel**

**Description**

Draw sector with ggplot.

**Usage**

```r
geom_sector(
    mapping = NULL,
    data = NULL,
    stat = "identity",
    position = "identity",
    ...,
    na.rm = FALSE,
    show.legend = NA,
    inherit.aes = TRUE,
    individual = FALSE,
    verbose = TRUE
)
```
GeomSectorPanel

Arguments

mapping  Set of aesthetic mappings created by `aes()` or `aes_()`. If specified and `inherit.aes` = TRUE (the default), it is combined with the default mapping at the top level of the plot. You must supply `mapping` if there is no plot mapping.

data The data to be displayed in this layer. There are three options:
If NULL, the default, the data is inherited from the plot data as specified in the call to `ggplot()`.
A `data.frame`, or other object, will override the plot data. All objects will be fortified to produce a data frame. See `fortify()` for which variables will be created.
A function will be called with a single argument, the plot data. The return value must be a `data.frame`, and will be used as the layer data. A function can be created from a `formula` (e.g. `~ head(.x, 10)`).

stat The statistical transformation to use on the data for this layer, as a string.
position Position adjustment, either as a string, or the result of a call to a position adjustment function.

... Other arguments passed on to `layer()`. These are often aesthetics, used to set an aesthetic to a fixed value, like `colour = "red"` or `size = 3`. They may also be parameters to the paired geom/stat.

na.rm If FALSE, the default, missing values are removed with a warning. If TRUE, missing values are silently removed.

show.legend logical. Should this layer be included in the legends? NA, the default, includes if any aesthetics are mapped. FALSE never includes, and TRUE always includes. It can also be a named logical vector to finely select the aesthetics to display.

inherit.aes If FALSE, overrides the default aesthetics, rather than combining with them. This is most useful for helper functions that define both data and aesthetics and shouldn’t inherit behaviour from the default plot specification, e.g. `borders()`.

individual Logical, default is FALSE. When "individual=FALSE", draw very quickly with a vector form, when "individual=TRUE", draw individually at a slower speed. Anyway, for better presentation, please add `coord_fixed()`.

verbose Logical, default is TRUE. Whether to display reminder information.

Details

When "individual=FALSE", draw very quickly with a vector form, when "individual=TRUE", draw individually at a slower speed.

The required parameters in mapping are "x", "y", "theta", and the additional modifiable parameters are "r", "start", "r_start", "type", "colour", "fill", "ratio", "size" for line size, "linetype".

When there is `coord_fixed()`, r = 0.5 means that the sector-shaped background circle just fills the entire cell

The `ratio` parameter is still an experimental parameter, if it is not necessary, please do not set it yourself. The `ratio` parameter only works when `individual = FALSE`. When `ratio` is null, it will be auto calculated.

For better display effect, please always add `coord_fixed()`.
For details, please check the `grid.sector()`.
For more details, please type `vignette("ggsector")`.

**Value**

`ggplot` object

**Examples**

```r
## prepare data
library(ggsector)
library(reshape2)
df <- cor(mtcars)[1:3, 1:5] %>%
  abs() %>%
  melt(varnames = c("x", "y"))
###
## Note, for better display effect, please always add coord_fixed()
## Note, for better display effect, please always add coord_fixed()
## Note, for better display effect, please always add coord_fixed()
## theta
ggplot(df) +
## type = "percent", theta = 0-100
  geom_sector(
    aes(y, x, theta = value * 100),
    type = "percent",
    color = "blue",
    individual = TRUE
  ) +
## type = "degree", theta = 0-360
  geom_sector(
    aes(y, x, theta = value * 360),
    type = "degree",
    color = "red",
    alpha = 0.5,
    individual = TRUE
  ) +
  coord_fixed() +
  theme_bw() +
  theme(axis.title = element_blank())
## r
ggplot(df) +
  geom_sector(
    aes(y, x, theta = value * 100),
    r = rep(c(0.15, 0.3, 0.45), 5),
    fill = 2,
    individual = TRUE
  ) +
  coord_fixed() +
  theme_bw() +
```
theme(axis.title = element_blank())

## start
ggplot(df) +
  geom_sector(
    aes(y, x, theta = value * 100),
    start = rep(c(60, 40, 20), 5),
    fill = 2,
    individual = TRUE
  ) +
  coord_fixed() +
  theme_bw() +
  theme(axis.title = element_blank())

## r_start
ggplot(df) +
  geom_sector(
    aes(y, x, theta = value * 100),
    r_start = rep(c(0.15, 0.25, 0.35), 5),
    fill = 2,
    individual = TRUE
  ) +
  coord_fixed() +
  theme_bw() +
  theme(axis.title = element_blank())

# x = x, y = y
ggplot(rbind(
  cbind(df, t1 = 1),
  cbind(df[1:9, ], t1 = 2)
)) +
  facet_wrap(-t1, ncol = 2) +
  geom_sector(
    aes(x, y),
    theta = 75,
    fill = 2,
    r = 0.5,
    individual = TRUE
  ) +
  coord_fixed() +
  theme_bw() +
  theme(axis.title = element_blank())

# x = y, y = x
ggplot(rbind(
  cbind(df, t1 = 1),
  cbind(df[1:9, ], t1 = 2)
)) +
facet_wrap(~t1, ncol = 2) +
geom_sector(
  aes(y, x),
  theta = 75,
  fill = 2,
  r = 0.5,
  individual = TRUE
) +
coord_fixed() +
theme_bw() +
theme(axis.title = element_blank())

## `individual = FALSE` + coord_fixed()
## x = x, y = y
ggplot(rbind(
  cbind(df, t1 = 1),
  cbind(df[,1:9, ], t1 = 2)
)) +
  facet_wrap(~t1, ncol = 2) +
  geom_sector(
    aes(x, y),
    theta = 75,
    fill = 2,
    r = 0.5,
    individual = FALSE
  ) +
  coord_fixed() +
  theme_bw() +
  theme(axis.title = element_blank())

# x = y, y = x
ggplot(rbind(
  cbind(df, t1 = 1),
  cbind(df[,1:9, ], t1 = 2)
)) +
  facet_wrap(~t1, ncol = 2) +
  geom_sector(
    aes(y, x),
    theta = 75,
    fill = 2,
    r = 0.5,
    individual = TRUE
  ) +
  coord_fixed() +
  theme_bw() +
  theme(axis.title = element_blank())

############### individual without coord_fixed() ###############
## If you are in a special situation and cannot use coord_fixed(),
## then it is recommended that you use `individual = TRUE` and
## the `r` parameter to fine-tune.
## Also, to reduce the radius, you need to try it manually.
```r
## 'individual = TRUE' without coord_fixed()
# x = x, y = y
ggplot(rbind(
    cbind(df, t1 = 1),
    cbind(df[1:9, ], t1 = 2)
)) +
  facet_wrap(~t1, ncol = 2) +
  geom_sector(
    aes(x, y),
    theta = 75,
    fill = 2,
    r = 0.35, ## To reduce the radius, you need to try it manually
    individual = TRUE
  ) +
  theme_bw() +
  theme(axis.title = element_blank())

## 'individual = FALSE'
## If you really want to use 'individual = FALSE' without coord_fixed(),
## you might try the experimental parameter 'ratio'
## You need to manually adjust the 'ratio' value
## to prevent sector deformation.
# x = x, y = y
ggplot(rbind(
    cbind(df, t1 = 1),
    cbind(df[1:9, ], t1 = 2)
)) +
  facet_wrap(~t1, ncol = 2) +
  geom_sector(
    aes(y, x),
    theta = 75,
    fill = 2,
    r = 0.25, ## To reduce the radius, you need to try it manually
    individual = TRUE
  ) +
  theme_bw() +
  theme(axis.title = element_blank())

## 'individual = FALSE'
## 'r = 0.5, ## You need to manually adjust the 'ratio' value
## to prevent sector deformation.
ratio = 1.6,
individual = FALSE
```
```r
library(ggplot2)

# x = y, y = x
ggplot(rbind(
  cbind(df, t1 = 1),
  cbind(df[1:9, ], t1 = 2)
)) +
  facet_wrap(~t1, ncol = 2) +
  geom_sector(
    aes(y, x),
    theta = 75,
    fill = 2,
    r = 0.5,
    ## You need to manually adjust the 'ratio' value
    ## to prevent sector deformation.
    ratio = 1.6,
    individual = FALSE
  ) +
  # coord_fixed() +
  theme_bw() +
  theme(axis.title = element_blank())
```

---

**sectorGrob**

**Draw sector with grid**

**Description**

`sectorGrob()` return a polygon grob. `grid.sector()` draw sector. For more details, please type `vignette("ggsector")`.

**Usage**

```r
sectorGrob(
  x = 0.5,
  y = 0.5,
  theta = 25,
  r = 0.5,
  start = 0,
  r_start = 0,
  type = "percent",
  ratio = 1,
  group,
  default.units = "npc",
  vp = viewport(height = unit(1, "snpc"), width = unit(1, "snpc")),
  gp = gpar(col = "black", fill = "transparent")
)```

grid.sector(
  x = 0.5,
  y = 0.5,
  theta = 25,
  r = 0.5,
  start = 0,
  r_start = 0,
  type = "percent",
  ratio = 1,
  group,
  default.units = "npc",
  vp = viewport(height = unit(1, "snpc"), width = unit(1, "snpc")),
  gp = gpar(col = "black", fill = "transparent")
)

Arguments

x Numeric, the x-axis coordinate of the sector center.
y Numeric, the y-axis coordinate of the sector center.
theta Numeric, the angle of the sector, if 'type = "percent"', the input is a percentage(0-100), if 'type = "degree"', the input is an angle(0-360).
r Numeric, radius of the outer circle of the sector(0-0.5).
start Numeric, starting angle of sector.
r_start Numeric, radius of the inner circle of the sector(0-r).
type "percent", "degree" or an integer (preferably greater than 50), represents the number of scattered points on the circle where the sector is drawn. When type = "percent", the circumference of the circle where the sector is located is composed of 100 scattered points; when type = "degree", the circumference of the circle where the sector is located is composed of 360 scattered points; when type = 150, the circumference of the circle where the sector is located is composed of 150 scattered points.
ratio aspect ratio, expressed as y / x.
group A numeric vector used to separate locations in x and y into multiple sectors. If missing, it will be automatically added as a number.
default.units A string indicating the default units to use if x, y, width, or height are only given as numeric vectors.
vp A Grid viewport object (or NULL).
gp An object of class "gpar", typically the output from a call to the function gpar. This is basically a list of graphical parameter settings.

Value

draw sector
Examples

## Draw basic grid

# sectorGrob with units of "cm" and type of "degree"
grid.newpage()
gp <- sectorGrob(
  x = unit(c(3, 9, 15), "cm"),
  y = unit(c(5, 9, 15), "cm"),
  theta = c(90, 180, 270),
  r = 1,
  start = c(180, 180, 270),
  r_start = c(0.6, 0.3, 0),
  type = "degree",
  group = factor(1:3, levels = c(2, 3, 1)),
  gp = gpar(fill = c("green", "red", "blue"))
)
grid.draw(gp)

# grid.sector with units of "npc" and type of "percent"
grid.newpage()
grid.sector(
  x = c(0.1, 0.5, 0.9),
  y = c(0.9, 0.6, 0.1),
  theta = c(25, 50, 90),
  r = .1,
  start = c(25, 50, 100),
  r_start = c(0.06, 0.03, 0),
  type = "percent",
  group = factor(1:3, levels = c(2, 3, 1)),
  gp = gpar(col = c("green", "red", "blue"), fill = 2:4),
  default.units = "npc"
)

## Draw sector with ComplexHeatmap

# prepare data
library(magrittr)
library(ComplexHeatmap)
t0 <- cor(mtcars) %>%
  set_colnames(paste("y_", colnames(.))) %>%
  set_rownames(paste("x_", rownames(.)))
mat <- abs(t0)
mat[1:5, 1:5]

# Realized by modifying the [grid::viewport()], 
# the sector can be set with a fixed width and height
set.seed(1)
Heatmap(
  mat,
  name = "vp",
  rect_gp = gpar(type = "none"),
cell_fun = function(j, i, x, y, width, height, fill) {
    grid.rect(
        x = x, y = y, width = width, height = height,
        gp = gpar(col = "grey", fill = NA)
    )
    grid.sector(
        theta = mat[i, j] * 100,
        r = 0.5,
        start = mat[i, j] * 100 * runif(1),
        r_start = mat[i, j] * 0.49 * runif(1),
        vp = viewport(x, y, width, height),
        gp = gpar(fill = fill, col = "transparent")
    )
},
width = unit(.7, "snpc"),
height = unit(.7, "snpc")
)

# Realized in the form of coordinates + radius.
# The default viewport locks the horizontal and vertical axes
# so that the sector does not deform, which needs to be removed here.
# The radius 'r' is half the min(length, width).
set.seed(2)
Heatmap(
    mat,
    name = "xy + r",
    rect_gp = gpar(type = "none"),
    cell_fun = function(j, i, x, y, width, height, fill) {
        grid.rect(
            x = x, y = y, width = width, height = height,
            gp = gpar(col = "grey", fill = NA)
        )
        r <- as.numeric(min(width, height)) / 2
        grid.sector(
            x,
            y,
            theta = mat[i, j] * 100,
            r = r,
            start = mat[i, j] * 100 * runif(1),
            r_start = mat[i, j] * r * 0.9 * runif(1),
            vp = NULL,
            gp = gpar(fill = fill, col = "transparent")
        )
    },
    width = unit(.7, "snpc"),
    height = unit(.7, "snpc")
)

# layer full
# The input matrix needs to be extracted with pindex(mat, i, j)
set.seed(3)
Heatmap(
    mat,
SectorPlot

name = "layer",
rect_gp = gpar(type = "none"),
layer_fun = function(j, i, x, y, width, height, fill) {
  grid.rect(
    x = x, y = y, width = width, height = height,
    gp = gpar(col = "grey", fill = NA)
  )
  r <- as.numeric(min(width, height)) / 2
  grid.sector(
    x, y,
    theta = pindex(mat, i, j) * 100,
    r = r,
    start = pindex(mat, i, j) * 100 * runif(nrow(mat) * ncol(mat)),
    r_start = pindex(mat, i, j) * r * 0.9 * runif(nrow(mat) * ncol(mat)),
    vp = NULL,
    gp = gpar(fill = fill, col = "transparent")
  )
},
width = unit(.7, "snpc"),
height = unit(.7, "snpc")
}

---

**SectorPlot**

*Draw sector for seurat object*

**Description**

A better alternative to `Seurat::DotPlot()`. For more details, please type vignette("ggsector").

**Usage**

```r
SectorPlot(  
  object,  
  features,  
  features.level,  
  assay,  
  slot = c("data", "scale.data", "counts"),  
  group.by,  
  group.level,  
  split.by,  
  split.level,  
  col_low = "blue",  
  col_mid = "white",  
  col_high = "red",  
  col_midpoint,  
  ...
)
```
SectorPlot

Arguments

- **object**: Seurat object
- **features**: Input vector of genes list.
- **features.level**: Levels of genes list.
- **assay**: Specific assay to get data from or set data for; defaults to the default assay.
- **slot**: Specific assay data to get or set.
- **group.by**: Column of metadata to group the cells by, default is Idents().
- **group.level**: Levels of group.
- **split.by**: Column of metadata to split the cells by, default is NULL.
- **split.level**: Levels of split vars.
- **col_low**: Colours for low ends of the gradient.
- **col_mid**: Colour for mid point.
- **col_high**: Colours for high ends of the gradient.
- **col_midpoint**: The midpoint (in data value) of the diverging scale.
- **...**: Other arguments for `ggplot2::facet_wrap()`. Defaults to `quantile(exp, 0.5)`

Value

`ggplot`

Examples

```r
## Download pbmc data from
# https://cf.10xgenomics.com/samples/cell/pbmc3k/pbmc3k_filtered_gene_bc_matrices.tar.gz
library(Seurat)
path <- paste0(tempdir(), "/pbmc3k.tar.gz")
file <- paste0(tempdir(), "/filtered_gene_bc_matrices/hg19")
download.file(
  "https://cf.10xgenomics.com/samples/cell/pbmc3k/pbmc3k_filtered_gene_bc_matrices.tar.gz",
  path
)
untar(path, exdir = tempdir())
pbmc.data <- Read10X(data.dir = file)
pbmc <- CreateSeuratObject(
  counts = pbmc.data,
  project = "pbmc3k",
  min.cells = 3,
  min.features = 200
)
pbmc <- NormalizeData(pbmc)
pbmc <- FindVariableFeatures(pbmc, selection.method = "vst", nfeatures = 2000)
pbmc <- ScaleData(pbmc, features = rownames(pbmc))
pbmc <- RunPCA(pbmc)
pbmc <- RunUMAP(pbmc, dim = 1:10)
pbmc <- FindNeighbors(pbmc, dims = 1:10)
```
pbmc <- FindClusters(pbmc, resolution = 1)
pbmc <- FindClusters(pbmc, resolution = 0.5)
markers <- tibble::tribble(~type, ~marker,
                          "Naive CD4+ T", "IL7R,CCR7",
                          "CD14+ Mono", "CD14,LYZ",
                          "Memory CD4+", "IL7R,S100A4",
                          "B", "MS4A1",
                          "CD8+ T", "CD8A",
                          "FCGR3A+ Mono", "FCGR3A,MS4A7",
                          "NK", "GNLY,NKG7",
                          "DC", "FCER1A,CST3",
                          "Platelet", "PPBP",
                        ) %>%
tidyr::separate_rows(marker, sep = ",
                        ) %>%
dplyr::distinct()

# Dotplot
DotPlot(pbmc, features = unique(markers$marker)) + coord_flip()

# contrast with DotPlot
SectorPlot(pbmc, markers$marker, features.level = unique(rev(markers$marker)))
SectorPlot(pbmc, markers$marker, group.by = "RNA_snn_res.1")

# split plot
# Assume a variable 'day', expressed as the number of days of cell development.
set.seed(1)
pbmc["day"] <- sample(1:3, ncol(pbmc), TRUE)
SectorPlot(pbmc, markers$marker, group.by = "RNA_snn_res.0.5", split.by = "day")
SectorPlot(  pbmc, markers$marker,
              group.by = "day", split.by = "RNA_snn_res.0.5", nrow = 1
)

---

**sector_df**

**sector coordinates**

**Description**

According to the input center position, radius and angle, get the polygon coordinates of a sector.

**Usage**

```
sector_df(
  x = 0.5,
  y = 0.5,
  theta = 25,
)```
sector_df

r = 0.5,
start = 0,
r_start = 0,
type = "percent",
ratio = 1
)

sector_df_multiple(
  x = 0.5,
y = 0.5,
theta = 25,
r = 0.5,
start = 0,
r_start = 0,
type = "percent",
ratio = 1,
group
)

Arguments

x       Numeric, the x-axis coordinate of the sector center.
y       Numeric, the y-axis coordinate of the sector center.
theta   Numeric, the angle of the sector, if 'type = "percent"', the input is a percentage(0-100), if 'type = "degree"', the input is an angle(0-360).
r       Numeric, radius of the outer circle of the sector(0-0.5).
start   Numeric, starting angle of sector.
r_start Numeric, radius of the inner circle of the sector(0-r).
type    "percent", "degree" or an integer (preferably greater than 50), represents the number of scattered points on the circle where the sector is drawn. When type = "percent", the circumference of the circle where the sector is located is composed of 100 scattered points; when type = "degree", the circumference of the circle where the sector is located is composed of 360 scattered points; when type = 150, the circumference of the circle where the sector is located is composed of 150 scattered points.
ratio   aspect ratio, expressed as y / x.
group   A numeric vector used to separate locations in x and y into multiple sectors. If missing, it will be automatically added as a number.

Details

sector_df() Only one value can be passed in for each parameter, and a sector coordinate is returned.

sector_df_multiple() Each parameter can pass in multiple values, and return multiple sector coordinates
The value of the 'type' parameter is "percent", "degree" or an integer (preferably greater than 50), represents the number of scattered points on the circle where the sector is drawn. When type = "percent", the circumference of the circle where the sector is located is composed of 100 scattered points; when type = "degree", the circumference of the circle where the sector is located is composed of 360 scattered points.

For more details, please type vignette("ggsector").

**Value**

coordinates of sector.
coordinates of sectors.

**Examples**

```r
## coordinates of single sector
# type of percent, start = 0, r_start = 0
tmp_df <- sector_df(x = 0.5, y = 0.5, theta = 25, r = 0.4, start = 0, r_start = 0)
tmp_df
grid.newpage()
grid.polygon(
  tmp_df$x, tmp_df$y,
  vp = viewport(height = unit(1, "snpc"), width = unit(1, "snpc"))
)
# type of percent, start = 50, r_start = 0.2
tmp_df <- sector_df(x = 0.5, y = 0.5, theta = 25, r = 0.4, start = 50, r_start = 0.2)
tmp_df
grid.newpage()
grid.polygon(
  tmp_df$x, tmp_df$y,
  vp = viewport(height = unit(1, "snpc"), width = unit(1, "snpc"))
)
# type of degree, start = 90, r_start = 0
tmp_df <- sector_df(
  x = 0.5, y = 0.5, theta = 180, r = 0.4,
  start = 90, r_start = 0, type = "degree"
)
tmp_df
grid.newpage()
grid.polygon(
  tmp_df$x, tmp_df$y,
  vp = viewport(height = unit(1, "snpc"), width = unit(1, "snpc"))
)
# type of degree, start = 180, r_start = 0.2
tmp_df <- sector_df(
  x = 0.5, y = 0.5, theta = 180, r = 0.4,
  start = 270, r_start = 0.2, type = "degree"
)
tmp_df
grid.newpage()
grid.polygon(
```
tmp_df$x, tmp_df$y,
  vp = viewport(height = unit(1, "snpc"), width = unit(1, "snpc")))
}

## Coordinates of Multiple Sectors
tmp_df <- sector_df_multiple(
  x = c(0.2, 0.5, 0.8),
  theta = c(25, 50, 75),
  r = 0.15,
  start = c(75, 50, 100),
  r_start = c(0, 0.05, 0.1),
  type = "percent"
)
tmp_df
grid.newpage()
grid.polygon(
  tmp_df$x,
  tmp_df$y,
  id = tmp_df$group,
  vp = viewport(height = unit(1, "snpc"), width = unit(1, "snpc")),
  gp = gpar(
    fill = 3:1, col = 1:3
  )
)

# type = 10, 100, 1000
tmp_df <- sector_df_multiple(
  x = c(0.25, 0.5, 0.75),
  theta = c(7.5, 75, 750),
  r = 0.125,
  r_start = c(0.05),
  type = c(10, "percent", 1000))
tmp_df
grid.newpage()
grid.polygon(
  tmp_df$x,
  tmp_df$y,
  id = tmp_df$group,
  vp = viewport(height = unit(1, "snpc"), width = unit(1, "snpc")),
  gp = gpar(
    fill = 3:1, col = 1:3
  )
)
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