

Package ‘gginnards’

October 16, 2022

Type Package

Title Explore the Innards of 'ggplot2' Objects

Version 0.1.1

Date 2022-10-15

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Description Extensions to 'ggplot2' providing low-level debug tools: statistics and geometries echoing their data argument. Layer manipulation: deletion, insertion, extraction and reordering of layers. Deletion of unused variables from the data object embedded in ``ggplot'' objects.

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LazyLoad TRUE

ByteCompile TRUE

Depends R (>= 3.6.0), ggplot2 (>= 3.3.1)

Imports utils, methods, rlang (>= 0.4.0), stringr (>= 1.4.0), magrittr (>= 1.5), tibble (>= 2.1.0)

Suggests knitr (>= 1.24), rmarkdown (>= 1.14), sf (>= 0.9), pryr (>= 0.1.4)

URL <https://www.r4photobiology.info>,
<https://github.com/aphalo/gginnards>

BugReports <https://github.com/aphalo/gginnards/issues>

Encoding UTF-8

RoxygenNote 7.2.1

VignetteBuilder knitr

NeedsCompilation no

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Repository CRAN

Date/Publication 2022-10-16 00:23:27 UTC

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Description

Extensions to 'ggplot2' providing low-level debug tools: statistics and geometries echoing their data argument. Layer manipulation: deletion, insertion, extraction and reordering of layers. Deletion of unused variables from the data object embedded in "ggplot" objects.

Details

The new facilities for cleanly defining new stats and geoms added to package 'ggplot2' in version 2.0.0 gave origin to this package. I needed tools to help me learn how layers work and to debug the extensions to 'ggplot2' that I was developing. I share them through this package in the hope that they will help other users of 'ggplot2' understand how this very popular graphics package works internally. The vignettes provide examples of how to use these tools both for debugging and learning how ggplots are stored.

Extensions provided:

- "Debug" stats and a "debug" geom that print to the console a summary of their data input.
- Functions for inspecting and manipulating the list of layers of a ggplot object.
- Functions for exploring and manipulating the data embedded in ggplot objects, including dropping unused variables.

Author(s)

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References

Package 'tidyverse' web site at <https://www.tidyverse.org/>
 Package 'ggplot2' documentation at <https://ggplot2.tidyverse.org/>
 Package 'ggplot2' source code at <https://github.com/tidyverse/ggplot2>

See Also

Useful links:

- <https://www.r4photobiology.info>
- <https://github.com/aphalo/gginnards>
- Report bugs at <https://github.com/aphalo/gginnards/issues>

Examples

```
# echo to the R console \code{data} as received by geoms
ggplot(mtcars, aes(cyl, mpg, color = factor(cyl))) +
  geom_point() +
  geom_debug()

# echo to the R console \code{data} as received by geoms
ggplot(mtcars, aes(cyl, mpg, colour = factor(cyl))) +
  stat_summary(fun.data = "mean_se") +
  stat_summary(fun.data = "mean_se", geom = "debug")

# echo to the R console \code{data} received by \code{compute_panel()}
ggplot(mtcars, aes(cyl, mpg, color = factor(cyl))) +
  geom_point() +
  stat_debug_panel()

# echo to the R console \code{data} received by \code{compute_group()}
ggplot(mtcars, aes(cyl, mpg, color = factor(cyl))) +
  geom_point() +
  stat_debug_group()
```

delete_layers

Layer manipulation.

Description

Delete, move or append one or more layers in a ggplot object.

Usage

```
delete_layers(x, match_type = NULL, idx = NULL)

append_layers(x, object, position = "top")

move_layers(x, match_type = NULL, position = "top", idx = NULL)

shift_layers(x, match_type = NULL, idx = NULL, shift = 1L)

which_layers(x, match_type = NULL, idx = NULL)
```

```
extract_layers(x, match_type = NULL, idx = NULL)
```

```
top_layer(x)
```

```
bottom_layer(x)
```

```
num_layers(x)
```

Arguments

<code>x</code>	an object of class <code>gg</code> to be operated upon.
<code>match_type</code>	The name of the <code>ggproto</code> object class for the <code>geom(s)</code> , <code>position(s)</code> or <code>stat(s)</code> matching that of the layers to be operated upon.
<code>idx</code>	integer vector Index into the list of layers used to select the layers to be operated upon.
<code>object</code>	a <code>ggplot</code> layer created by a <code>geom_</code> or <code>stat_</code> function or a list of such layers or an empty list.
<code>position</code>	character or interger, the position of the layer immediately above of which to move or append the moved or appended layers.
<code>shift</code>	integer.

Details

These functions must be used with care as they select all layers matching the provided `geom`, `position` or `stat` `ggproto` object class. Layers added with a `stat` do use a `geom`, and vice versa.

One and only one of `match_type` and `idx` must be passed a non-null argument.

In plots with several layers, it is possible that more than one layer matches the class name passed to `match_type`. It is also possible to pass a numeric vector with multiple indexes through parameter `idx`. In both cases multiple layers will be operated upon, but their relative positions will remain unchanged.

If a numeric vector with multiple position indexes is supplied as argument for `position`, the top-most position will be used. As indexing in R starts at 1, passing 0 or "bottom" as argument for `position` puts the moved or appended layer(s) behind all other layers (prepends the layer).

Value

An edited copy of `x` for `delete_layers`, `append_layers` and `move_layers`. An integer vector of indexes giving the positions of the matching layers in the list of layers contained in `x` in the case of `which_layers`.

Note

The functions described here are not expected to be useful in everyday plotting as one can more easily change the order in which layers are added to a `ggplot`. However, if one uses high level methods or functions that automatically produce a full plot using 'ggplot2' internally, one may need to add, move or delete layers so as to profit from such canned methods and retain enough flexibility.

References

<https://stackoverflow.com/questions/13407236/remove-a-layer-from-a-ggplot2-chart>

Examples

```
df <- data.frame(
  gp = factor(rep(letters[1:3], each = 10)),
  y = rnorm(30)
)
p <- ggplot(df, aes(gp, y)) +
  geom_point() +
  stat_summary(fun.data = "mean_se", colour = "red")

p
delete_layers(p, "GeomPoint")
delete_layers(p, "StatSummary")
move_layers(p, "GeomPoint", position = "top")
move_layers(p, "GeomPointrange", position = "bottom")
move_layers(p, "StatSummary", position = "bottom")
move_layers(p, "GeomPointrange", position = 1L)
append_layers(p, geom_line(colour = "orange"), position = "bottom")
append_layers(p, geom_line(colour = "orange"), position = 1L)
extract_layers(p, "GeomPoint")
ggplot(df, aes(gp, y)) + extract_layers(p, "GeomPoint")
which_layers(p, "GeomPoint")
num_layers(p)
top_layer(p)
bottom_layer(p)
num_layers(ggplot())
top_layer(ggplot())
bottom_layer(ggplot())

if (requireNamespace("sf", quietly = TRUE)) {
  nc <- sf::st_read(system.file("shape/nc.shp", package = "sf"), quiet = TRUE)
  nc_3857 <- sf::st_transform(nc, 3857)

  p.sf1 <- ggplot() +
    geom_sf(data = nc)

  p.sf1
  num_layers(p.sf1)
  top_layer(p.sf1)

  append_layers(p.sf1,
    geom_sf(data = nc_3857, colour = "red", fill = NA),
    position = "top")

  p.sf2 <- ggplot() +
    geom_sf(data = nc) +
    geom_sf(data = nc_3857, colour = "red", fill = NA)

  p.sf2
  num_layers(p.sf2)
  top_layer(p.sf2)
  delete_layers(p.sf2, idx = 2L)
```

```

extract_layers(p.sf2, "GeomSf")
extract_layers(p.sf2, "StatSf")
extract_layers(p.sf2, idx = 1L)
p.sf1 + extract_layers(p.sf2, idx = 2L)

# beware that Coords are not extracted!
ggplot() + extract_layers(p.sf2, idx = 2L) + coord_sf()
}

```

drop_vars

Explore and manipulate the embedded data.

Description

Automatically remove unused variables from the "default" data object embedded in a gg or ggplot object with `drop_vars()`. Explore data variables and their use with `mapped_vars()`, `data_vars()` and `data_attributes()`.

Usage

```

drop_vars(p, keep.vars = character(), guess.vars = TRUE)

mapped_vars(p, invert = FALSE)

data_vars(p)

data_attributes(p)

```

Arguments

<code>p</code>	ggplot Plot object with embedded data.
<code>keep.vars</code>	character Names of unused variables to be kept.
<code>guess.vars</code>	logical Flag indicating whether to find used variables automatically.
<code>invert</code>	logical If TRUE return indices for elements of data that are not mapped to any aesthetic or facet.

Value

A "ggplot" object that is a copy of `p` but containing only a subset of the variables in its default data.

character vector with names of mapped variables in the default data object.

character vector with names of all variables in the default data object.

list containing all attributes of the default data object.

Warning!

The current implementation drops variables only from the default data object. Data objects within layers are not modified.

Note

These functions are under development and not yet thoroughly tested! They are a demonstration of how one can manipulate the internals of ggplot objects created with 'ggplot2' versions 3.1.0 and later. These functions may stop working after some future update to the 'ggplot2' package. Although I will maintain this package for use in some of my other packages, there is no guarantee that I will be able to achieve this transparently.

Obviously, rather than using function drop_vars() after creating the ggplot object it is usually more efficient to select the variables of interest and pass a data frame containing only these to the ggplot() constructor.

Examples

```
library(ggplot2)

p <- ggplot(mpg, aes(factor(year), (cty + hwy) / 2)) +
  geom_boxplot() +
  facet_grid(. ~ class)

mapped_vars(p) # those in use
mapped_vars(p, invert = TRUE) # those not used

p.dp <- drop_vars(p) # we drop unused vars

# number of columns in the data member
ncol(p$data)
ncol(p.dp$data)

# which vars are in the data member
data_vars(p)
data_vars(p.dp)

# which variables in data are used in the plot
mapped_vars(p)
mapped_vars(p.dp)

# the plots identical
p
p.dp

# structure and size of p
str(p, max.level = 0)
str(p.dp, max.level = 0) # smaller in size

# structure and size of p["data"]
str(p, components = "data")
str(p.dp, components = "data") # smaller in size
```

```
# shape data
if (requireNamespace("sf", quietly = TRUE)) {
  nc <- sf::st_read(system.file("shape/nc.shp", package = "sf"), quiet = TRUE)

  p.sf <- ggplot(data = nc) +
    geom_sf()
  p.sf
  mapped_vars(p.sf)
  drop_vars(p.sf)
}
```

geom_debug

Geom that prints input data to console.

Description

The debug geom is used to print to the console a summary of the data being received by geoms as input data data frame.

Usage

```
geom_debug(
  mapping = NULL,
  data = NULL,
  stat = "identity",
  summary.fun = "head",
  summary.fun.args = list(),
  parse = NULL,
  nudge_x = 0,
  nudge_y = 0,
  position = "identity",
  na.rm = FALSE,
  show.legend = FALSE,
  inherit.aes = TRUE,
  ...
)
```

```
geom_debug_npc(
  mapping = NULL,
  data = NULL,
  stat = "identity",
  summary.fun = "head",
  summary.fun.args = list(),
  parse = NULL,
  nudge_x = 0,
  nudge_y = 0,
```



```

    position = "identity",
    na.rm = FALSE,
    show.legend = FALSE,
    inherit.aes = TRUE,
    ...
  )

```

Arguments

mapping	Set of aesthetic mappings created by <code>aes</code> or <code>aes_</code> . If specified and <code>inherit.aes = TRUE</code> (the default), is combined with the default mapping at the top level of the plot. You only need to supply mapping if there isn't a mapping defined for the plot.
data	A data frame. If specified, overrides the default data frame defined at the top level of the plot.
stat	The statistical transformation to use on the data for this layer, as a string.
summary.fun	The name of a function as a character string (or a function) to be used to summarize the data object received as input before printing it.
summary.fun.args	A list of additional arguments to be passed to <code>summary.fun</code> .
parse	Ignored. Helps avoid warnings.
nudge_x, nudge_y	Horizontal and vertical adjustments to nudge the starting position. The units for <code>nudge_x</code> and <code>nudge_y</code> are the same as for the data units on the x-axis and y-axis.
position	Position adjustment, either as a string, or the result of a call to a position adjustment function.
na.rm	If <code>FALSE</code> (the default), removes missing values with a warning. If <code>TRUE</code> silently removes missing values.
show.legend	logical. Should this layer be included in the legends? <code>NA</code> , the default, includes if any aesthetics are mapped. <code>FALSE</code> never includes, and <code>TRUE</code> always includes.
inherit.aes	If <code>FALSE</code> , 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. <code>borders</code> .
...	other arguments passed on to <code>layer</code> . There are three types of arguments you can use here: <ul style="list-style-type: none"> • Aesthetics: to set an aesthetic to a fixed value, like <code>color = "red"</code> or <code>size = 3</code>. • Other arguments to the layer, for example you override the default <code>stat</code> associated with the layer. • Other arguments passed on to the <code>stat</code>.

Details

It can be useful when debugging the code of statistics or to learn how the stats and geoms work in 'ggplot2' (>= 2.0.0).

The intended use of this geometry is to help explore the data as they are added to a plot layer. It is very unusual in that it does not produce visible graphic output. It only returns a `grid.null()` grob (graphical object) when the plot is rendered. Also, differently to normal geometries, it passes its data input as argument to the first parameter of the function passed as argument to `summary.fun`. The value returned by this function is then printed to the R console. If `summary.fun = NULL`, the whole data object is printed.

Nudging with `nudge_x` and `nudge_y` behave as in [geom_text](#). Arguments passed to `position` are obeyed. So the effects of positions are reflected in the data object printed or summarized to the R console. The argument passed to `parse` is currently ignored.

Many aesthetics are defined as optional so that they are accepted silently by `geom_debug()` and handled by 'ggplot2' as usual.

If the argument passed to `summary.fun()` is a character string, the name will appear in the header of the printout. However, the function must be available at the time the plot is rendered. If a function is passed as argument, its definition will be saved as part of the "gg" object.

Value

The panel function of this geometry always returns a [nullGrob](#), the legend is also set to [nullGrob](#). This geometry used for its text printing side effect.

See Also

To access data, scales and grobs in a built ggplot, see [ggplot_build](#).

Examples

```
# echo to the R console \code{data} as received by geoms
ggplot(mtcars, aes(cyl, mpg, color = factor(cyl))) +
  geom_point() +
  geom_debug()

ggplot(mtcars, aes(cyl, mpg, color = factor(cyl))) +
  geom_point() +
  geom_debug(summary.fun = "head", summary.fun.args = list(n = 3))

ggplot(mtcars, aes(cyl, mpg, color = factor(cyl))) +
  geom_point() +
  geom_debug(summary.fun = "nrow")

ggplot(mtcars, aes(cyl, mpg, color = factor(cyl))) +
  geom_point() +
  geom_debug(summary.fun = "attributes")

# echo to the R console \code{data} as received by geoms
ggplot(mtcars, aes(cyl, mpg, colour = factor(cyl))) +
  stat_summary(fun.data = "mean_se") +
  stat_summary(fun.data = "mean_se", geom = "debug", summary.fun = NULL)

# shape data is not passed to geometries or statistics
if (requireNamespace("sf", quietly = TRUE)) {
```

```
nc <- sf::st_read(system.file("shape/nc.shp", package = "sf"), quiet = TRUE)

ggplot(data = nc) +
  geom_sf(color = "darkblue", fill = "white") +
  geom_debug()
}
```

geom_null

A null geom or 'no-op' geom.

Description

The null geom can be used to silence graphic output from a stat, such as `stat_debug_group()` and `stat_debug_panel()` defined in this same package. No visible graphical output is returned. An invisible `grid::grid_null()` grob is returned instead.

Usage

```
geom_null(
  mapping = NULL,
  data = NULL,
  stat = "identity",
  position = "identity",
  na.rm = FALSE,
  show.legend = FALSE,
  inherit.aes = TRUE,
  ...
)
```

Arguments

mapping	Set of aesthetic mappings created by aes . If specified and <code>inherit.aes = TRUE</code> (the default), are combined with the default mapping at the top level of the plot. You only need to supply mapping if there isn't a mapping defined for the plot.
data	A data frame. If specified, overrides the default data frame defined at the top level of the plot.
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.
na.rm	If <code>FALSE</code> (the default), removes missing values with a warning. If <code>TRUE</code> silently removes missing values.
show.legend	logical. Should this layer be included in the legends? <code>NA</code> , the default, includes if any aesthetics are mapped. <code>FALSE</code> never includes, and <code>TRUE</code> always includes.
inherit.aes	If <code>FALSE</code> , 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 .

... other arguments passed on to `layer`. There are three types of arguments you can use here:

- Aesthetics: to set an aesthetic to a fixed value, like `color = "red"` or `size = 3`.
- Other arguments to the layer, for example you override the default stat associated with the layer.
- Other arguments passed on to the stat.

Value

A plot layer instance. Mainly used for the side-effect of printing to the console the data object.

Note

This geom is very unusual in that it does not produce visible graphic output. It only returns a `grid.null` grob (graphical object). However, it accepts for consistency all the same parameters as normal geoms, which have no effect on the graphical output, except for `show.legend`.

Examples

```
ggplot(mtcars) +
  geom_null()

ggplot(mtcars, aes(cyl, mpg)) +
  geom_null()

# shape data

if (requireNamespace("sf", quietly = TRUE)) {
  nc <- sf::st_read(system.file("shape/nc.shp", package = "sf"), quiet = TRUE)

  ggplot(data = nc) +
    geom_null()
}
```

stat_debug_group

Print to console data received by the compute group function.

Description

`stat_debug` reports all distinct values in `group` and `PANEL`, and `nrow`, `ncol` and the names of the columns or variables, and the class of `x` and `y` for each group in a `ggplot` as passed to the `compute_group` function in the `ggproto` object.

Usage

```

stat_debug_group(
  mapping = NULL,
  data = NULL,
  geom = "null",
  summary.fun = "head",
  summary.fun.args = list(),
  geom.summary.fun = NULL,
  geom.summary.fun.args = list(),
  position = "identity",
  na.rm = FALSE,
  show.legend = FALSE,
  inherit.aes = TRUE,
  ...
)

```

Arguments

mapping	The aesthetic mapping, usually constructed with aes or aes_ . Only needs to be set at the layer level if you are overriding the plot defaults.
data	A layer specific dataset - only needed if you want to override the plot defaults.
geom	The geometric object to use display the data
summary.fun, geom.summary.fun	A function used to print the data object received as input.
summary.fun.args, geom.summary.fun.args	A named list.
position	The position adjustment to use for overlapping points on this layer
na.rm	a logical value indicating whether NA values should be stripped before the computation proceeds.
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.
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 .
...	other arguments passed on to layer . This can include aesthetics whose values you want to set, not map. See layer for more details.

Details

This stat is meant to be used for the side-effect of printing to the console the data object received as input by the `compute_grroup()` function, or a summary of it. This is the same as for any other statistics passed the same arguments (including defaults that may need to be overridden if they differ).

In principle any geom can be passed as argument to override "null". Keep in mind that this stat sets default mappings only for the *x* and *y* aesthetics: `geom_debug()` and `geom_text()` are useful.


```
      geom = "text")

# here we show all the data object
ggplot(my.df, aes(x,y)) +
  geom_point() +
  stat_debug_group(summary.fun = NULL)

ggplot(my.df, aes(x,y)) +
  geom_point() +
  stat_debug_group(summary.fun = "nrow")

# with grouping
ggplot(my.df, aes(x,y, colour = group)) +
  geom_point() +
  stat_debug_group()

ggplot(my.df, aes(x,y)) +
  geom_point() +
  facet_wrap(~group) +
  stat_debug_group()

# by default head() is used to show the top rows of data object
ggplot(my.df, aes(group,y)) +
  geom_point() +
  stat_debug_group()
```

stat_debug_panel

Print to console data received by the compute panel function.

Description

stat_debug reports all distinct values in group and PANEL, and nrow, ncol and the names of the columns or variables, and the class of x and y for each panel in a ggplot as passed to the compute_panel function in the ggproto object.

Usage

```
stat_debug_panel(  
  mapping = NULL,  
  data = NULL,  
  geom = "null",  
  summary.fun = "head",  
  summary.fun.args = list(),  
  geom.summary.fun = NULL,  
  geom.summary.fun.args = list(),  
  position = "identity",  
  na.rm = FALSE,  
  show.legend = FALSE,
```

```

  inherit.aes = TRUE,
  ...
)

```

Arguments

mapping	The aesthetic mapping, usually constructed with <code>aes</code> or <code>aes_</code> . Only needs to be set at the layer level if you are overriding the plot defaults.
data	A layer specific dataset - only needed if you want to override the plot defaults.
geom	The geometric object to use display the data
summary.fun, geom.summary.fun	A function used to print the data object received as input.
summary.fun.args, geom.summary.fun.args	A named list.
position	The position adjustment to use for overlapping points on this layer
na.rm	a logical value indicating whether NA values should be stripped before the computation proceeds.
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.
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. <code>borders</code> .
...	other arguments passed on to <code>layer</code> . This can include aesthetics whose values you want to set, not map. See <code>layer</code> for more details.

Details

This stat is meant to be used for the side-effect of printing to the console the data object received as input by the `compute_panel()` function, or a summary of it. This is the same as for any other statistics passed the same arguments (including defaults that may need to be overridden if they differ).

In principle any geom can be passed as argument to override "null". Keep in mind that this stat sets default mappings only for the x and y aesthetics: `geom_debug()` and `geom_text()` are useful.

Value

A tibble with a summary of the data received, which is not printed by default using `geom_null()`. Can be printed by passing `geom = "debug"`.

Computed variables

x x at centre of range
y y at centre of range
nrow `nrow()` of data object
ncol `ncol()` of data object

colnames colnames() of data object
colclasses class() of x and y columns in data object
group all distinct values in group as passed in data object
PANEL all distinct values in PANEL as passed in data object

See Also

Other diagnosis functions: [stat_debug_group\(\)](#)

Examples

```
my.df <- data.frame(x = rep(1:10, 2),
                   y = rep(c(1,2), c(10,10)) + rnorm(20),
                   group = rep(c("A","B"), c(10,10)))

# by default head() is used to show the top rows of data object
# and geom_null() to silence the data returned by the stat
ggplot(my.df, aes(x,y)) +
  geom_point() +
  stat_debug_panel()

# geom_debug prints the data returned by the stat
ggplot(my.df, aes(x,y)) +
  geom_point() +
  stat_debug_panel(geom = "debug")

# to print only the the data returned by the stat
# we pass as summary function a function that always returns NULL
ggplot(my.df, aes(x,y)) +
  geom_point() +
  stat_debug_panel(geom = "debug",
                  summary.fun = function(x) {NULL})

ggplot(my.df, aes(x,y)) +
  geom_point() +
  stat_debug_panel(aes(label = sprintf("nrow = %i, ncol = %i, colnames: %s",
                                     after_stat(nrow),
                                     after_stat(ncol),
                                     after_stat(colnames))),
                  geom = "text")

# here we show all the data object
ggplot(my.df, aes(x,y)) +
  geom_point() +
  stat_debug_panel(summary.fun = NULL)

ggplot(my.df, aes(x,y)) +
  geom_point() +
  stat_debug_panel(summary.fun = "nrow")

# with grouping
```

```

ggplot(my.df, aes(x,y, colour = group)) +
  geom_point() +
  stat_debug_panel(summary.fun = NULL)

ggplot(my.df, aes(x,y)) +
  geom_point() +
  facet_wrap(~group) +
  stat_debug_panel()

# by default head() is used to show the top rows of data object
ggplot(my.df, aes(group,y)) +
  geom_point() +
  stat_debug_panel()

```

str

Show the structure of a ggplot object.

Description

A `str()` method tailored to objects of class "ggplot". It adds to the output the size of the object, and the ability to subset individual components.

Usage

```

## S3 method for class 'ggplot'
str(
  object,
  ...,
  max.level = 1,
  components = TRUE,
  vec.len = 2,
  list.len = 99,
  give.attr = FALSE,
  comp.str = "$ ",
  nest.lev = 0,
  indent.str = paste(rep.int(" ", max(0, nest.lev + 1)), collapse = ".."),
  size = TRUE
)

```

Arguments

<code>object</code>	ggplot Plot object with embedded data.
<code>...</code>	accept additional parameter arguments
<code>max.level</code>	integer Maximum depth of recursion (of lists within lists ...) to be printed.
<code>components</code>	Vector of components to print, as indexes into object.

vec.len	integer Approximate maximum length allowed when showing the first few values of a vector.
list.len	integer Maximum number of components to show of any list that will be described.
give.attr	logical Flag, determining whether a description of attributes will be shown.
comp.str	character String to be used for separating list components.
nest.lev	numeric current nesting level in the recursive calls to <code>str()</code> .
indent.str	character String used for each level of indentation.
size	logical Flag, should the size of the object in bytes be printed?

Value

A NULL is returned invisibly. While a description of the structure of `p` or its components will be printed in outline form as a "side-effect", with indentation for each level of recursion, showing the internal storage mode, class(es) if any, attributes, and first few elements of each data vector. By default each level of list recursion is indicated and attributes enclosed in angle brackets.

Note

In the case of objects with a nested structure `str()` is called recursively and dispatched according to the class of each nested member.

See Also

A [summary](#) method for class `ggplot` is defined by package `'ggplot2'`. Method `summary()` provides a more compact description of "ggplot" objects than method `str()`. Here we provide a wrapper on R's `str()` with different default arguments. A summary does not directly describe how the different components of an R object are stored, while the structure does.

Examples

```
p <- ggplot(mpg, aes(factor(year), (cty + hwy) / 2)) +
  geom_boxplot() +
  geom_point(color = "red") +
  facet_grid(. ~ class) +
  ggtitle("Example plot")

p

# str(p) vs. summary(p)
str(p)
summary(p) # from package 'ggplot2'

# structure of p at 2 levels of nesting
str(p, max.level = 2, size = FALSE)

# top level structure and size of p
str(p, max.level = 0)
```

```
# names of ggplot members
names(p)

# structure and size of p["data"]
str(p, max.level = 2, components = "data")

# structure and size of p["layers"]
str(p, max.level = 1, components = "layers")
```

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