Lattice Graphics

Paul Murrell

The University of Auckland
New Zealand
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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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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  \textit{Lattice produces graphical objects which can be edited}
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- I wanted to explore some ideas for graphical statistics
  
  *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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  *viewports*

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  *viewports*

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  *units*

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  *layouts* and *nesting* viewports

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What can Lattice do?

- Multiple plotting regions
  - viewports
- Multiple coordinate systems
  - units
- Multilevel layouts
  - layouts and nesting viewports
- Going beyond Trellis
  - interaction and customisation
What can Lattice do?

- Multiple plotting regions
  *viewports*
- Multiple coordinate systems
  *units*
- Multilevel layouts
  *layouts and nesting viewports*
- Going beyond Trellis
  *interaction and customisation
  extensibility and ease-of-use*
What can Lattice do?

- Multiple plotting regions
  viewports
- Multiple coordinate systems
  units
- Multilevel layouts
  layouts and nesting viewports
- Going beyond Trellis
  interaction and customisation
  extensibility and ease-of-use
  experimental stuff
Lattice Viewports

Draw here
Lattice Viewports

<table>
<thead>
<tr>
<th>Draw here</th>
</tr>
</thead>
<tbody>
<tr>
<td>Then draw here</td>
</tr>
</tbody>
</table>

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

R base graphics works in a current *plot region*
Lattice Viewports

<table>
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</table>

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, ...)

![Diagram showing lattice units with physical coordinates indicated.](image)
Lattice Units

- Native coordinates
- Character-based coordinates
Lattice Units

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

- Draw a “strip”
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

\[
\begin{align*}
\text{x} & \leftarrow \text{lxaxis}() \\
\text{y} & \leftarrow \text{lyaxis}() \\
\text{...}
\end{align*}
\]
Interaction and Customisation

```r
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 “procedurally”
  \ltext{"hi"}  
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  txt <- ltext("hi", draw=F)
  ```

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  \[
  \text{ltext}(\text{"hi"})
  \]

  Lattice can be used “object”ively
  \[
  \text{txt} \leftarrow \text{ltext}(\text{"hi"}, \text{draw=F})
  \]

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• User objects are the same as system objects
  
  *The user can write “procedurally”*
Extensibility and Ease-of-Use

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  *Lattice can be used “procedurally”*
  
  ```r
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  ```

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- User objects are the same as system objects

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  my.func <- function() { ltext("hi") }
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  ```r
  my.func <- function() {
    txt <- ltext("hi", draw=F)
    box <- lrect(w=unit(1, "strwidth", "hi"), draw=F)
    lgrob(list(txt, box), "boxed.text")
  }
  ```
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  }
Rotating Viewports
Frames and Packing
Frames and Packing

lf <- lframe()
Frames and Packing

```r
lf <- lframe()
lpack(lf, my.plot)
```
Frames and Packing

```r
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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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))

```
null  null  null
null  1
null  0
null  0
null  1
null  null
null  null  null
null  null  null
```
Some Lattice Examples

Deepayan Sarkar’s Trellis package
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  Trellis