Introduction to Sweave

and (maybe) odfWeave

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Overview

What is Sweave?

What about odfWeave?

Sweave = LaTeX + R

Why would we want to do that?

- If you already use LaTeX and R, why not use both at once?
- Saves time: no need to copy numbers, tables and graphics by hand into documents
- Don't have to redo everything everytime a client says "Hey, I have more data. Can you look at the numbers again?"
- Reproducible Research!

Sweave = LaTeX+ R

But, LaTeXdoesn't understand R, and R doesn't know LaTeX!

- Sweave uses a different filetype: `.rnw`, which combines both
- Run the file through R, using `Sweave` command $\longrightarrow$ Creates a `.tex` file with R output
- Then, you can compile the `.tex` file in LaTeX, like any other `.tex` file.
- Optionally, use Stangle to extract all of the R code you used

In other words:

$$\texttt{rnw} \overset{\text{Sweave}}{\Longrightarrow} \texttt{tex} \overset{\text{pdfLatex}}{\Longrightarrow} \texttt{pdf},$$

and optionally:

$$\texttt{rnw} \overset{\text{Stangle}}{\Longrightarrow} \texttt{R}$$

Sweave = LaTeX + R

So, how do the programs know the difference between R code and LaTeXcode?

- The `.rnw` file looks basically like a `.tex` file, except, where you've included R code.
- When you have R code, you have to write it like this, in what they call a Code Chunk:

```
<<options>>=
 Here's some code
@
```

Using R code within a paragraph: with `\Sexpr{}`

R code in Sweave

What kind of options do we have for the R output?

`Label` : labels code chunks, and also gives that name to any figures produced

`echo` : Print code in document? (`True`)

`print` : Prints all results? (`False`)

`results` : How are results included? (Default=`verbatim`; `tex`; `hide`)

`fig` : Is there a figure to print? (`False`)

etc ...

What else can I do with Sweave?

What kind of options do we have for the R output?

Make Tables : `xtable` outputs R tables with LaTeX syntax very nicely (use `results=tex`)

Make Reports : `reporttools` provides some functions which are helpful when writing reports ($2x2$ tables, summary tables for different kinds of data, etc) –KR

Graphics : (Almost) Anything you can plot in R can be automatically included as a figure in your document (use `fig=T`)

***Not* Lattice** The `Lattice` package is poorly supported in Sweave

Cache : If you run code that takes a long time (simulations?), you may want use `cacheSweave` so the code does not run every time you compile the document

How do I compile an Sweave document?

Method	Pros	Cons	OS
`makefile`	Quick to run: `make`	Make a new `makefile` for every document	Linux, Mac
`Sweave.sh`, `Sweave.bat`	Script has lots of options, same command every time	Have to install the script, command can be long	Linux, Mac, Windows
`GUI`	Not commandline	Doesn't run cleanly every time	Windows, Linux, Mac
`Terminal`	No makefile, or shell script	Run the same set of commands every time	Linux, Mac

See: `http://www.biostat.uzh.ch/services/templates.html`

Method 1: `makefile`[1]

Make a file with the following, and call it `makefile`:

```
all:  Sample.pdf

Sample.pdf: Sample.rnw makefile setup.tex consulting.bib data.r
echo "Stangle(\"Sample.rnw\"); Sweave(\"Sample.rnw\")" \
| R --no-save --no-restore
pdflatex Sample
bibtex Sample
pdflatex Sample
pdflatex Sample
```

Then, in the terminal, go into the directory where the document is, and type: `make`

- Requires a new `makefile` for every document
- Requires all source code to be included, or with `source()` commands

[1] Linux, Mac

Method 2: `Sweave.sh`[3], `sweave.bat`[4]

1. Download the `Sweave.sh` script[2] into `~/bin`.
2. Change the permissions so you can run the script: `sudo chmod u+x ~/bin/Sweave.sh`
3. Navigate to the Directory where your `rnw` document is, and run: `Sweave.sh Sample.rnw`
4. Lots of options! (I use `Sweave.sh -t -ld -nc Sample.rnw`, which creates an R file (`-t`), a `pdf` file from LaTeX(`-ld`), and keeps all the extra files (`-nc`))

- `sweave.bat` has similar functionality, haven't tried it yet
- Requires all source code to be included, or with `source()` commands

[2] http://cran.r-project.org/contrib/extra/scripts/Sweave.sh
[3] Linux, Mac
[4] Windows

Method 3: GUI[5]

1. Open R
2. Copy the "Initial Settings" part of `makefile.r` into R, and run.
3. Copy and Run all of your code in R. (Or use `source()` commands to do this.)
4. Go back to `makefile.r`, and run the last section of code which creates the `tex` file.
5. Open the `tex` file in a LaTeX program, and compile it. (Probably twice to get references correct. Alternately, if you have a bibliography, once, then with bibtex once, then two more times.)

- R source code can be in several different places, which makes it difficult to reproduce a document if it's not clear which files were used.
- Don't necessarily rerun all code every time you compile the document. OK for testing, but if the code has mistakes, the document may not compile correctly.

[5] Linux, Mac, Windows

Method 4: `Terminal`[6]

1. Open a terminal, and navigate to the directory where your document is
2. `R CMD Sweave Sample.rnw`
3. `R CMD Stangle Sample.rnw` (optionally)
4. Open the `tex` file in a LaTeX program, and compile it. (Probably twice to get references correct. Alternately, if you have a bibliography, once, then with bibtex once, then two more times.)

- Requires all source code to be included, or with `source()` commands
- A `makefile` or script would be quicker, since you always run the same set of commands for each document.

[6] Linux, Mac

Report Template

Two files: `template.rnw`, `setup.tex`

- In `setup.tex` (same for every document):

```
\newcommand{\name}{Berater}
\newcommand{\mail}{berater@ifspm.uzh.ch}
```

- In `Template.rnw` (different for each report):

```
\newcommand{\versiondate}{\today}
\newcommand{\client}{Test Client}
\newcommand{\subtitle}{Project Name}
\newcommand{\version}{1.0}
```

Overview

What is Sweave?

What about odfWeave?

odfWeave = R + OpenOffice

What if I want to use OpenOffice instead?

- odfWeave weaves R output into OpenOffice documents using XML
- Input *and* Output files are both `odt`, so must be careful not to overwrite the original file
- No `tangle` option available (to create a `R` file with just the code)
- Similar to Sweave, but doesn't necessarily have all the same features
- For example, the `xtable` package only works in Sweave, and `odfTable` has different options
- Other functionality for `ODF` is included: `odfPageBreak`, `odfItemize` for example
- Could be useful, for example, to give clients tables or plots, even if you don't normally use `odfWeave`

Compiling odfWeave documents

```
install.packages("odfWeave")
library(odfWeave)

file.in <- "/filepath/SampleOdf.odt"
file.out <- "/filepath/SampleOdfOut.odt"

odfWeave(file.in, file.out)
```

If you have trouble installing `odfWeave`, it may be because of the `XML` set up on your computer. (I had to install the `libxml2` package on Ubuntu, and then it worked.)

Report Template

Similar to the report template for Sweave

- `Extras > Optionen > OpenOffice.org > Benutzerdaten`: Change Name and Email (same for all documents)
- `Datei > Eigenschaften > Beschreibung`: Titel = Client Name, Thema = Project Name (different for each report)