

The Traditional R Graphical System

Main source: *R Graphics* by Paul Murrell

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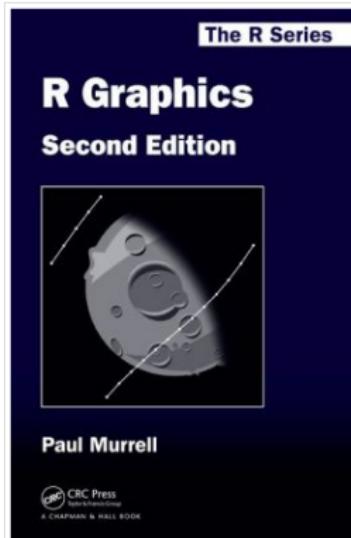
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Main source: Paul Murrell's R Graphics

This book probably contains all the information you will need.



Other useful sources

1. <https://www.stat.auckland.ac.nz/~paul/RGraphics/rgraphics.html>
(Source code for all plots in *R Graphics*.)
2. <https://www.harding.edu/fmccown/r/>
(Useful for learning high-level plots.)
3. <http://www.statmethods.net/graphs/>
(Useful for learning basic plotting parameters.)
4. <http://research.stowers-institute.org/mcm/efg/R/Graphics/Basics/mar-oma/index.htm>
(Useful for learning margin details.)

Introduction

Why use R for graphics ?

1. R is open source.
2. De facto programming language for statisticians.
3. Publication quality graphs: with fine control.
4. Easy to implement and maintain your own graphical ideas from scratch.
5. Huge support community (Books, Stack Overflow, etc).

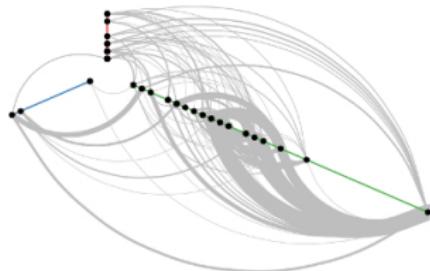
Goal for today:

- ▶ Describe the **traditional R graphics system**.

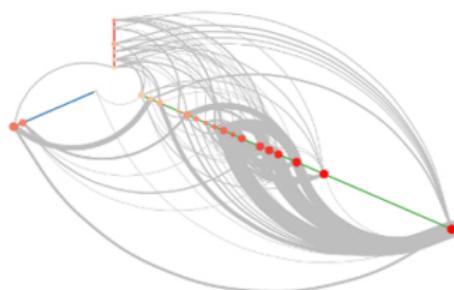
Outline

1. Examples: high-level and low-level plotting functions.
2. Graphical Regions:
 - 1.Plot region,
 - 2.Figure region, and
 - 3.Outer margins.
3. Detailed example: MA-plot and volcano plot.

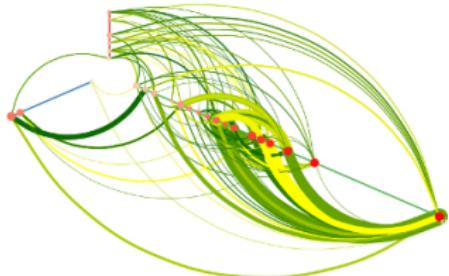
Example: Network (Gene Clusters)



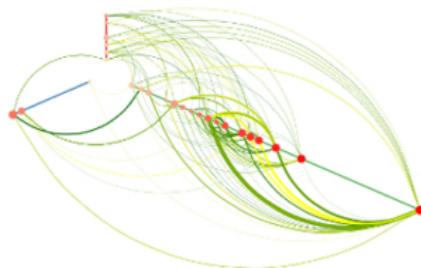
A



B



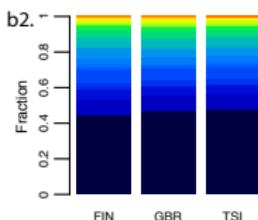
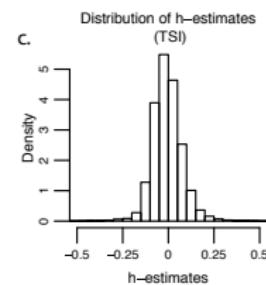
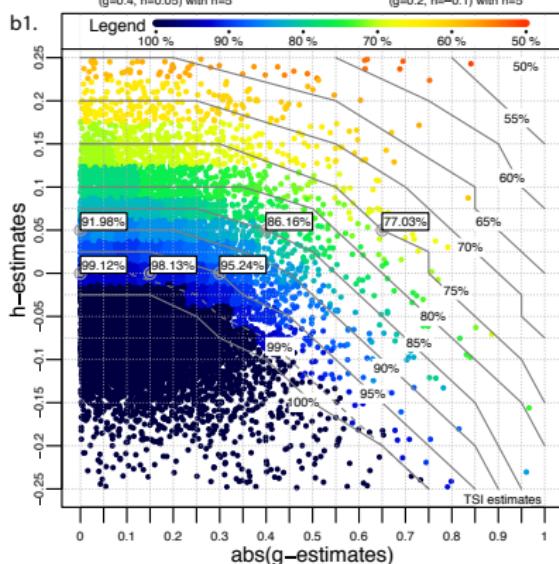
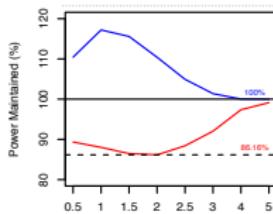
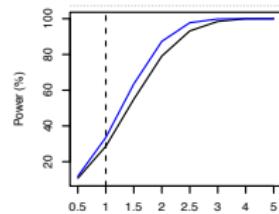
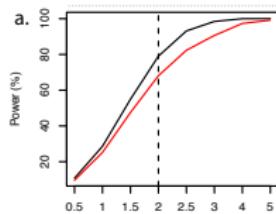
C



D

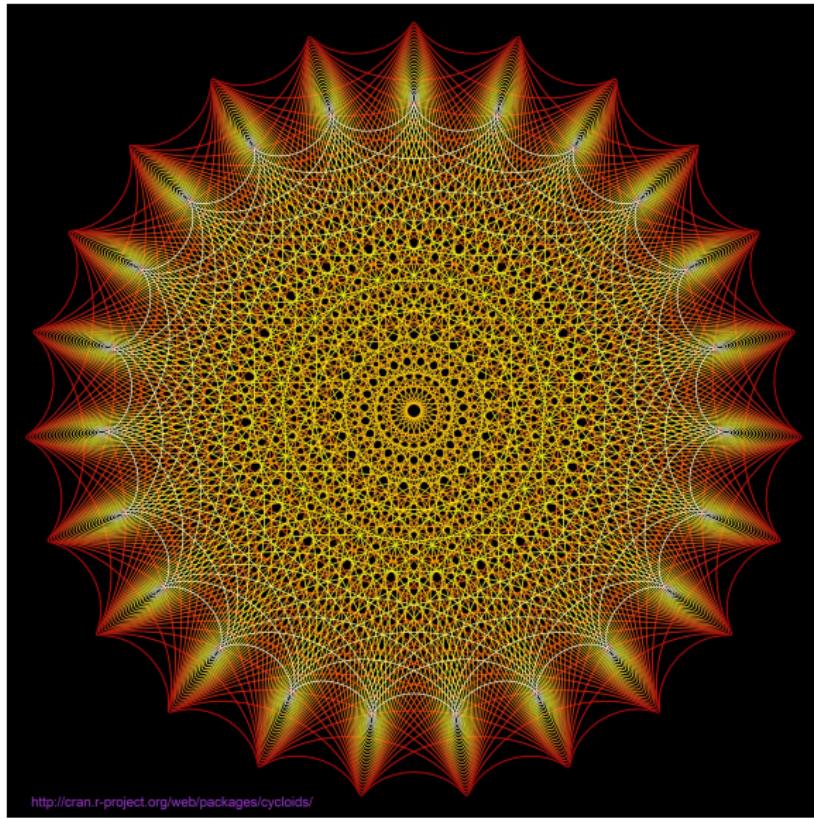
¹<http://www.vesnam.com/Rblog/viznets3/>

Example - Multiple Plots (From Scratch)



2

Just cool



<http://cran.r-project.org/web/packages/cycloids/>

3

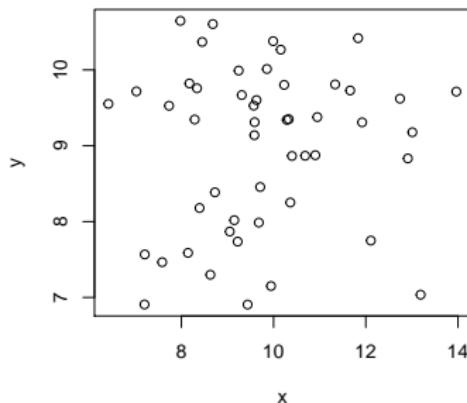
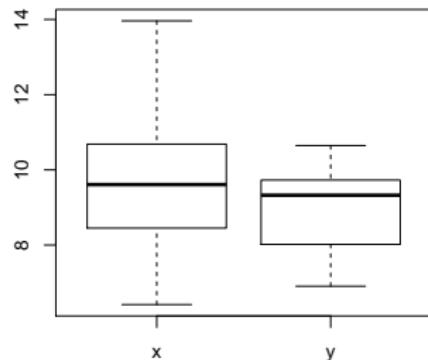
³<http://cran.r-project.org/web/packages/cycloids/>

High-level plotting functions

High-level functions are used to produce “complete” plots.

There are tons of high-level plots in R. Below we show 2 examples **plot()** and **boxplot()**.

```
x = rnorm(n = 50, mean = 10, sd = 2)
y = rnorm(n = 50, mean = 9, sd = 1)
boxplot(cbind(x, y))
plot(x, y)
```

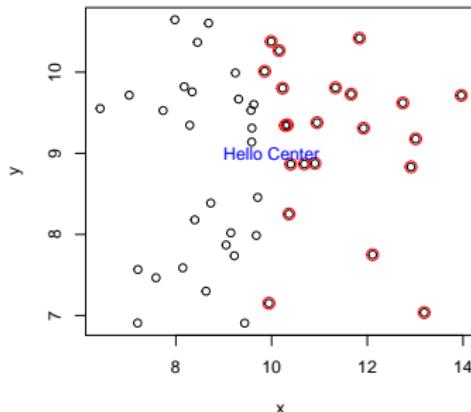


Low-level plotting functions

Low-level functions are used to modify high-level plots or make new plots from scratch.

Below we show 2 examples **points()** and **text()**.

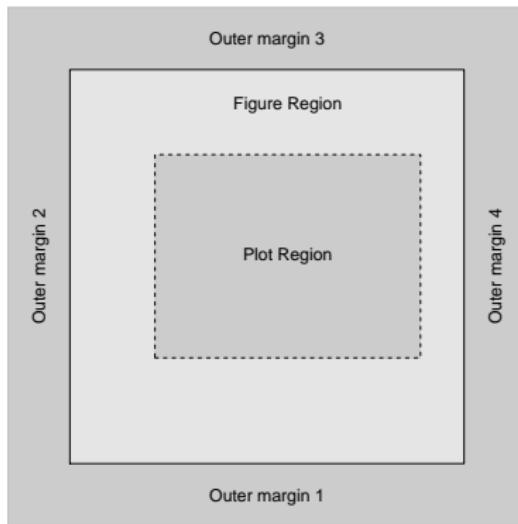
```
plot(x, y) # high-level plot  
# low-level plot: add red circles  
points(x[x > mean(x)], y[x > mean(x)], col = "red", cex = 1.5)  
text(10, 9, labels = "Hello Center", col = "blue")
```



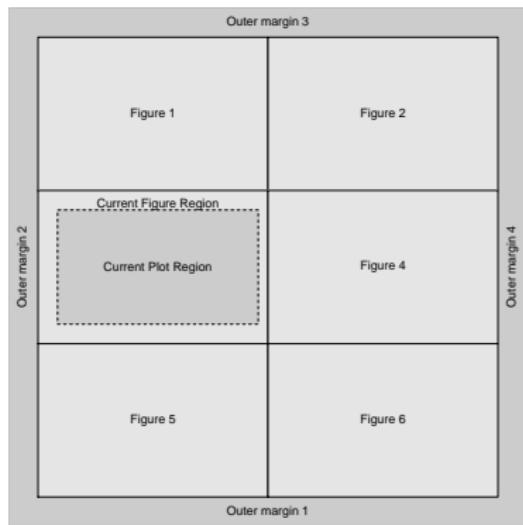
Graphical Regions

There are 3 main regions:

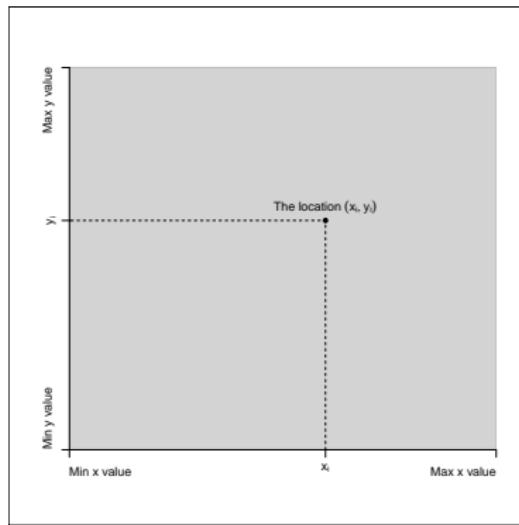
1. Plot region/area.
2. Figure region (contains plot area).
3. Outer margins (by default $oma = c(0, 0, 0, 0)$).



Graphical Regions: Multiple Plots



Plotting Region: Coordinate System



par(): modifies graph and graphical regions

```
names(par())
```

```
## [1] "xlog"      "ylog"      "adj"       "ann"
## [5] "ask"        "bg"        "bty"       "cex"
## [9] "cex.axis"   "cex.lab"    "cex.main"  "cex.sub"
## [13] "cin"        "col"        "col.axis"  "col.lab"
## [17] "col.main"   "col.sub"    "cra"       "crt"
## [21] "csi"        "cxy"        "din"       "err"
## [25] "family"     "fg"         "fig"       "fin"
## [29] "font"        "font.axis"  "font.lab"  "font.main"
## [33] "font.sub"    "lab"        "las"       "lend"
## [37] "lheight"    "ljoin"     "lmitre"   "lty"
## [41] "lwd"         "mai"        "mar"       "mex"
## [45] "mfcol"       "mfg"        "mfrow"    "mgp"
## [49] "mkh"         "new"        "oma"       "omd"
## [53] "omi"         "page"      "pch"       "pin"
## [57] "plt"         "ps"         "pty"       "smo"
## [61] "srt"         "tck"        "tcl"       "usr"
## [65] "xaxp"        "xaxs"      "xaxt"     "xpd"
## [69] "yaxp"        "yaxs"      "yaxt"     "ylbias"
```

Graphical parameters

You do not need to know all the graphical parameters.

You will learn them on a need to know (or frequency) of use basis.

- ▶ Global settings (Affects all plots in R session):

par(< param >=)

- ▶ Local settings (Affects current plot only):

< plot.function > (..., < param >=)

parameter	description
col	Drawing COL or
cex	Character Ex pansion factor (text size multiplier)
pch	Plotting CH aracter (symbol)
las	Axis LA bel S tyle
mar	Figure MAR gins in lines of text
srt	S tring (text) RoT ation angle.

Table : Some useful basic parameters

par(): Some defaults

```
par() [c("col", "cex", "pch", "las", "mar", "srt")]

## $col
## [1] "black"
##
## $cex
## [1] 1
##
## $pch
## [1] 1
##
## $las
## [1] 0
##
## $mar
## [1] 5.1 4.1 4.1 2.1
##
## $srt
## [1] 0
```

Where low-level functions operate

Plot Area	Figure Margins	Outer Margins
<code>text()</code>	<code>mtext()</code>	<code>mtext()</code>
<code>points()</code>	<code>axis()</code>	
<code>lines()</code>		
<code>arrows()</code>		
<code>rect()</code>		
<code>abline()</code>		
<code>polygon()</code>		
<code>symbols()</code>		

Table : Most work within the plotting region

Switch to R-studio for demo.