Sweave/odfWeave: Bringing R and LaTeX/Office together

Dr Peter K Dunn

http://www.usq.edu.au
Department of Mathematics and Computing
University of Southern Queensland

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Why use Sweave?

Has this ever happened? #1

- Someone brings you data
- You manipulate it: extract a subset, omit outliers, transform some variables, etc.
- You produce a beautiful graphic or complex table
- Then you want to make a change...but can't remember how it was generated, or at least you need to go through the whole process again!

Solution: Use Sweave (if a LaTeX user) or odfWeave

Why use Sweave?

Has this ever happened? #2

- You manipulate some data: extract a subset, omit outliers, transform some variables, etc.
- You discuss variables and models with the discipline expert, fit possible models, examine diagnostic plots, and produce your final report
- But when you need to write about what you did, you can't remember everything!

Solution: Use Sweave (if a LaTeX user) or odfWeave

Why use Sweave?

Has this ever happened? #3

- You wish to teach students how to use R
- You produce all your code, graphics, tables, etc.
- Then something changes and you need to recreate all the graphics, tables, R output, ...

Solution: Use Sweave (if a LaTeX user) or odfWeave

Why use Sweave/odfWeave?

- Sweave allows you to mix:
  - the R code that performs the analysis
  - the documentation explaining what you did, and why
- It's a way to document your analysis
- It permits **reproducible research**

What is Sweave/odfWeave?

- Sweave is a framework for mixing R and LaTeX
- odfWeave is a framework for mixing R and Open Document office documents (produced by, for example, OpenOffice.org)
- It enables automatic document generation
- A **single file** contains R code and the documentation
- Graphics, tables, code, solutions, ...can all appear in the final document
- Allows automatic updating of results in document

How does Sweave work?

- A Sweave document is R code, with LaTeX documentation throughout
- Or: A Sweave document a LaTeX document with computation performed in R
- Sweave is an R package that takes an `.Snw`, `.Rnw` (or `.snw` or `.rnw`) file and replaces all the R code by its R output

How does odfWeave work?

- An odfWeave document is R code, with Office documentation throughout
- Or: An odfWeave document an Office document with computation performed in R
- odfWeave is an R package that takes an `.odt`, file and replaces all the R code by its R output

Sweave/odfWeave basics

- Create a .Snw file (.odt file)
- Fill it with LaTeX (Office) text
- Place R commands in where you want output (see following example)
- Sweave: Run Sweave from within R (ie. type Sweave("document.Snw") from within R)
- odfWeave: Run odfWweave from within R (ie. type odfWeave("document.odt", "documentfinal.odt") from within R)
- Sweave: The .Snw file is converted into a .tex file, replacing all the R code by appropriate LaTeX commands Then run LaTeX etc. as usual
- odfWeave: The .odt file is converted into another .odt file, replacing all the R code by appropriate Office commands

Sweave commands

- In the LaTeX document, R instructions must be differentiated from LaTeX instructions
- Start designated R code 'chunks' with <<>>=
- A code 'chunk' ends with @
- Various options may be contained within the << and >> constructs
- Common options for the code chunk:
  - echo=FALSE: don't show R code in the final document
  - results=hide: hides R's results
  - results=tex: The R output is actually LaTeX code
  - results=xml: The R output is actually XML code, which appears asa formatted table
  - fig=TRUE: include the output as a figure in the final document
- Small (scalar) output specified using \Sexpr{}

Small examples

Example

The Sweave/odfWeave document contains the text:

The sample size
is $n = \Sexpr{length(varname)}$.

Output

After running through Sweave or odfWeave, the resulting LaTeX file contains

The sample size
is $n = 92$.

Small examples

Example

```
<<echo=FALSE,results=hide>>=
round(pi, 3)
@
```

Output

No output, as results hide, and the code itself is not echo-ed

Small examples

Example

```
<<echo=FALSE,results=verbatim>>=
round(pi, 3)
@
```

Output
3.142

Small examples

Example

```
<<echo=TRUE,results=verbatim>>=
round(pi, 3)
@
```

Output
```
> round(pi, 3)
[1] 3.142
```

Small examples (Sweave only)

Example

```
<<echo=FALSE,results=tex>>=
counts <- as.matrix( c(1,2,3), ncol=2 )
xtable(counts) # Needs package  xtable
@
```

The output is actual LaTeX code for a table; that's what the R package xtable does

Small examples (Sweave only)

Output appearing in .tex file

```
% latex table generated in R 2.6.2 by xtable 1.5-1
package
% Tue Mar 25 16:39:49 2008
\begin{table}{ht}
\begin{center}
\begin{tabular}{rr}
\hline
& x \\
\hline
1 & 1.00 \\
2 & 2.00 \\
3 & 3.00 \\
\hline
\endtabular
\endcenter
```

Small examples (Sweave only)

Output in final document

	x
1	1.00
2	2.00
3	3.00

Small examples (odfWeave only)

Example

```
<<echo=FALSE,results=xml>>=
counts <- as.matrix( c(1,2,3), ncol=2 )
odfTable(counts)
@
```

The output is a formatted table in the final document

Small examples (odfWeave only)

Output in final document

	x
1	1.00
2	2.00
3	3.00

Small examples (Sweave only)

Example

```
<<fig=TRUE,echo=FALSE>>=
x <- seq(-1, 1, length=100)
y <- x^2
plot( y ~ x, type="l")
@
```

Small examples (Sweave only)

Output in appearing in `.tex` file
- An eps and pdf file is generated, named `filename-001.eps` and `filename-001.pdf`
- The following code is included in the LATEX document to include the figure:
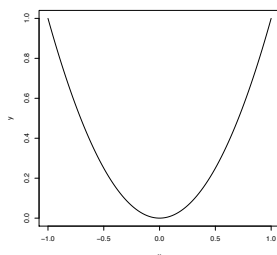 `\includegraphics{filename-001}`

Small examples (odfWeave only)

Example

```
<<fig=TRUE,echo=FALSE>>=
x <- seq(-1, 1, length=100)
y <- x^2
plot( y ~ x, type="l")
@
```

Small examples

Output in appearing in final document

Small examples

Look at examples to show the capabilities of Sweave

What do I need?

Sweave:
- A working copy of R
- A working copy of LATEX
- and a bit of time to learn

Sweave: On my linux system:
- A working copy of R
- A working copy of OpenOffice.org, or any other word processor using the Open Document format
- and a bit of time to learn

Where can I learn more?

See:
- The Sweave web page:
  `http://www.ci.tuwien.ac.at/~leisch/Sweave`
- The odfWeave manual:
  `http://mirror.aarnet.edu.au/pub/CRAN/`
- R News, Volume 2/3, December 2002; see
  `http://CRAN.R-project.org/docs/Rnews`