

# Package ‘scatterplot3d’

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**Title** 3D Scatter Plot

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

**Depends** R (>= 2.7.0)

**License** GPL-2

**Encoding** latin1

**Imports** grDevices, graphics, stats

**NeedsCompilation** no

**Repository** CRAN

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## R topics documented:

|                         |          |
|-------------------------|----------|
| scatterplot3d . . . . . | 1        |
| <b>Index</b>            | <b>7</b> |

---

|               |                        |
|---------------|------------------------|
| scatterplot3d | <i>3D Scatter Plot</i> |
|---------------|------------------------|

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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, 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**

|                                    |   |
|------------------------------------|---|
| x                                  | the coordinates of points in the plot.  |
| y                                  | the y coordinates of points in the plot, optional if x is an appropriate structure.   |
| z                                  | the z coordinates of points in the plot, optional if x is an appropriate structure.   |
| color                              | colors of points in the plot, optional if x is an appropriate structure. Will be ignored if <code>highlight.3d = TRUE</code> .                      |
| pch                                | plotting "character", i.e. symbol to use.   |
| main                               | an overall title for the plot.  |
| sub                                | sub-title.  |
| xlim, ylim, zlim                   | 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).      |
| xlab, ylab, zlab                   | titles for the x, y and z axis.   |
| scale.y                            | scale of y axis related to x- and z axis.   |
| angle                              | angle between x and y axis (Attention: result depends on scaling).  |
| axis                               | a logical value indicating whether axes should be drawn on the plot.  |
| tick.marks                         | a logical value indicating whether tick marks should be drawn on the plot (only if <code>axis = TRUE</code> ).                                      |
| label.tick.marks                   | 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> ). |
| x.ticklabs, y.ticklabs, z.ticklabs | vector of tick mark labels.   |
| y.margin.add                       | add additional space between tick mark labels and axis label of the y axis  |
| grid                               | a logical value indicating whether a grid should be drawn on the plot.  |
| box                                | a logical value indicating whether a box should be drawn around the plot.   |

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

### Value

|             |  |
|-------------|--|
| xyz.convert | function which converts coordinates from 3D ( $x, y, z$ ) to 2D-projection ( $x, y$ ) of scatterplot3d. Useful to plot objects into existing plot.   |
| points3d    | function which draws points or lines into the existing plot.   |
| plane3d     | function which draws a plane into the existing plot: <code>plane3d(Intercept, x.coef = NULL, y.coef = NULL, z.coef = NULL, lty.box = NULL, draw_lines = TRUE, draw_polygon = FALSE, polygon_args = ...)</code> . Instead of Intercept 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> . |

|           |  |
|-----------|--|
| box3d     | function which “refreshes” the box surrounding the plot.   |
| contour3d | function which draws contour lines into the existing plot: <code>contour3d(f, x.count = 10, y.count = 10)</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. |
| par.mar   | 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)

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### References

Ligges, U., and Maechler, M. (2003): Scatterplot3d – an R Package for Visualizing Multivariate Data. *Journal of Statistical Software* 8(11), 1–20. <http://www.jstatsoft.org/>

### 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)

## 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)

```

# Index

\*Topic **hplot**

scatterplot3d, 1

par, 4

persp, 4

plot, 4

polygon, 3

scatterplot3d, 1