

Package ‘scatterplot3d’

July 17, 2025

Version 0.3-44

Date 2023-05-05

Title 3D Scatter Plot

Author

Uwe Ligges <ligges@statistik.tu-dortmund.de>, Martin Maechler, Sarah Schnackenberg

Maintainer Uwe Ligges <ligges@statistik.tu-dortmund.de>

Description Plots a three dimensional (3D) point cloud.

Depends R (>= 2.7.0)

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Encoding UTF-8

Imports grDevices, graphics, stats

NeedsCompilation no

Repository CRAN

Date/Publication 2023-05-05 09:20:09 UTC

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Description

Plots a three dimensional (3D) point cloud.

Usage

```
scatterplot3d(x, y=NULL, z=NULL, color=par("col"), pch=par("pch"),
  main=NULL, sub=NULL, xlim=NULL, ylim=NULL, zlim=NULL,
  xlab=NULL, ylab=NULL, zlab=NULL, scale.y=1, angle=40,
  axis=TRUE, tick.marks=TRUE, label.tick.marks=TRUE,
  x.ticklabs=NULL, y.ticklabs=NULL, z.ticklabs=NULL,
  y.margin.add=0, y.axis.offset=1, grid=TRUE, box=TRUE,
  lab=par("lab"), lab.z=mean(lab[1:2]), type="p",
  highlight.3d=FALSE, mar=c(5,3,4,3)+0.1, bg=par("bg"),
  col.axis=par("col.axis"), col.grid="grey", col.lab=par("col.lab"),
  cex.symbols=par("cex"), cex.axis=0.8 * par("cex.axis"),
  cex.lab=par("cex.lab"), font.axis=par("font.axis"),
  font.lab=par("font.lab"), lty.axis=par("lty"),
  lty.grid=par("lty"), lty.hide=NULL, lty.hplot=par("lty"),
  log="", asp=NA, ...)
```

Arguments

<code>x</code>	the coordinates of points in the plot.
<code>y</code>	the y coordinates of points in the plot, optional if <code>x</code> is an appropriate structure.
<code>z</code>	the z coordinates of points in the plot, optional if <code>x</code> is an appropriate structure.
<code>color</code>	colors of points in the plot, optional if <code>x</code> is an appropriate structure. Will be ignored if <code>highlight.3d = TRUE</code> .
<code>pch</code>	plotting "character", i.e. symbol to use.
<code>main</code>	an overall title for the plot.
<code>sub</code>	sub-title.
<code>xlim, ylim, zlim</code>	the x, y and z limits (min, max) of the plot. Note that setting enlarged limits may not work as exactly as expected (a known but unfixed bug).
<code>xlab, ylab, zlab</code>	titles for the x, y and z axis.
<code>scale.y</code>	scale of y axis related to x- and z axis.
<code>angle</code>	angle between x and y axis (Attention: result depends on scaling).
<code>axis</code>	a logical value indicating whether axes should be drawn on the plot.
<code>tick.marks</code>	a logical value indicating whether tick marks should be drawn on the plot (only if <code>axis = TRUE</code>).
<code>label.tick.marks</code>	a logical value indicating whether tick marks should be labeled on the plot (only if <code>axis = TRUE</code> and <code>tick.marks = TRUE</code>).
<code>x.ticklabs, y.ticklabs, z.ticklabs</code>	vector of tick mark labels.
<code>y.margin.add</code>	add additional space between tick mark labels and axis label of the y axis
<code>y.axis.offset</code>	a numeric (default 1) specifying the offset of y axis tick mark labels from the axis, see offset argument of text .
<code>grid</code>	a logical value indicating whether a grid should be drawn on the plot.

<code>box</code>	a logical value indicating whether a box should be drawn around the plot.
<code>lab</code>	a numerical vector of the form <code>c(x, y, len)</code> . The values of <code>x</code> and <code>y</code> give the (approximate) number of tickmarks on the <code>x</code> and <code>y</code> axes.
<code>lab.z</code>	the same as <code>lab</code> , but for <code>z</code> axis.
<code>type</code>	character indicating the type of plot: "p" for points, "l" for lines, "h" for vertical lines to x-y-plane, etc.
<code>highlight.3d</code>	points will be drawn in different colors related to <code>y</code> coordinates (only if <code>type = "p"</code> or <code>type = "h"</code> , else color will be used). On some devices not all colors can be displayed. In this case try the postscript device or use <code>highlight.3d = FALSE</code> .
<code>mar</code>	A numerical vector of the form <code>c(bottom, left, top, right)</code> which gives the lines of margin to be specified on the four sides of the plot. See section Values on how to change the setting back to the default / previous setting.
<code>bg</code>	background (fill) color for the open plot symbols given by <code>pch = 21:25</code> .
<code>col.axis, col.grid, col.lab</code>	the color to be used for axis / grid / axis labels.
<code>cex.symbols</code>	the magnification to be used for point symbols.
<code>cex.axis, cex.lab</code>	the magnification to be used for axis annotation and labels relative to the current.
<code>font.axis, font.lab</code>	the font to be used for axis annotation / labels.
<code>lty.axis, lty.grid</code>	the line type to be used for axis / grid.
<code>lty.hide</code>	line style used to plot 'non-visible' edges (defaults of the <code>lty.axis</code> style)
<code>lty.hplot</code>	the line type to be used for vertical segments with <code>type = "h"</code> .
<code>log</code>	Not yet implemented! A character string which contains "x" (if the <code>x</code> axis is to be logarithmic), "y", "z", "xy", "xz", "yz", "xyz".
<code>asp</code>	numeric, giving the aspect ratio <code>z/x</code> or <code>z/y</code> , see 'Note'.
<code>...</code>	more graphical parameters can be given as arguments, <code>pch = 16</code> or <code>pch = 20</code> may be nice.

Value

<code>xyz.convert</code>	function which converts coordinates from 3D (<code>x</code> , <code>y</code> , <code>z</code>) to 2D-projection (<code>x</code> , <code>y</code>) of <code>scatterplot3d</code> . Useful to plot objects into existing plot.
<code>points3d</code>	function which draws points or lines into the existing plot.
<code>plane3d</code>	function which draws a plane into the existing plot: <code>plane3d(Intercept, x.coef = NULL, y.coef = NULL, lty = "dashed", lty.box = NULL, draw_lines = TRUE, draw_polygon = FALSE, polygon_args = list(border = NA, col = rgb(0,0,0,0.2)), ...)</code> . Instead of <code>Intercept</code> a vector containing 3 elements or an (g)lm object can be specified. The argument <code>lty.box</code> allows to set a different line style for the intersecting lines in the box's walls. The arguments <code>draw_lines</code> and <code>draw_polygon</code> allow for choosing whether to represent the plane via line segments or as a solid surface, respectively. The list in <code>polygon_args</code> collects arguments to be passed to the underlying <code>polygon</code> call that draws a solid (or transparent) plane if <code>draw_polygon=TRUE</code> .

<code>box3d</code>	function which “refreshes” the box surrounding the plot.
<code>contour3d</code>	function which draws contour lines into the existing plot: <code>contour3d(f, x.count = 10, y.count = 10, type = "l", lty = "24", x.resolution = 50, y.resolution = 50, ...)</code> . The first argument can be an <code>lm</code> object of two dimensions or a function of two arguments. In both cases the dimensions have to be given in the order <code>x, y</code> of the <code>scatterplot3d</code> call. The arguments <code>x.count</code> and <code>y.count</code> specify how many segments should be drawn for each dimension. The arguments <code>x.resolution</code> and <code>y.resolution</code> control the number of locations where the segments have to be evaluated.
<code>par.mar</code>	As the function modifies the <code>par("mar")</code> settings of the current device and needs to keep these in case you add elements to the plot later on, you can change these back via <code>par(object\$par.mar)</code> in case you want to add more plots with default margins to the current device.

Note

Some graphical parameters should only be set as arguments in `scatterplot3d` but not in a previous `par()` call. One of these is `mar`, which is also non-standard in another way: Users who want to extend an existing `scatterplot3d` graphic with another function than `points3d`, `plane3d` or `box3d`, should consider to set `par(mar = c(b, l, t, r))` to the value of `mar` used in `scatterplot3d`, which defaults to `c(5, 3, 4, 3) + 0.1`.

Other `par` arguments may be split into several arguments in `scatterplot3d`, e.g., for specifying the line type. And finally some of `par` arguments do not apply here, e.g., many of those for axis calculation. So we recommend to try the specification of graphical parameters at first as arguments in `scatterplot3d` and only if needed as arguments in previous `par()` call.

If `asp` is a finite positive value then the window is set up so that one data unit in the `x` or `y` direction (the one that is plotted horizontally - depends on angle -) is equal in length to `asp × one data unit` in the `z` direction. The variation of `asp` is only reasonable if the default values `x.ticklabs=NULL`, `y.ticklabs=NULL`, `z.ticklabs=NULL` are not changed.

Author(s)

Uwe Ligges <ligges@statistik.tu-dortmund.de>, Martin Maechler, Sarah Schnackenberg

References

Ligges, U., and Maechler, M. (2003): Scatterplot3d – an R Package for Visualizing Multivariate Data. *Journal of Statistical Software* 8(11), 1–20. doi:10.18637/jss.v008.i11

See Also

`persp`, `plot`, `par`.

Examples

```
## On some devices not all colors can be displayed.
## Try the postscript device or use highlight.3d = FALSE.

## example 1
```

```

z <- seq(-10, 10, 0.01)
x <- cos(z)
y <- sin(z)
scatterplot3d(x, y, z, highlight.3d=TRUE, col.axis="blue",
  col.grid="lightblue", main="scatterplot3d - 1", pch=20, mar=c(0,0,0,0))

## example 2
temp <- seq(-pi, 0, length = 50)
x <- c(rep(1, 50) %*% t(cos(temp)))
y <- c(cos(temp) %*% t(sin(temp)))
z <- c(sin(temp) %*% t(sin(temp)))
scatterplot3d(x, y, z, highlight.3d=TRUE,
  col.axis="blue", col.grid="lightblue",
  main="scatterplot3d - 2", pch=20)

## example 3
temp <- seq(-pi, 0, length = 50)
x <- c(rep(1, 50) %*% t(cos(temp)))
y <- c(cos(temp) %*% t(sin(temp)))
z <- 10 * c(sin(temp) %*% t(sin(temp)))
color <- rep("green", length(x))
temp <- seq(-10, 10, 0.01)
x <- c(x, cos(temp))
y <- c(y, sin(temp))
z <- c(z, temp)
color <- c(color, rep("red", length(temp)))
scatterplot3d(x, y, z, color, pch=20, zlim=c(-2, 10),
  main="scatterplot3d - 3")

## example 4
my.mat <- matrix(runif(25), nrow=5)
dimnames(my.mat) <- list(LETTERS[1:5], letters[11:15])
my.mat # the matrix we want to plot ...

s3d.dat <- data.frame(cols=as.vector(col(my.mat)),
  rows=as.vector(row(my.mat)),
  value=as.vector(my.mat))
scatterplot3d(s3d.dat, type="h", lwd=5, pch=" ",
  x.ticklabs=colnames(my.mat), y.ticklabs=rownames(my.mat),
  color=grey(25:1/40), main="scatterplot3d - 4")

## example 5
data(trees)
s3d <- scatterplot3d(trees, type="h", highlight.3d=TRUE,
  angle=55, scale.y=0.7, pch=16, main="scatterplot3d - 5")
# Now adding some points to the "scatterplot3d"
s3d$points3d(seq(10,20,2), seq(85,60,-5), seq(60,10,-10),
  col="blue", type="h", pch=16)
# Now adding a regression plane to the "scatterplot3d"
attach(trees)
my.lm <- lm(Volume ~ Girth + Height)
s3d$plane3d(my.lm, lty.box = "solid")

```

```
## example 6; by Martin Maechler
cubedraw <- function(res3d, min = 0, max = 255, cex = 2, text. = FALSE)
{
  ## Purpose: Draw nice cube with corners
  cube01 <- rbind(c(0,0,1), 0, c(1,0,0), c(1,1,0), 1, c(0,1,1), # < 6 outer
                 c(1,0,1), c(0,1,0)) # <- "inner": fore- & back-ground
  cub <- min + (max-min)* cube01
  ## visibile corners + lines:
  res3d$points3d(cub[c(1:6,1,7,3,7,5) ,], cex = cex, type = 'b', lty = 1)
  ## hidden corner + lines
  res3d$points3d(cub[c(2,8,4,8,6),      ], cex = cex, type = 'b', lty = 3)
  if(text.)## debug
    text(res3d$xyz.convert(cub), labels=1:nrow(cub), col='tomato', cex=2)
}
## 6 a) The named colors in R, i.e. colors()
cc <- colors()
crgb <- t(col2rgb(cc))
par(xpd = TRUE)
rr <- scatterplot3d(crgb, color = cc, box = FALSE, angle = 24,
  xlim = c(-50, 300), ylim = c(-50, 300), zlim = c(-50, 300))
cubedraw(rr)
## 6 b) The rainbow colors from rainbow(201)
rbc <- rainbow(201)
Rrb <- t(col2rgb(rbc))
rR <- scatterplot3d(Rrb, color = rbc, box = FALSE, angle = 24,
  xlim = c(-50, 300), ylim = c(-50, 300), zlim = c(-50, 300))
cubedraw(rR)
rR$points3d(Rrb, col = rbc, pch = 16)
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