Lattice Graphics

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Introduction

- What is Lattice graphics ?

- Who needs Lattice graphics ?

- What can Lattice graphics do ?

- Current Status of Lattice

- Some Lattice graphics examples

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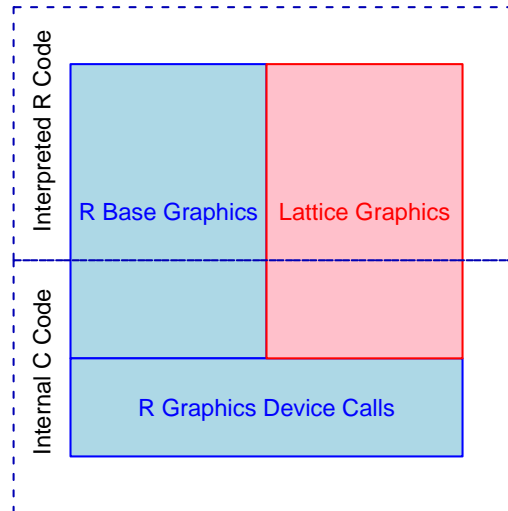
- Some Lattice graphics examples

What is Lattice ?

- Lattice is NOT Trellis
- An add-on package/library for R
- An alternative set of user-level graphics functions

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Who needs Lattice ?

- Lots of current and potential R users want Trellis

- Some people would like to be able to interact with R graphical objects

- I wanted to explore some ideas for graphical statistics

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    Lattice uses R as a platform for graphical research

What can Lattice do ?

- Multiple plotting regions

- Multiple coordinate systems

- Multilevel layouts

- Going beyond Trellis

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  interaction and *customisation*

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    layouts and *nesting* viewports

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    interaction and *customisation*
    extensibility and *ease-of-use*

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    layouts and *nesting* viewports

- Going beyond Trellis

    interaction and *customisation*
    extensibility and *ease-of-use*
    experimental stuff

Lattice Viewports

Draw here

Lattice Viewports
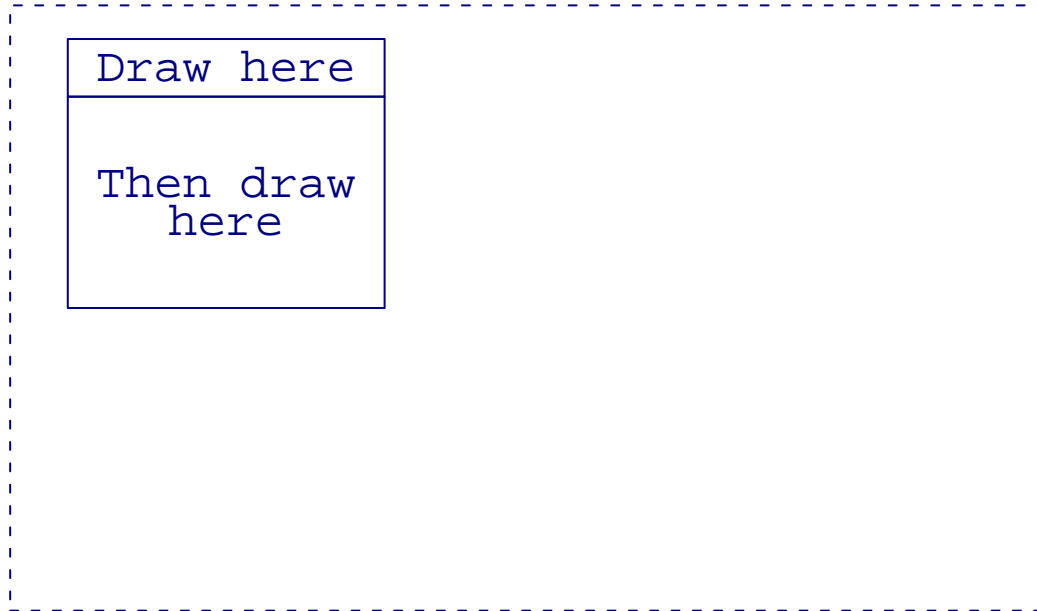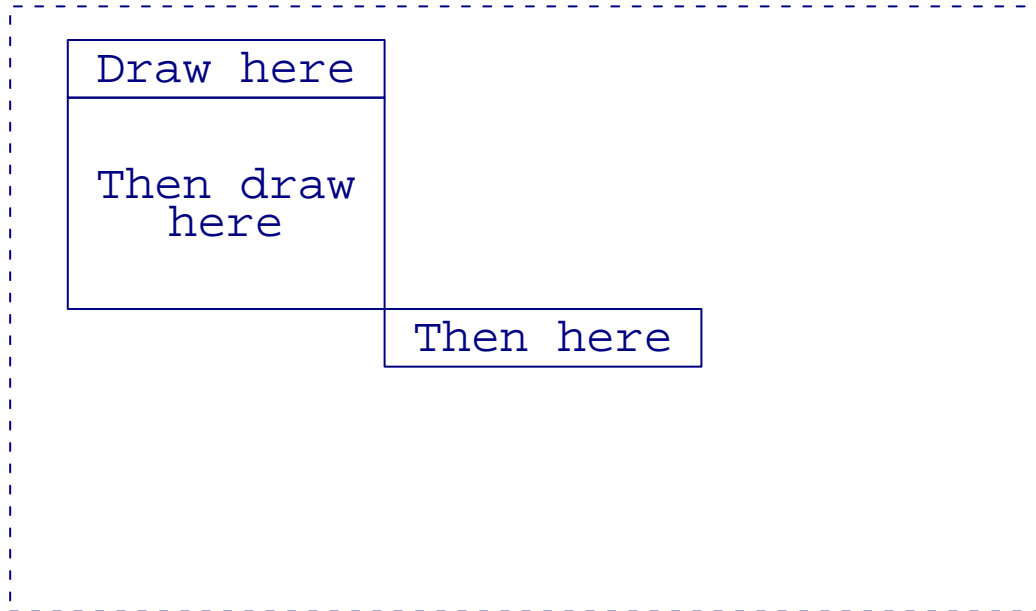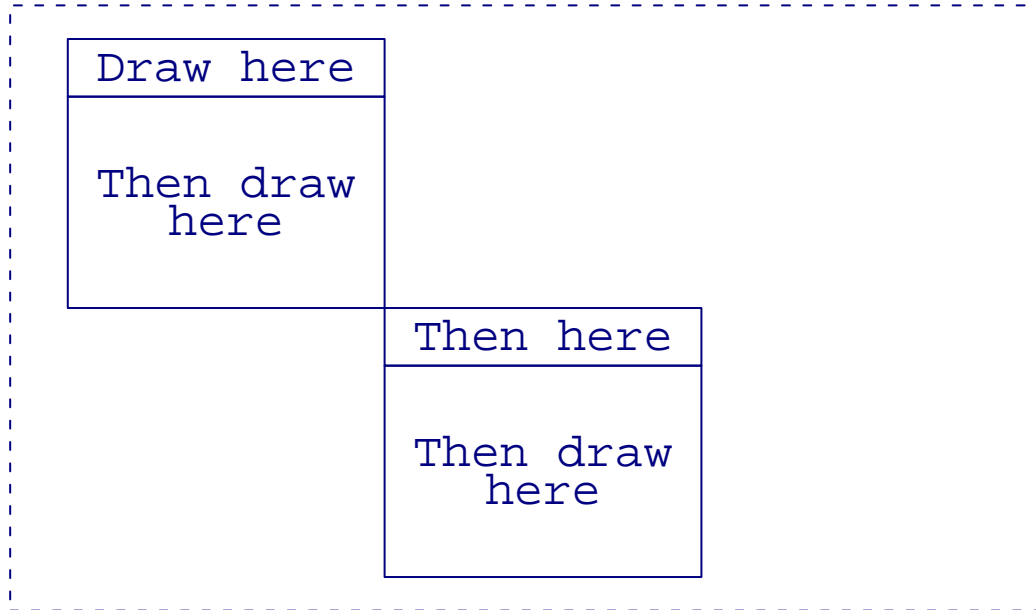
Draw here

Then draw
here

Lattice Viewports

Draw here

Then draw
here

Then here

Lattice Viewports

Draw here

Then draw here

Then here

Then draw here

Lattice Viewports

Draw here

Then draw here

Then here

Then draw here

Then draw a legend here

Lattice Viewports

Draw here

Then draw here

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Then draw a legend here
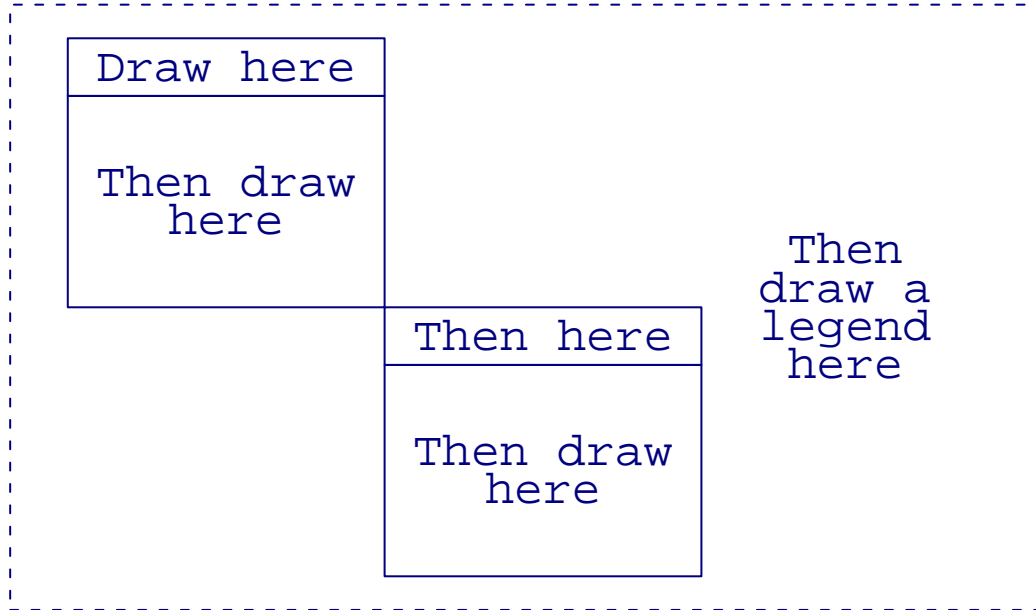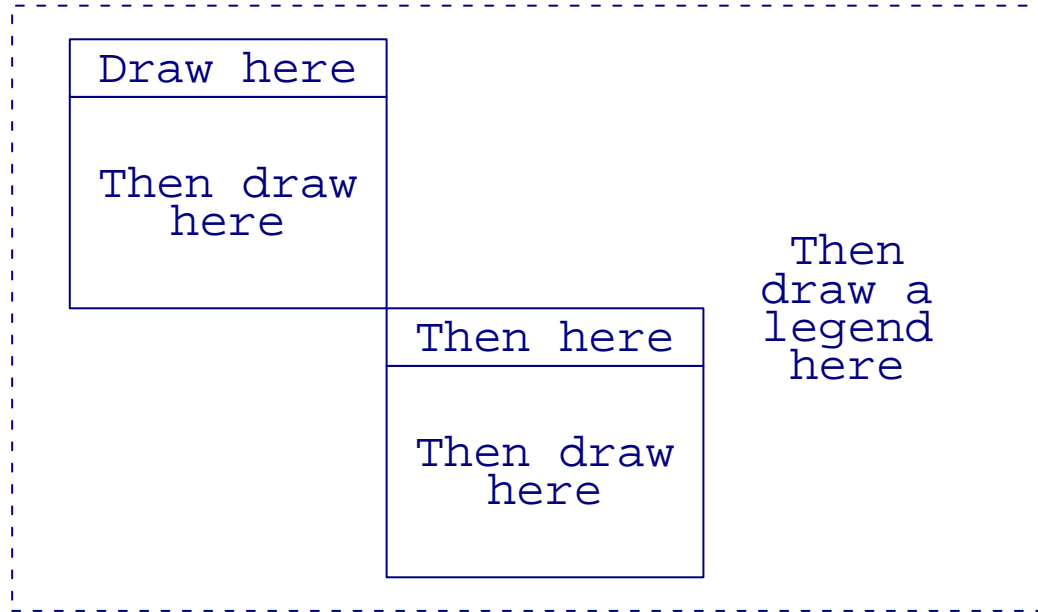
R base graphics works in a current *plot region*

Lattice Viewports

```
Draw here

Then draw
   here
```

```
Then here

Then draw
   here
```

```
Then
draw a
legend
here
```
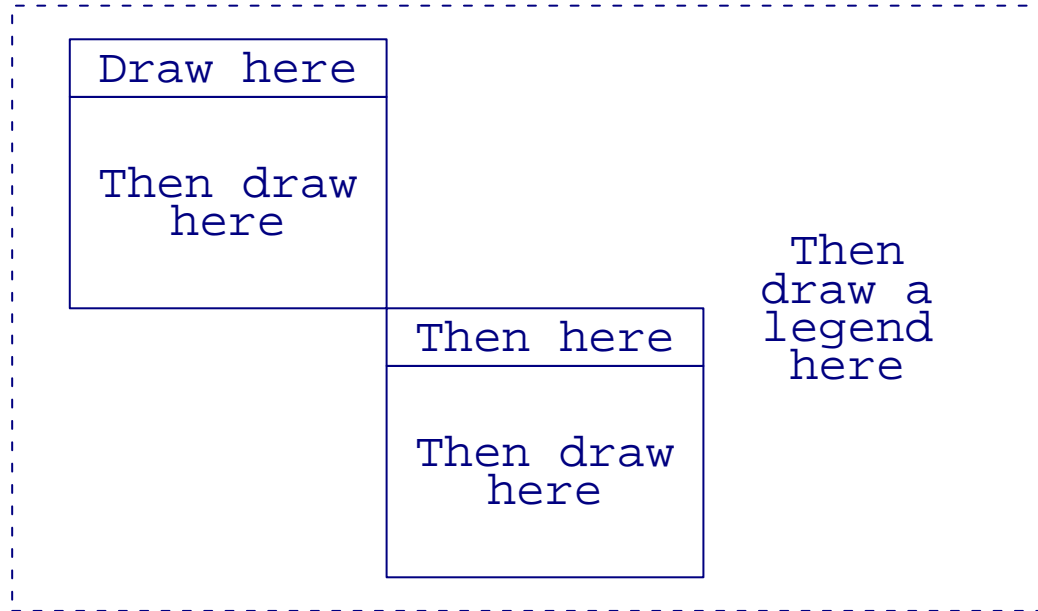
R base graphics works in a current *plot region*

Lattice graphics works in a current *drawing region*

Lattice Units

- Normalised Parent Coordinates
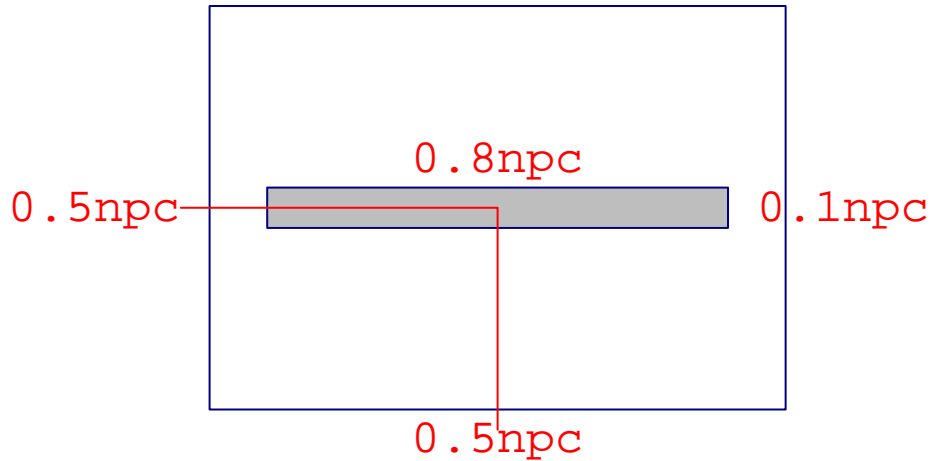
Lattice Units

- Physical coordinates (inches, cm, mm, ...)
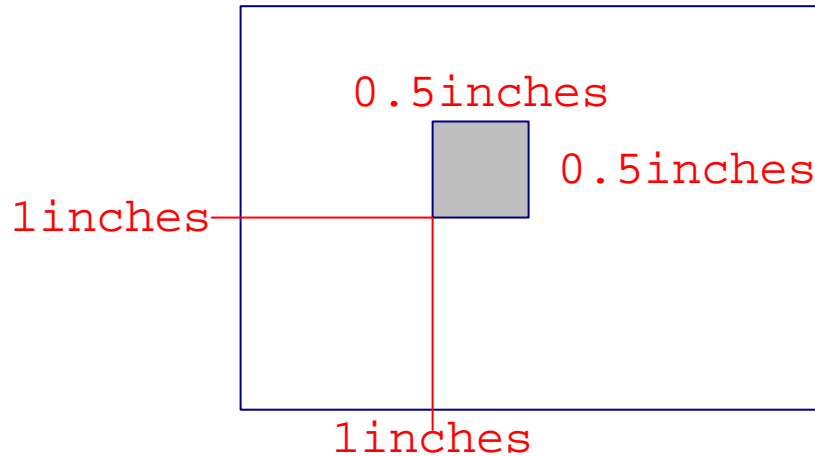
Lattice Units

- Native coordinates

- Character-based coordinates
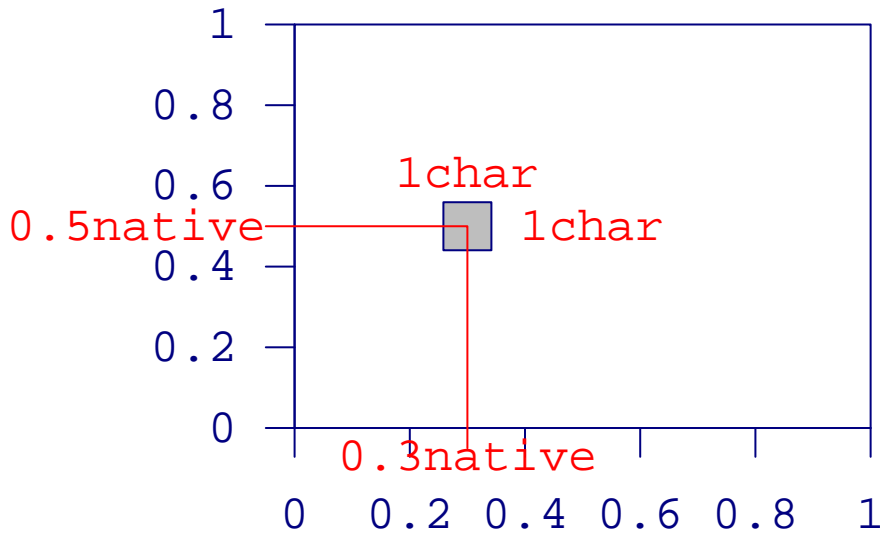
Lattice Units

- Line-based coordinates
- String-width-based coordinates
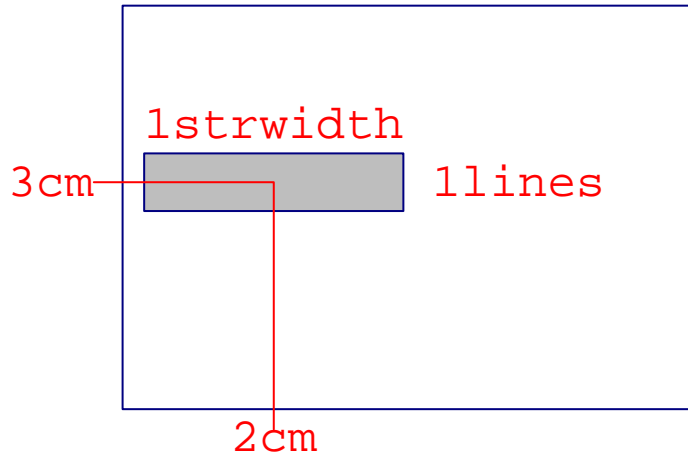
Lattice Layouts and Nesting Viewports

- Draw a "strip"

```
My Label
```
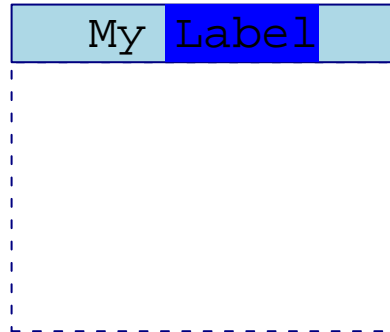
Lattice Layouts and Nesting Viewports

- Draw a "panel"
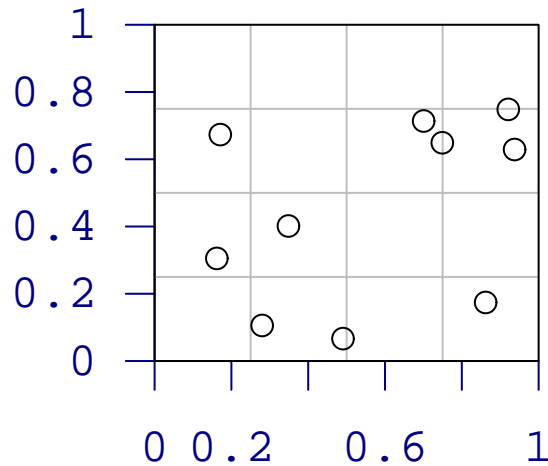
Lattice Layouts and Nesting Viewports
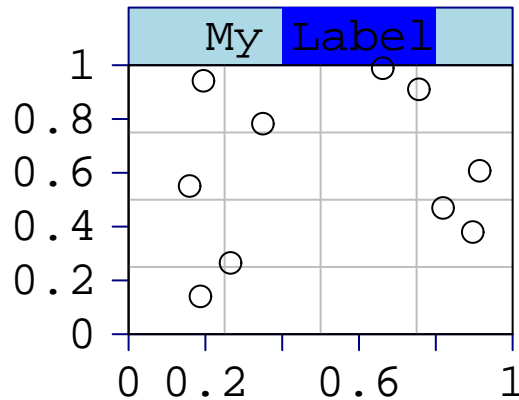
- Define an arrangement of strip and panel
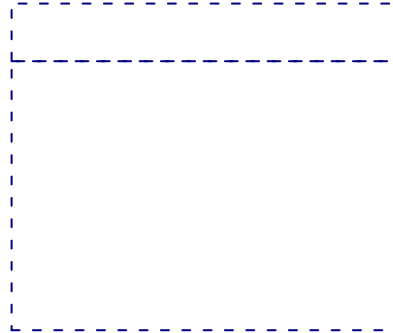
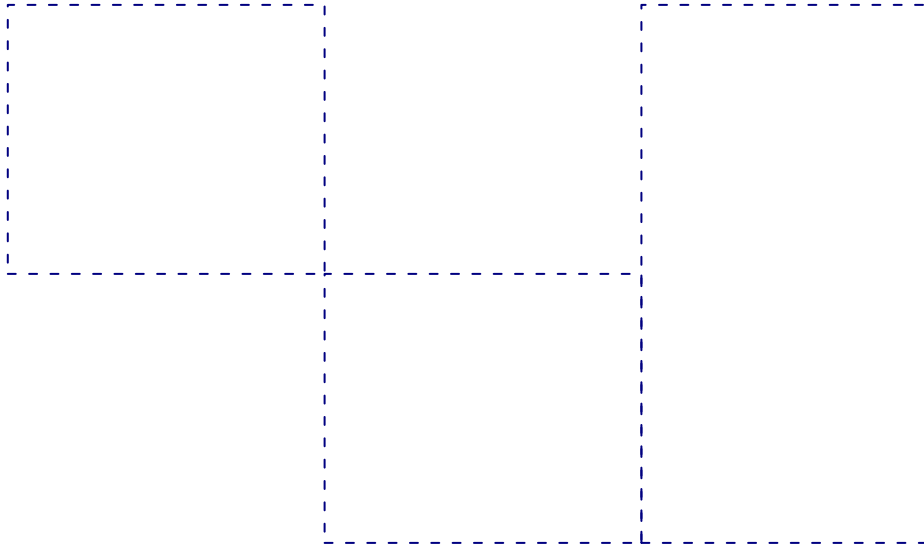# Lattice Layouts and Nesting Viewports

- Insert the strip

Lattice Layouts and Nesting Viewports

- Insert the panel

Lattice Layouts and Nesting Viewports

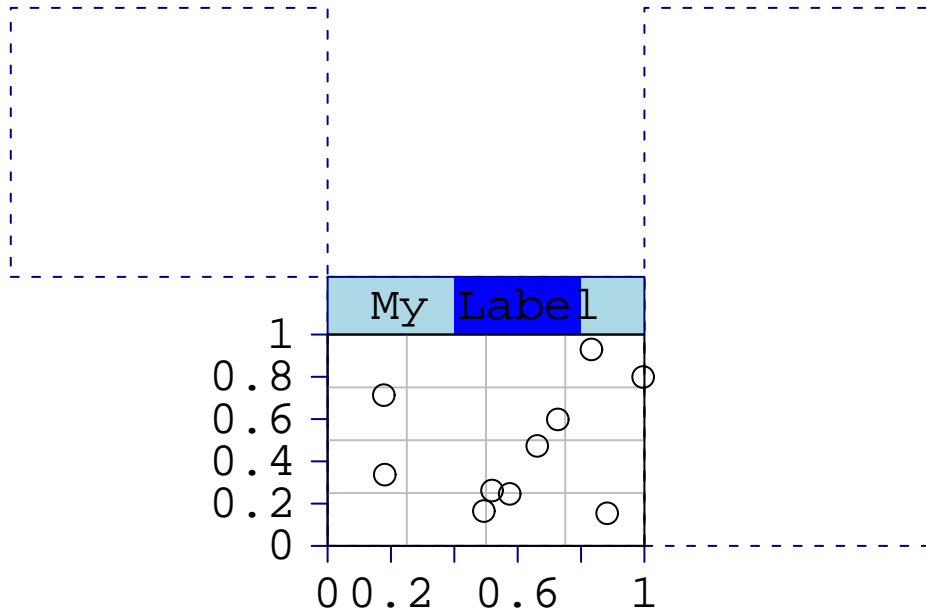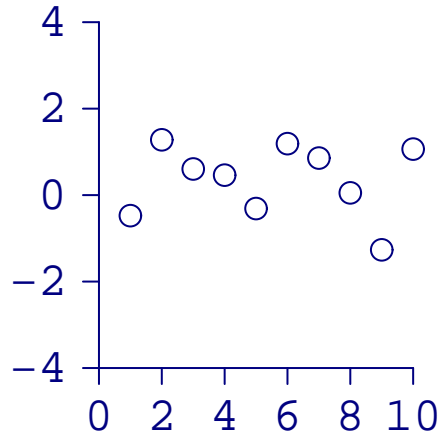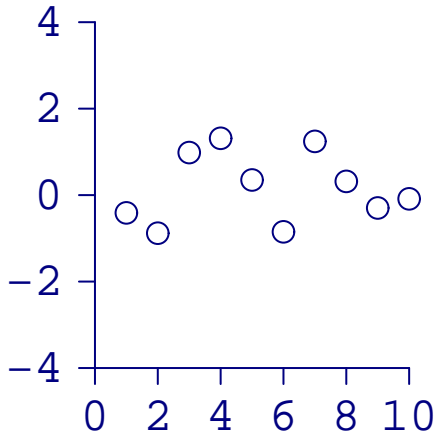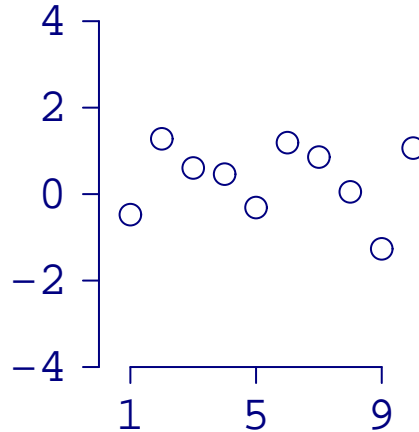- Define an arrangement of plots plus a legend

Lattice Layouts and Nesting Viewports

- Insert the plot

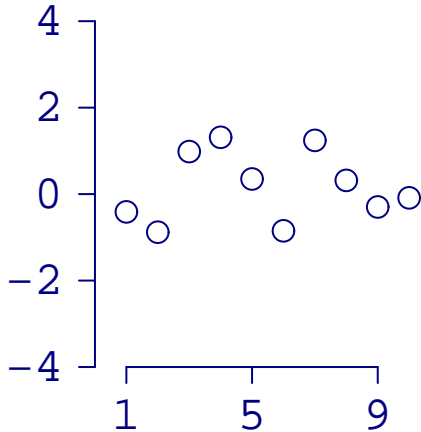# Interaction and Customisation


```
...
xa <- lxaxis()
ya <- lyaxis()
...
```
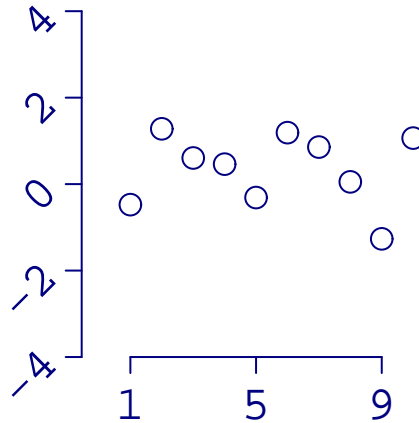
Interaction and Customisation


```
ledit(xa, at=c(1, 5, 9))
```

Interaction and Customisation
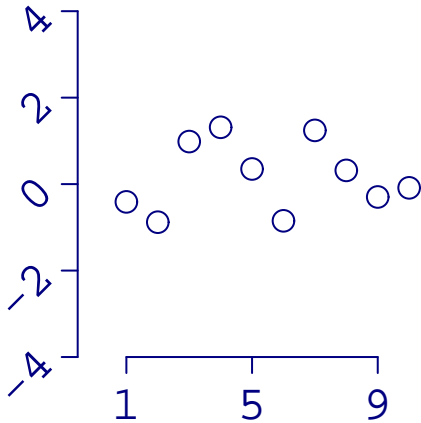

```
ledit(ya, "labels", rot=45)
```

Extensibility and Ease-of-Use

- Add power without sacrificing ease-of-use

- User objects are the same as system objects

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  ```
  ltext("hi")
  ```

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  Lattice can be used "object"ively

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  txt <- ltext("hi", draw=F)
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    ```
    my.func <- function() { ltext("hi") }
    ```

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 ```
  my.func <- function() { ltext("hi") }
  ```
  *The user can write "object"ively*
  ```
  my.func <- function() {
  txt <- ltext("hi", draw=F)
  box <- lrect(w=unit(1, "strwidth", "hi"), draw=F)
  lgrob(list(txt, box), "boxed.text") }
  ```

# Extensibility and Ease-of-Use

- Add power without sacrificing ease-of-use

    *Lattice can be used "procedurally"*
    ```
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    ```
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    ```

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    lgrob(list(txt, box), "boxed.text") }
    ```
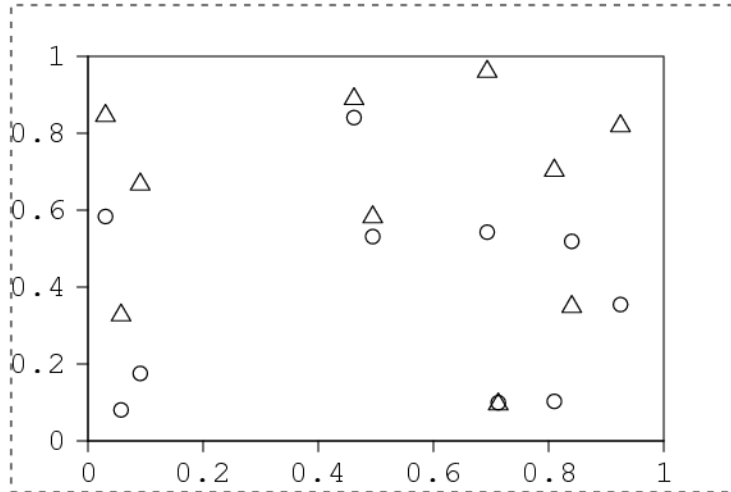
# Rotating Viewports
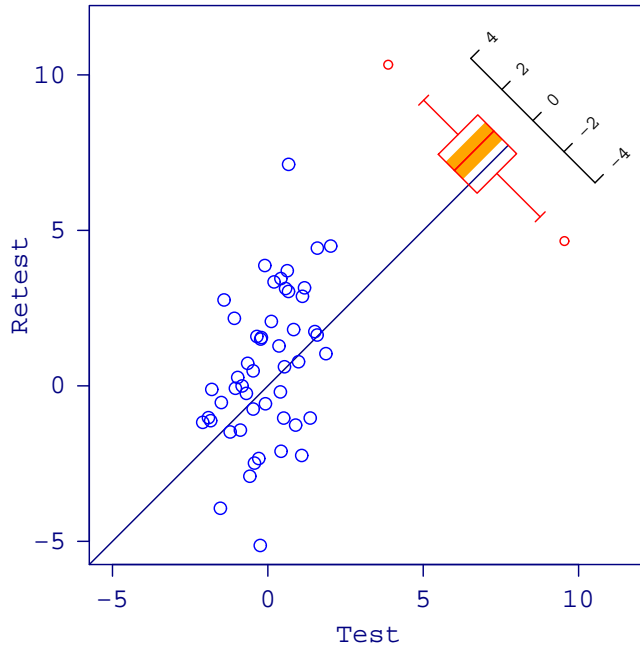
# Frames and Packing

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```
lf <- lframe()
```

Frames and Packing
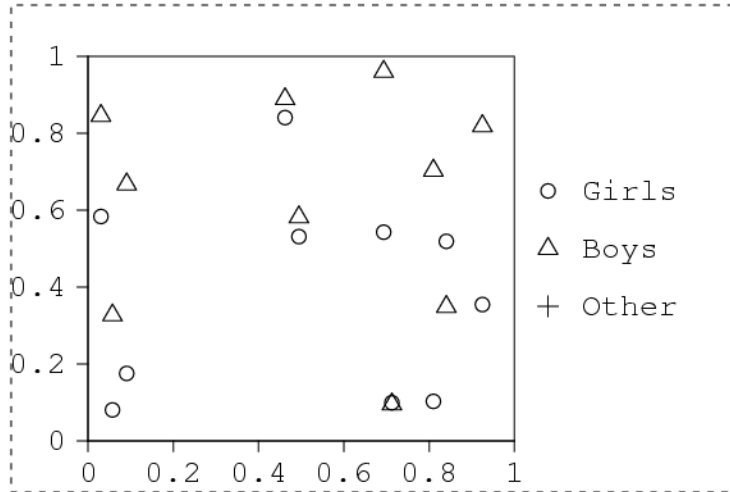


```
lf <- lframe()

lpack(lf, my.plot)
```

Frames and Packing


```
lf <- lframe()

lpack(lf, my.plot)

lpack(lf, my.legend, side="right")
```

Current Status of Lattice

- Support for Trellis-like layouts

- Editable graphical objects

- Trellis package being developed by Deepayan Sarkar

- Missing features: clipping, multiple devices, ...

- Lots of polish required

- Some features still highly experimental

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Some Lattice Examples

```
lshow.layout(llayout(2, 4,
  widths=unit(c(1, 1, .25, .1),
              c("null", "cm", "npc", "native"))))
```
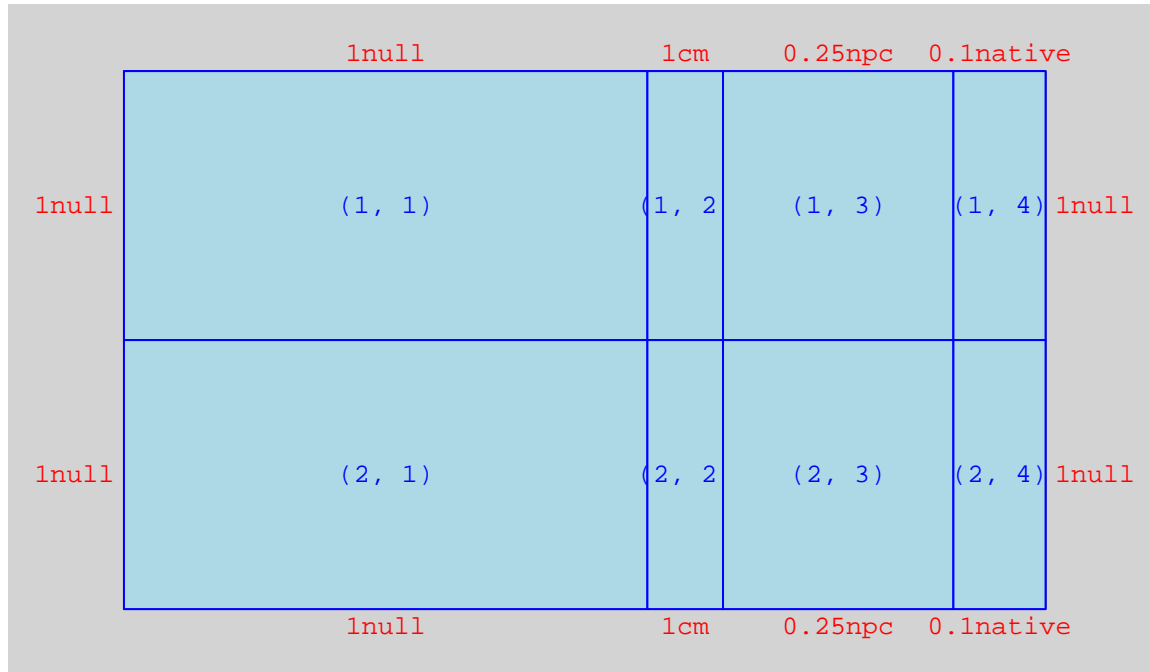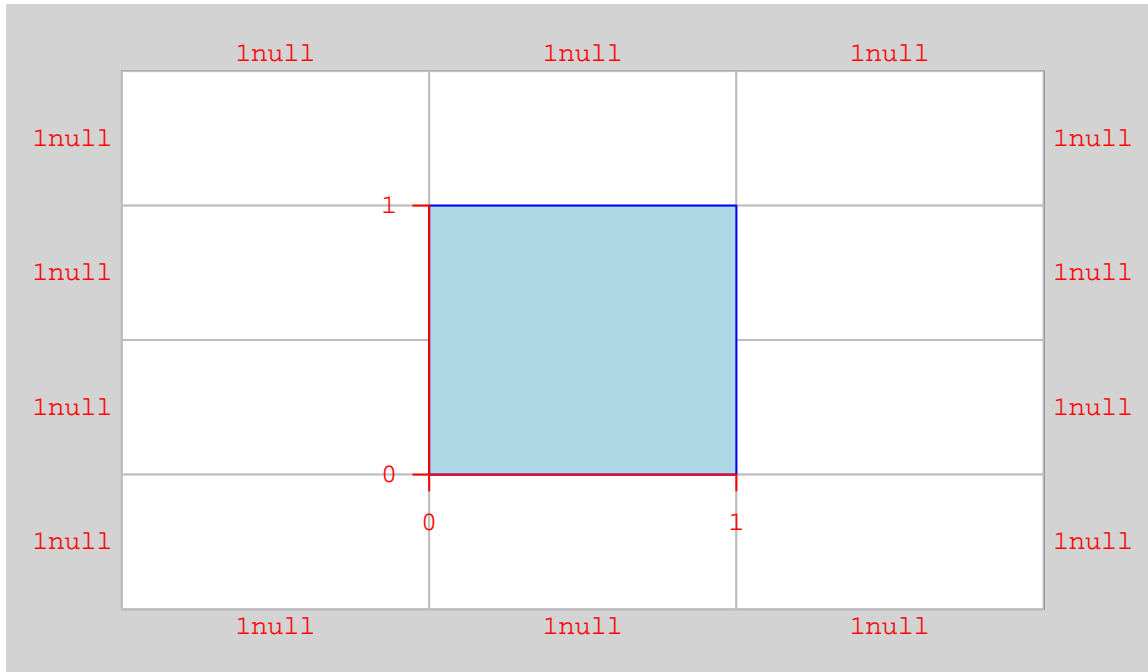
Some Lattice Examples

```
lshow.viewport(
  lviewport(x=unit(1, "npc") - unit(1, "inches"), y=.5,
            w=.2, h=.5, just=c("right", "centre")))
```
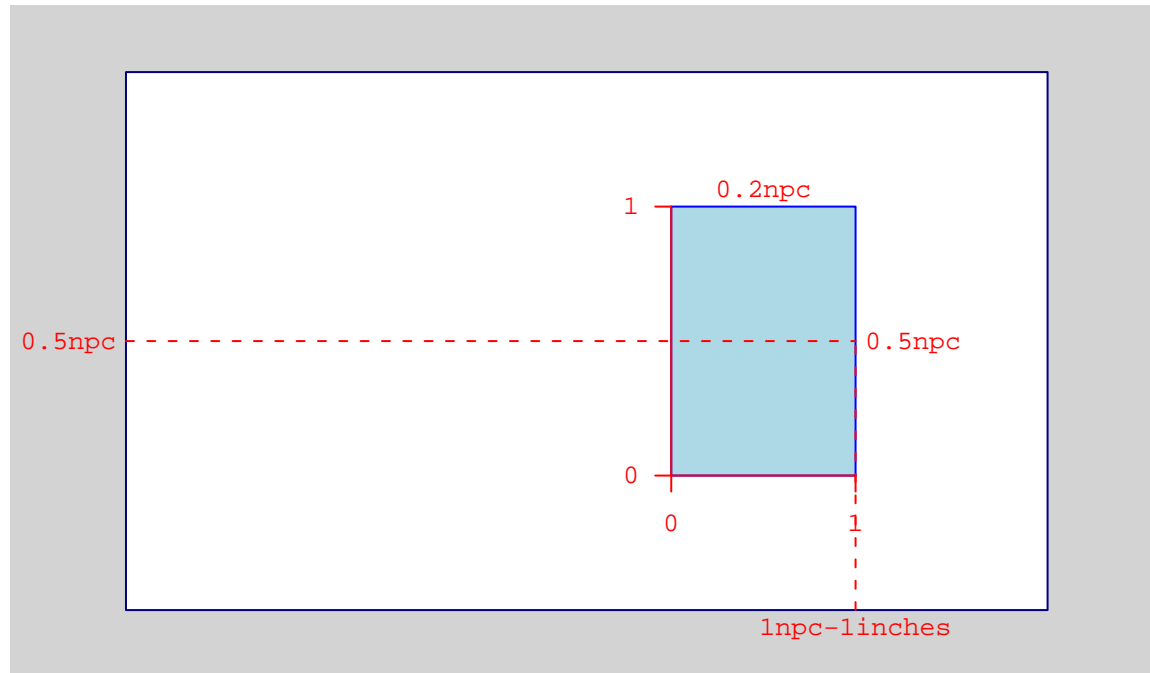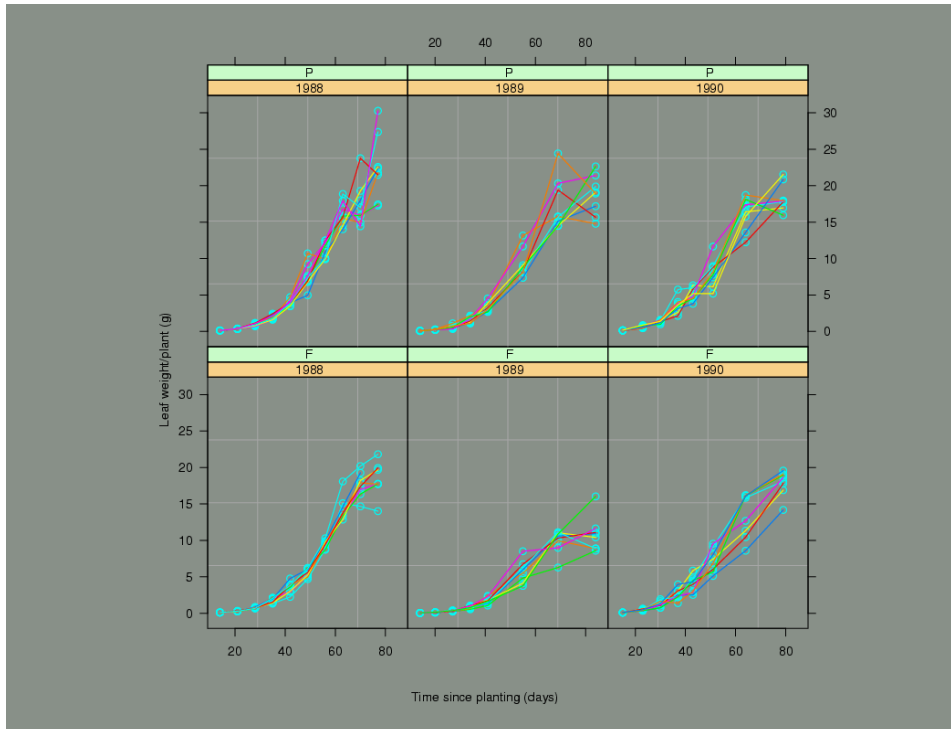
Some Lattice Examples

```
lshow.viewport(
  lviewport(layout.pos.row=2:3, layout.pos.col=2),
  llayout(4, 3))
```
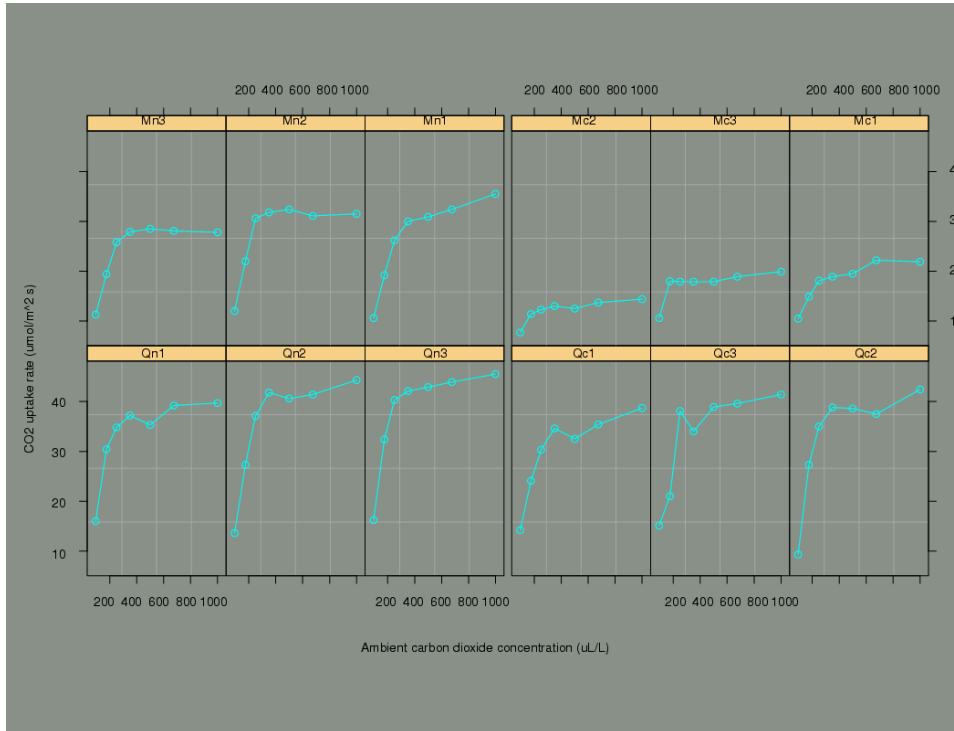
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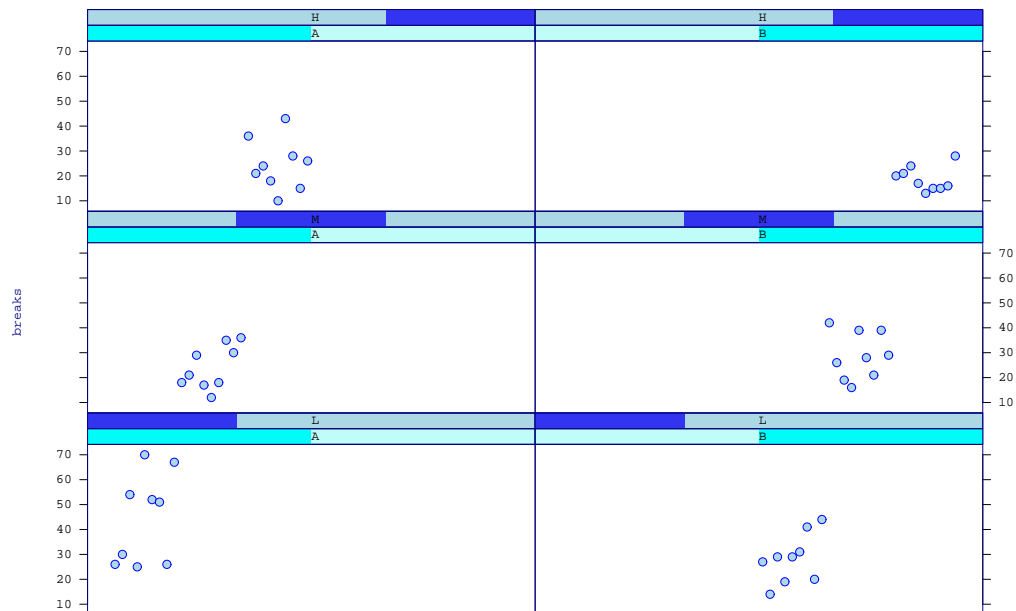
Deepayan Sarkar's Trellis package

Some Lattice Examples

Deepayan Sarkar's Trellis package

Some Lattice Examples

Deepayan Sarkar's Trellis package

Acknowledgements

- Luke Tierney

  R external references and R profiling

- Kurt Hornik (et al. ?)

  R CMD build/check/INSTALL, codoc, ...

- Brian Ripley

  R Graphics API

- Duncan Temple Lang

  early development in Java

- Deepayan Sarkar

  Trellis