Plotting Systems in R

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The Base Plotting System

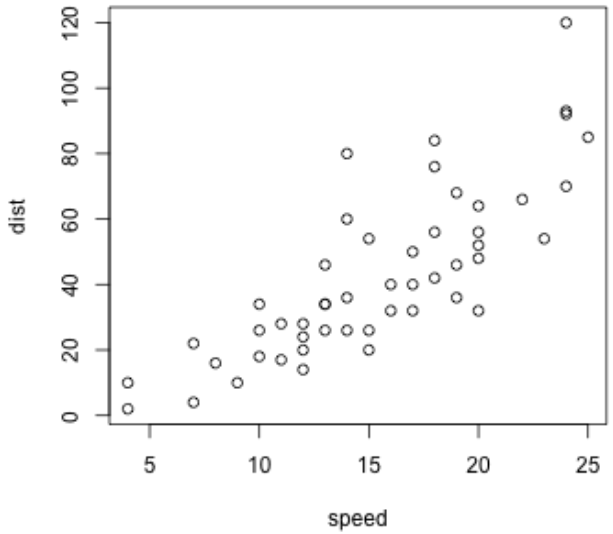
- "Artist's palette" model
- Start with blank canvas and build up from there
- Start with plot function (or similar)
- Use annotation functions to add/modify (`text`, `lines`, `points`, `axis`)

The Base Plotting System

- Convenient, mirrors how we think of building plots and analyzing data
- Can’t go back once plot has started (i.e. to adjust margins); need to plan in advance
- Difficult to "translate" to others once a new plot has been created (no graphical "language")
- Plot is just a series of R commands

Base Plot

```
library(datasets)
data(cars)
with(cars, plot(speed, dist))
```



The Lattice System

- Plots are created with a single function call (`xyplot`, `bwplot`, etc.)
- Most useful for conditioning types of plots: Looking at how y changes with x across levels of z

panel plot

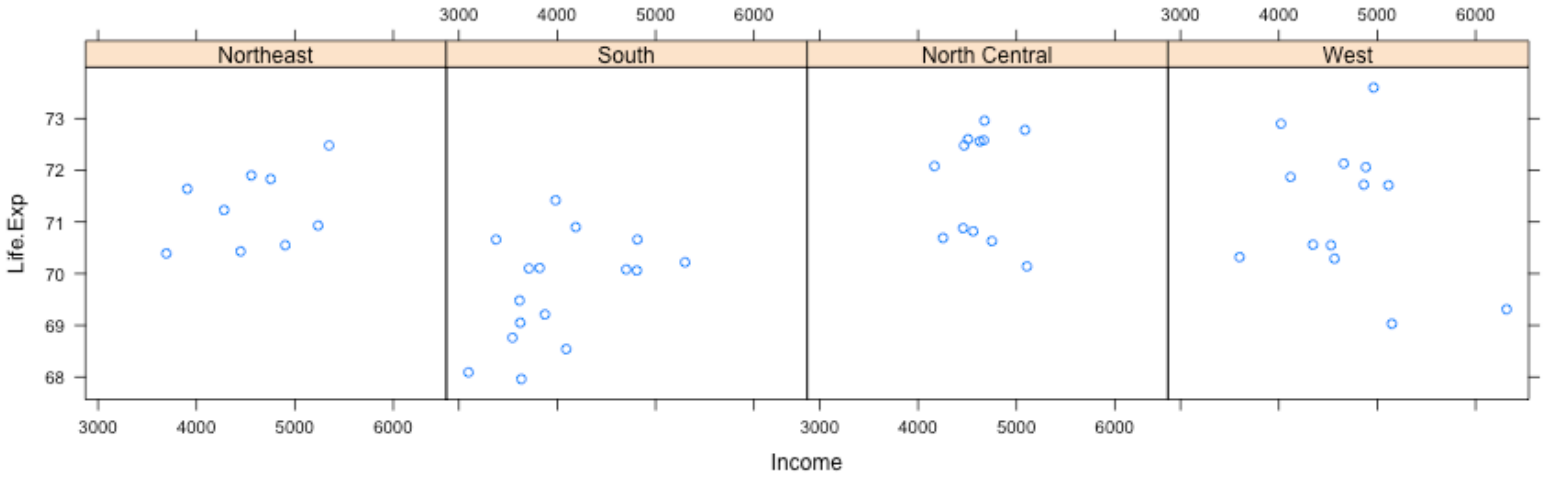
- Things like margins/spacing set automatically because entire plot is specified at once
- Good for puttng many many plots on a screen

The Lattice System

- Sometimes awkward to specify an entire plot in a single function call
- Annotation in plot is not especially intuitive you can not add anything after a plot is created
- Use of panel functions and subscripts difficult to wield and requires intense preparation
- Cannot "add" to the plot once it is created

Lattice Plot

```
library(lattice)
state <- data.frame(state.x77, region = state.region)
xyplot(Life.Exp ~ Income | region, data = state, layout = c(4, 1))
```



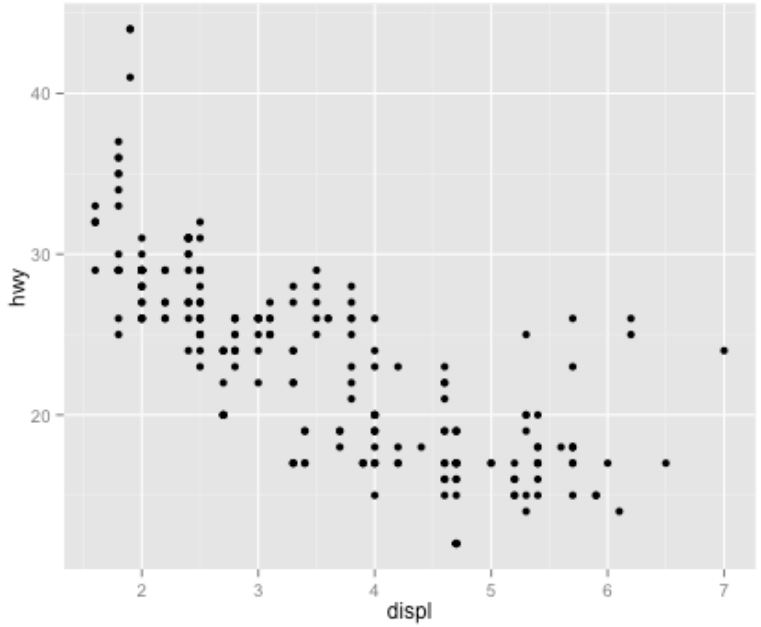
The ggplot2 System

- Splits the difference between base and lattice in a number of ways
- Automatically deals with spacings, text, titles but also allows you to annotate by "adding" to a plot
- Superficial similarity to lattice but generally easier/more intuitive to use
- Default mode makes many choices for you (but you can still customize to your heart's desire)

Comes from the grammar of graphics, which created a language or grammar to describe different aspects of a plot

ggplot2 Plot

```
library(ggplot2)
data(mpg)
qplot(displ, hwy, data = mpg)
```



Summary

- Base: "artist's palette" model
- Lattice: Entire plot specified by one function; conditioning
- ggplot2: Mixes elements of Base and Lattice

you can not mix the functions under different plotting systems.

References

Paul Murrell (2011). *R Graphics*, CRC Press.

Hadley Wickham (2009). *ggplot2*, Springer.