SVG MAPPING

AN R PACKAGE TO MAP OMIC DATA SETS ONTO PATHWAYS TEMPLATES

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Context & Motivation

undirected visualization*

directed visualization*

prior knowledge

data

plot, ggplot2, lattice...

igraph...

ggmap...

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Modified Template

Template

SVGMapping...
Pathway Template

SVGMapping

Pathway Experiment Map
(dots are colored according to a gene expression measurement)

Experimentalist

design

conduct

Experimental data:
(microarrays, ngs, ...)

Experimentalist

Experimental data:
(microarrays, ngs, ...)

Pathway Template

SVGMapping

Pathway Experiment Map
(dots are colored according to a gene expression measurement)
ID (or Label) are used to identify visual shapes that will be modified (colors, stroke, ...)

Template Editing using Inkscape

Detoxification System

\[
\begin{align*}
H^+ & \rightarrow O_2^- \\
& \downarrow sodB (sll1516) \\
& \downarrow H_2O_2 \\
& \downarrow katG (sll1987) \\
H_2O & \rightarrow \text{Arsenate} \\
& \downarrow \text{arsI1} (sll5104) \\
& \downarrow \text{arsI2} (sll0946) \\
& \downarrow \text{arsC} (sll0946) \\
& \downarrow \text{Arsenite} \\
& \downarrow \text{Glutaredoxin} \\
& \downarrow \text{H}_2\text{O} \\
& \downarrow gpx1 (sll1171) \\
& \downarrow gpx2 (sll1992) \\
\end{align*}
\]
**Experiment**: Synechocystis sp. cells are exposed to an uranium pulse. mRNA are extracted 3h and 9h after this treatment.
**SVGMapping** = **SVG** + **Mapping**

- **SVG** key features
  - easy to use getter/setter
  - pseudo-devices
  - (basic) grid layout

- **Mapping** key features
  - **Data** = **Values** + **Targets**
  - **Transformation** function applied on values, before the mapping operation
  - **Operations** used transformed values to alter target shapes or document
(basic) grid-layout

- Creates **fixed** and **variable** grids one the whole document or within a rectangle:

```r
> blank <- SVG.factory(dims="a4", landscape=TRUE)
> vgrid <- VarGrid.factory(cols=c(0,0.25,0.28,1.0),opacity=1.0,prefix="Grid")
> layout(blank) <- vgrid
> lgrid <- FixGrid.factory(nrows=3,opacity=1.0,prefix="leftGrid")
> layout(blank,blank["Grid.grid.1.1"][[1]]) <- lgrid
```
Transformations

- Transformations are R function with the following prototype `function(x,p)`
  - `x` is a single data row (of a data-frame or vector) argument
  - `p` is the function parameter argument

- We provide a set of built-in functions:
  - `random(x,p={min,max})`, `identity(x)`,
  - `linear(x,p={a,b})`, `range-linear(x,p={a,b,min,max})`
  - `logistic(x,p={K,a,r})`, `sigmoid(x,p={r})`
  - `log2FC(x)` for microarrays log2 ratios to fold-change conversions

- One can also used its own function:

  ```r
  id2url ← function(x,params) {
    return(paste('http://uniprot.org/query.pl?geneid=',x,sep=''))
  }
  ```
• **MappingFillColors**: convert a numeric value to a fill color given a list of colors or a gradient
  
  • it also works with vectors....

• **MappingStrokeColors**: same as above for the stroke color

• **MappingOpacity**: set global shape opacity (input is in the range [0,1])

• **MappingFillOpacity**: set the fill opacity

• **MappingStrokeOpacity**: set the stroke opacity

• **MappingStrokeWidth**: convert numeric values to a stroke width

• **MappingMasks**: apply a mask to partially hide a shape. The hidden fraction of the shape depends on the input value
We can map other data as well...

Weather in Orsay Today..

16.8 °C

9.3 Km/h

ATM. Pressure
1007.3 hPa

Rel. Humidity
98%
CONCLUSION

- **SVGMapping** aims to map *omic* experimental data onto SVG template for visualization purposes.

- What I have not talked about:
  - Geometric transformations (rotation, scaling ...)
  - Animations

- Complementary/Alternative packages:
  - SVGAnnotation (omegahat), RSVGTipsDevice, gridSVG

- Contributors:
  - Raphaël Champeimont, version 1.x main contributor
  - Christophe Leplat, *synechocystis* sp. pathway designer
  - Franck Chauvat, for the financial support

- Project hosted here https://github.com/jcaude/SVGMapping/tree/V2, please contact me before at jean-christophe.aude@cea.fr