Sweave – Dynamic Interaction of R and LaTeX

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Why would I need Sweave?

- Creating reports that can be updated automatically
- Statistic exercises
- Manuals with embedded examples (like R-help files, etc.)
- Avoiding copy/paste errors between analysis output and report file
- Reproducible research

R package xtable – create export tables

- Function converting an R object to an 'xtable' object, which can then be printed as a LaTeX or HTML table
- `xtable(x, caption=NULL, label=NULL, align=NULL, digits=NULL, display=NULL, ...)`
- Check `print.xtable()` for useful arguments
- Example:

```
## Taken from help(lm) in R 1.1.1
## Annette Dobson (1990) "An Introduction to Generalized Linear Models".
## Page 9: Plant Weight Data.

ctl <- c(4.17,5.58,5.18,6.11,4.50,4.61,5.17,4.53,5.33,5.14)
trt <- c(4.81,4.17,4.41,3.59,5.87,3.83,6.03,4.89,4.32,4.69)
group <- gl(2,10,20, labels=c("Ctl","Trt"))
weight <- c(ctl, trt)
lm.D9 <- lm(weight ~ group)
print(xtable(lm.D9))
print(xtable(anova(lm.D9)))
```

R package xtable – example

- R output

```
> print(xtable(anova(lm.D9)))
% latex table generated in R 2.9.2 by xtable 1.5-6 package
% Mon Dec 07 14:53:44 2009
\begin{table}[ht]
\begin{center}
\begin{tabular}{lrrrrr}
  \hline
 & Df & Sum Sq & Mean Sq & F value & Pr($>$F) \\
  \hline
group & 1 & 0.69 & 0.69 & 1.42 & 0.2490 \\
  Residuals & 18 & 8.73 & 0.48 &  &  \\
   \hline
\end{tabular}
\end{center}
\end{table}
```

R package xtable – example

- LaTeX output

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
group	1	0.69	0.69	1.42	0.2490
Residuals	18	8.73	0.48		

Sweave example

```
\documentclass[a4paper]{article}

\begin{document}

In this example we embed parts of the examples from the
\texttt{kruskal.test} help page into a \LaTeX{} document:

<<>>=
data(airquality)
kruskal.test(Ozone ~ Month, data = airquality)
@
which shows that the location parameter of the Ozone
distribution varies significantly from month to month.
Finally we include a boxplot of the data:

\begin{center}
<<fig=TRUE,echo=FALSE>>=
boxplot(Ozone ~ Month, data = airquality)
@
\end{center}

\end{document}
```

How to use Sweave

- File will be saved as `filename.Snw`
- Then run `Sweave("filename.Snw", stylepath=T)`
- R generates `filename.tex` and possible figures (do not forget to set working directory in R!)
- Now compile `filename.tex`
- Done!
- If you want only the R code from your `filename.Snw` use `Stangle("filename.Snw")` and R will create filename.R with only R code from the R chunks

Useful options

```
<<>>=    starts an R chunk
@        starts a documentation chunk
         (ergo ends an R chunk)
```

- options are defined by: '<<option>>=' and seperated by commas
- `echo=false` to hide R commands
- `results=hide` when you do not want to have the results displayed
- `results=tex` when output shall not be displayed as S output (for example when using `xtable()`)
- `fig=true` when you want to insert a figure

Results of my thesis

- Spatial cueing effects and awareness of target location: Evidence against early selection
- Subjects had to press a button when they saw a light (simple reaction time)
- With or without mirror, cue on right or left ear, light in right or left eye

Documentation

On Friedrich Leisch's homepage you will find all the information you need about Sweave:

`http://www.statistik.lmu.de/~leisch/Sweave/`

Exercise

Write your own .Swn-file and compile it into a PDF:

- Load the dataset `cars` and write a few short sentences about it (where can you find information on the dataset?)
- Create a table with descriptive statistics of the dataset (use `caption` and `label`)
- Plot the data in a scatterplot and draw the regression line (use `lm()`, `abline()`)
- Put the parameters of your regression model in a table in your report
- HINT: for all tables use `xtable()`, remember options: `echo=false`, `results=hide`, `results=tex`, `fig=true`

Thank you for your attention!

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References

Leisch, F. (2002a). Sweave: Dynamic generation of statistical reports using literate data analysis. In Härdle, W. & Rönz, B. (Eds.), *Compstat 2002 — Proceedings in Computational Statistics*, (pp. 575–580). Physica Verlag, Heidelberg. ISBN 3-7908-1517-9.

Leisch, F. (2002b). Sweave, part I: Mixing R and LaTeX. *R News*, *2*(3), 28–31.

Leisch, F. (2003a). Sweave and beyond: Computations on text documents. In Hornik, K., Leisch, F., & Zeileis, A. (Eds.), *Proceedings of the 3rd International Workshop on Distributed Statistical Computing, Vienna, Austria*. ISSN 1609-395X.

Leisch, F. (2003b). Sweave, part II: Package vignettes. *R News*, *3*(2), 21–24.