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))
```
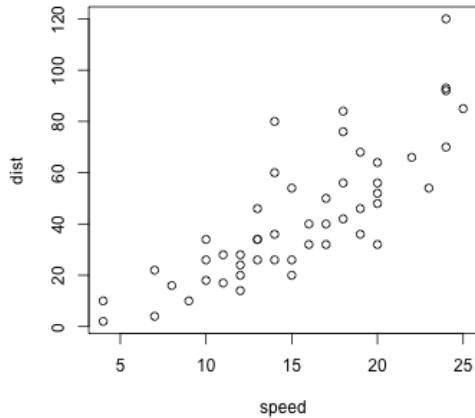
The Lattice System

· 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

· 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

· Use of panel functions and subscripts difficult to wield and requires intense preparation

· Cannot "add" to the plot once it is created

Lattice Plot

```r
library(lattice)
state <- data.frame(state.x77, region = state.region)
xyplot(Life.Exp ~ Income | region, data = state, layout = c(4, 1))
```
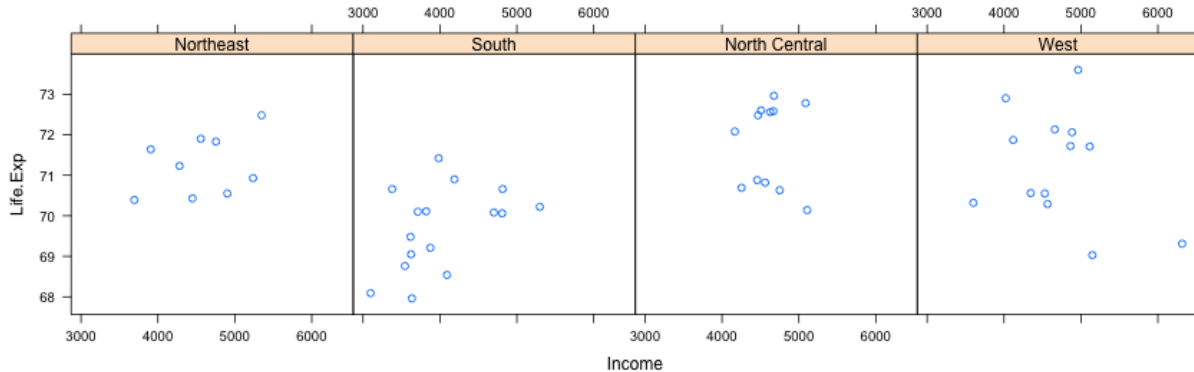
The ggplot2 System

· 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)

ggplot2 Plot

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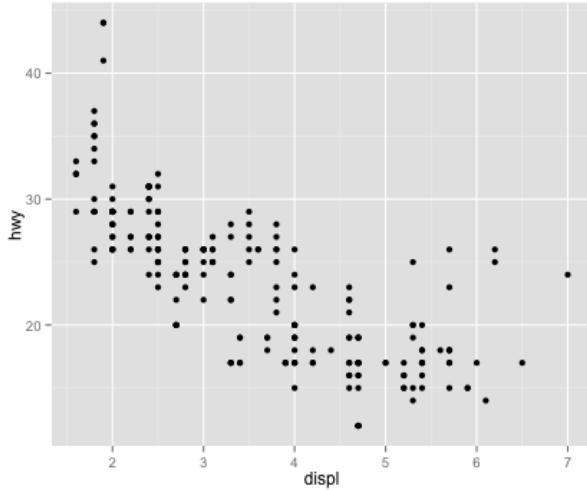
Summary

· Base: "artist's palette" model

· Lattice: Entire plot specified by one function; conditioning

· ggplot2: Mixes elements of Base and Lattice

References

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

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