

La sonification ou la transformation des données en son

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① Principe


② Packages

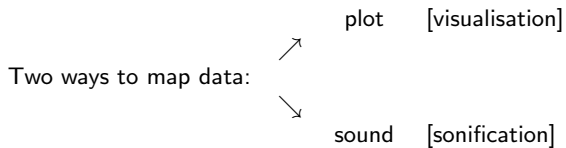
③ playitbyr

- tricky installation
- main functions: a ggplot2 grammar

④ References

Principe

Two ways to map data:  plot [visualisation]



Principe

- ▶ Geiger counter (ionizing radiation intensity)



Principe

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- ▶ electrocardiogram (times series)



Principe

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- ▶ electrocardiogram (times series)
- ▶ metal detector (magnetic field)



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- ▶ car parking radar (distance)



Principe

- ▶ Geiger counter (ionizing radiation intensity)
- ▶ electrocardiogram (times series)
- ▶ metal detector (magnetic field)
- ▶ car parking radar (distance)
- ▶ cockpit gauges (distance, speed...)



Packages

- ▶ `playitbyr`: *playitbyr is a flexible toolkit for data sonification, with syntax modeled after the ggplot2 package*
by Ethan C. Brown (USA)

Packages

- ▶ `playitbyr`: *playitbyr is a flexible toolkit for data sonification, with syntax modeled after the ggplot2 package*
by Ethan C. Brown (USA)
- ▶ `audiolyzR`: *Creates audio representations of common plots in R*
by Eric Stone and Jesse Garrison (AT&T lab, USA)

Packages

	playitbyr	audiolyzR
principle	ggplot2 layers	GUI
synthesiser	CSOUND	Max/MSP
dependency	csound rdyncall	RJSONIO hexbin plotrix
Linux	•	
Mac	•	•
Windows	•	•

Installation of the C library Csound

- ▶ Linux: `sudo apt-get install libcsound64-dev`
- ▶ Mac: <http://sourceforge.net/>
- ▶ Windows: <http://sourceforge.net/>

The package `playitbyr` and its dependent packages, `rdyncall` and `csound`, have been removed from CRAN but are still available on github

Installation with the package `devtools`:

```
library(devtools)
install_github(c("cran/rdyncall", "cran/csound",
"statisfactions/playitbyr"
))
```

Link between playitbyr and the C library Csound

- ▶ automatically found by playitbyr
- ▶ manually with the command `setCsoundLibrary("path/to/library/file")`

- Linux:

```
setCsoundLibrary("/usr/lib/libcsound64.so.6.0")
```

- Mac:

```
setCsoundLibrary("/Library/Frameworks/CsoundLib64.framework/  
Versions/Current/.")
```

- Windows:

```
setCsoundLibrary("//Program Files//Csound//bin//")
```

playitbyr

main functions: a ggplot2 grammar

	ggplot2	playitbyr	description
Mapping	<code>ggplot(data, aes())</code>	<code>sonify(data, sonaes())</code>	sound creation
Geoms	<code>geom_point()</code> <code>geom_histogram()</code> <code>geom_boxplot()</code> <code>geom_dotplot()</code>	<code>shape_scatter()</code> <code>shape_histogram()</code> <code>shape_boxplot()</code> <code>shape_dotchart()</code>	scatterplot sound histogram sound boxplot sound dotchart sound
Scales	<code>scale_x_continuous()</code> <code>scale_y_continuous()</code> - -	<code>scale_dur_continuous()</code> <code>scale_time_continuous()</code> <code>scale_atkpk_continuous()</code> <code>scale_decayp_continuous()</code> <code>scale_tempo_continuous()</code> <code>scale_pitch_continuous()</code> <code>scale_mod_continuous()</code> <code>scale_indx_continuous()</code> <code>scale_vol_continuous()</code> <code>scale_pan_continuous()</code>	sound duration note duration note initial attack note final decay sound tempo note pitch (frequency) FM rate FM index sound amplitude sound pan (LR balance)
Faceting	<code>facet_grid()</code>	<code>sonfacet()</code>	sound faceting
Saving	<code>ggsave()</code>	<code>sonsave()</code>	save as .wav file

playitbyr

main functions: a ggplot2 grammar: scatter plot

Library load

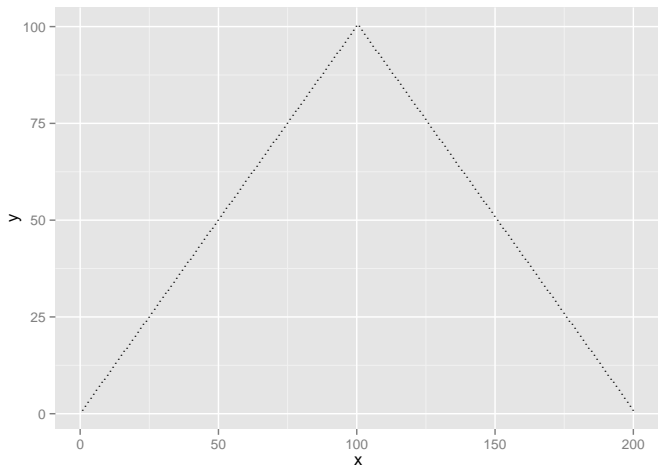
```
library(ggplot2)
library(playitbyr)
```

Dummy data generation

```
crescendo <- data.frame(x=1:100, y=1:100)
glissando <- data.frame(x=101:200, y=100:1)
fm <- rbind(crescendo, glissando)
```

playitbyr

main functions: a ggplot2 grammar: scatter plot

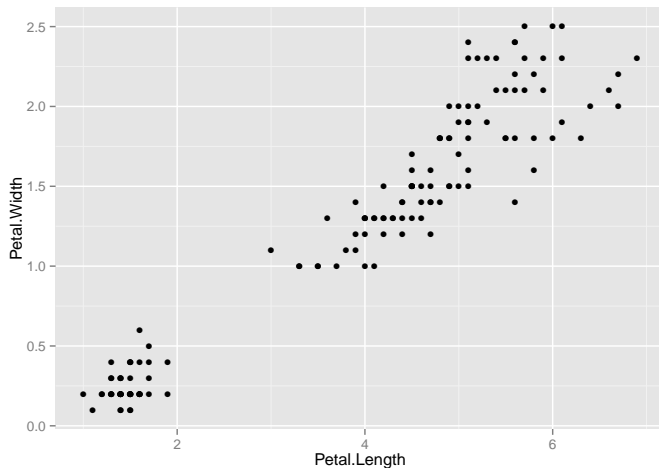


```
sonify(fm, sonaes(time = x, pitch = y)) +  
  shape_scatter() + scale_time_continuous(c(0, 10))
```



playitbyr

main functions: a ggplot2 grammar: scatter plot

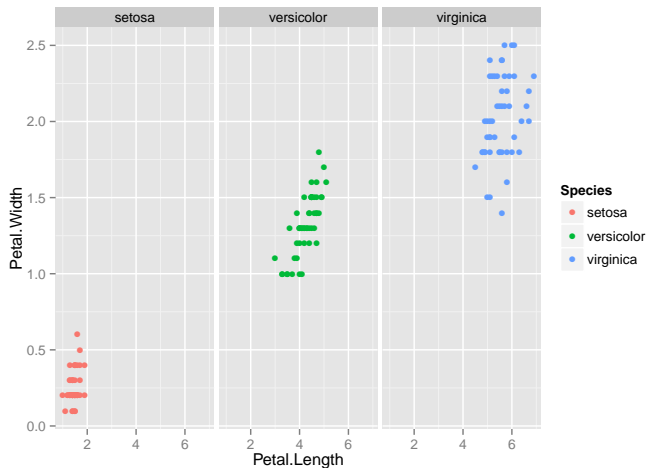


```
sonify(iris, sonaes(time = Petal.Length, pitch = Petal.Width)) +  
  shape_scatter() + scale_pitch_continuous(c(7, 12))
```



playitbyr

main functions: a ggplot2 grammar: faceting

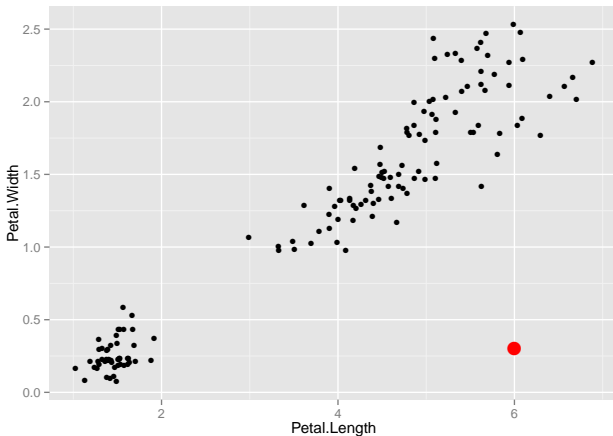


```
sonify(iris, sonaes(time = Petal.Length, pitch = Petal.Width)) +  
  shape_scatter(jitter = 1) + sonfacet(Species)
```



playitbyr

main functions: a ggplot2 grammar: outlier

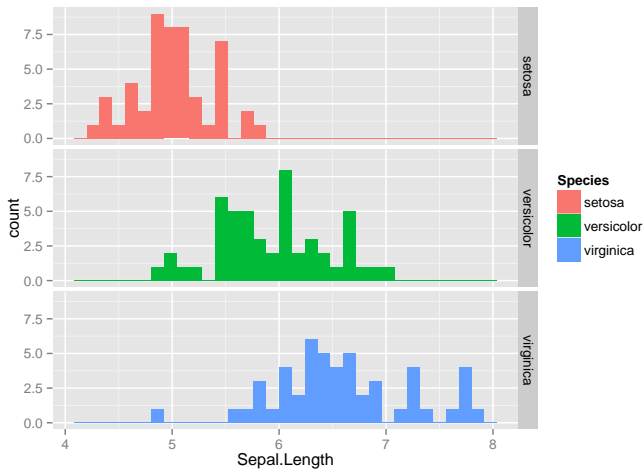


```
sonify(iris.outlier, sonaes(time = Petal.Length, pitch = Petal.Width)) +  
  shape_scatter(jitter = 1) + scale_time_continuous(c(0, 10)) +  
  scale_pitch_continuous(c(7, 12))
```



playitbyr

main functions: a ggplot2 grammar: histogram

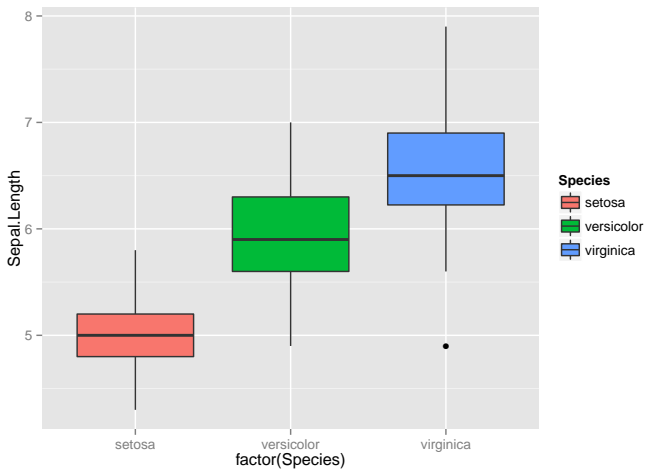


```
sonify(iris, sonaes(pitch = Sepal.Length)) +  
  shape_histogram(length = 3, tempo = 180) + sonfacet(Species)
```



playitbyr

main functions: a ggplot2 grammar: boxplot

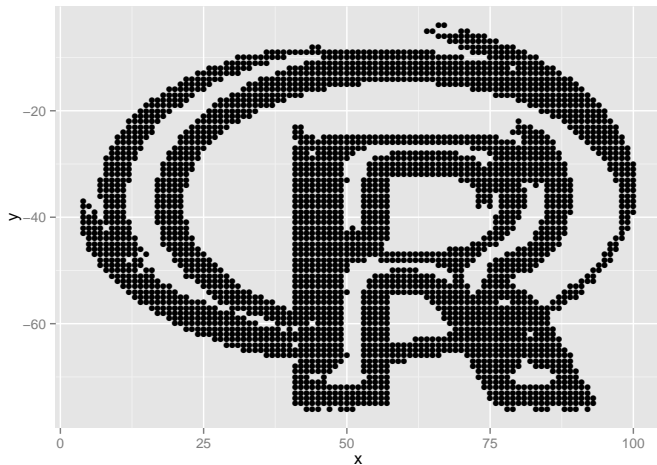


```
sonify(iris, sonaes(pitch = Sepal.Length)) +  
  shape_boxplot(length = 1, tempo = 1800) + sonfacet(Species)
```



playitbyr

main functions: a ggplot2 grammar: the sound of R



```
sonify(pos.rot, sonaes(time = x, pitch = y)) +  
  shape_scatter()+ scale_pitch_continuous(c(7, 12))
```



References

Hermann, Hunt, Neuhoff (2011) – The Sonification Handbook. *Logos Publishing House*, 586 p.

<http://sonification.de/handbook/>

playitbyr by Ethan C. Brown

<http://playitbyr.org>

Merci !