

Simple knitr to PDF via L^AT_EX2e Tutorial

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1 Introduction

This short tutorial describes the creation of attractive PDF documents incorporating R source code and output via the `knitr` R package and the L^AT_EX2e executable. It assumes enough proficiency with R to create source code and run source files. It further assumes no knowledge with L^AT_EX2e but the motivation and aptitude to learn how to create and process L^AT_EX2e files. It also assumes proficiency with the command line, as illustrated in this tutorial.

What you will need You will need first of all R and the `knitr` package. You will need the `pdflatex.exe` executable. You will eventually need other R libraries and L^AT_EX2e packages, but only for real work, not for this tutorial. You will also need a working computer with an operating system and a text editor or programming environment. This tutorial uses Windows 7 with Vim. Those who successfully complete this tutorial with other operating systems may contact the author for updates to this tutorial.

2 Getting `pdflatex.exe`

This tutorial uses the implementation of `pdflatex` from MiKTeX, <http://miktex.org/>. Download and install MiKTeX. You will find the `pdflatex.exe` executable in a directory created by the installation process. On the author's machine it is located at `C:/Program Files (x86)/MiKTeX 2.9/miktex/bin`. See figure 1. You can edit your path or create an environmental variable to the executable to avoid having to type the full path to the executable with each use.

This tutorial includes a `.tex` file named `simple.tex`, see listing 1. Run `pdflatex` using this file as input, see figure 2. The tutorial also includes the source of this PDF document (named `simple-knitr2pdf.tex`), which you can also run. Make sure that the current directory includes the image files. Running this source may load several packages unless you have already loaded them.

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Figure 1: Path to MiKTeX

```
C:\Program Files (x86)\MiKTeX 2.9\miktex\bin>dir pdf*
Volume in drive C has no label.
Volume Serial Number is F2A9-5F09

Directory of C:\Program Files (x86)\MiKTeX 2.9\miktex\bin

07/29/2011  05:38 PM                34,304 pdf2dsc.exe
07/29/2011  05:38 PM                34,304 pdf2ps.exe
07/29/2011  05:38 PM                33,792 pdfatfi.exe
07/29/2011  06:16 PM                33,280 pdfclose.exe
07/29/2011  05:38 PM                33,792 pdfcrop.exe
07/29/2011  06:16 PM                33,280 pdfdde.exe
04/14/2012  02:16 PM                34,304 pdfetex.exe
04/14/2012  02:16 PM                34,304 pdfjadetex.exe
04/14/2012  02:16 PM                34,304 pdflatex.exe
07/29/2011  05:38 PM                33,792 pdflatexdef.exe
04/14/2012  02:16 PM                34,304 pdfmex.exe
07/29/2011  06:16 PM                33,280 pdfopen.exe
07/29/2011  05:38 PM                34,304 pdfopt.exe
04/14/2012  02:16 PM                34,304 pdfplatex.exe
04/14/2012  02:16 PM                34,304 pdftex.exe
07/29/2011  05:38 PM                33,792 pdftexdef.exe
04/14/2012  02:16 PM                34,304 pdfxmltex.exe
               17 File(s)            578,048 bytes
               0 Dir(s)  125,477,355,520 bytes free
```

Listing 1: simple.tex

```
1 \documentclass{article}
2 \title{My First LaTeX File}
3 \author{My Name}
4 \date{}
5 \begin{document}
6 \maketitle{}
7 \paragraph{}This is my first .tex file, from \texttt{pdflatex.exe} to PDF using \LaTeX2e{}.
8 \end{document}
```

3 Getting knitr

Invoke the R GUI, install the `knitr` package if you have not already done so, and load the `knitr` library. See listing 2.

Listing 2: Loading knitr

```
1 install.packages(knitr)
2 library(knitr)
```

4 Creating PDF from .Rnw files

Creating a PDF document with `knitr` using $\text{\LaTeX}2\text{e}$ requires three steps: first, create a `.Rnw` source file, second, knit the source file with `knit()`, and

Figure 2: Using pdflatex.exe

```
C:\Users\carter\DataSci02\5-ReproResearch\pro-1>pdflatex simple.tex
This is pdfTeX, Version 3.1415926-2.3-1.40.12 (MiKTeX 2.9)
entering extended mode
(C:\Users\carter\DataSci02\5-ReproResearch\pro-1\simple.tex
LaTeXe <2011/06/27>
Babel <v3.8m> and hyphenation patterns for english, afrikaans, ancientgreek, ar
abic, armenian, assamese, basque, bengali, bokmal, bulgarian, catalan, coptic,
croatian, czech, danish, dutch, esperanto, estonian, farsi, finnish, french, ga
lician, german, german-x-2009-06-19, greek, gujarati, hindi, hungarian, iceland
ic, indonesian, interlingua, irish, italian, kannada, kurmanji, lao, latin, lat
vian, lithuanian, malayalam, marathi, mongolian, mongolianlmc, monogreek, ngerm
an, ngerman-x-2009-06-19, nynorsk, oriya, panjabi, pinyin, polish, portuguese,
romanian, russian, sanskrit, serbian, slovak, slovenian, spanish, swedish, swis
sgerman, tamil, telugu, turkish, turkmen, ukenglish, ukrainian, uppersorbian, u
senglishmax, welsh, loaded.
("C:\Program Files (x86)\MiKTeX 2.9\tex\latex\base\article.cls"
Document Class: article 2007/10/19 v1.4h Standard LaTeX document class
("C:\Program Files (x86)\MiKTeX 2.9\tex\latex\base\size10.clo"))
No file simple.aux.
[1(C:/Users/carter/AppData/Local/MiKTeX/2.9/pdftex/config/pdftex.map)]
(C:\Users\carter\DataSci02\5-ReproResearch\pro-1\simple.aux) <C:/Program Files
(x86)\MiKTeX 2.9/fonts/type1/public/amsfonts/cm/cm10.pfb><C:/Program Files (
x86)\MiKTeX 2.9/fonts/type1/public/amsfonts/cm/cm10.pfb><C:/Program Files (x86
)\MiKTeX 2.9/fonts/type1/public/amsfonts/cm/cm12.pfb><C:/Program Files (x86)\M
iKTeX 2.9/fonts/type1/public/amsfonts/cm/cm17.pfb><C:/Program Files (x86)\MiK
TeX 2.9/fonts/type1/public/amsfonts/cm/cm7.pfb><C:/Program Files (x86)\MiKTeX 2
.9/fonts/type1/public/amsfonts/cm/cmtt10.pfb>
Output written on simple.pdf (1 page, 61272 bytes).
Transcript written on simple.log.
```

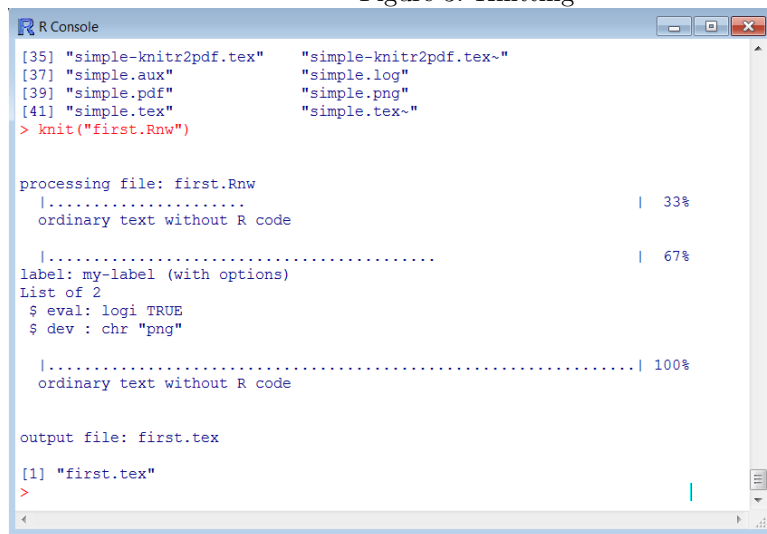
third, compile the resulting .tex file with pdflatex. This tutorial includes a simple source file (see listing 3) named first.Rnw. The R code shamelessly cribbed from Yihui Xie at <http://yihui.name/knitr/>.

Listing 3: First Rnw file

```
1
2 \documentclass{article}
3 \title{My First Rnw File}
4 \author{Charles Carter}
5 \date{}
6 \begin{document}
7 \maketitle{}
8 \paragraph{}This is my first .Rnw file, from \textsf{R} to PDF through \LaTeXe{}.
9
10 <<my-label, eval=TRUE, dev='png', fig.width = 3, fig.height = 3>>=
11 set.seed(1213) # for reproducibility
12 x = cumsum(rnorm(100))
13 mean(x) # mean of x
14 plot(x, type = 'l') # Brownian motion
15 @
16
17 \end{document}
```

In the R GUI, knit the first.Rnw source file. See figure 3. This will create a file named first.tex. Then, run pdflatex against this file. This will produce a PDF document named first.pdf that looks like figure 4.

Figure 3: Knitting



```

R Console
[35] "simple-knitr2pdf.tex" "simple-knitr2pdf.tex~"
[37] "simple.aux"          "simple.log"
[39] "simple.pdf"          "simple.png"
[41] "simple.tex"          "simple.tex~"
> knit("first.Rnw")

processing file: first.Rnw
|.....| 33%
ordinary text without R code

|.....| 67%
label: my-label (with options)
List of 2
 $ eval: logi TRUE
 $ dev : chr "png"

|.....| 100%
ordinary text without R code

output file: first.tex

[1] "first.tex"
>

```

5 Some After Words

Why use \LaTeX ? Because an author can produce attractive, professional documents with ease. At first, inserting formatting codes by hand may seem harder than using a point-and-click editor (like Microsoft Word, perhaps). However, \LaTeX makes many things easy, such as document subdivisions (chapters, sections, paragraphs), various tables (contents, figures, appendices, listings), mathematical equations, pagination, and precise placement of typographical elements. Learning and using \LaTeX has its cost — it's not particularly easy to learn — it has two great benefits which can outweigh the cost: (1) creating professional quality documents, and (2) not having to fight with a point-and-click document processing system. Sometimes, people claim that \LaTeX is a *logical* markup language. People who know how to use it understand how that claim makes sense.

I hope this short tutorial proves useful. Please contact the author if you note any errors or ambiguities, or if you have suggestions for improvements in any way.

Figure 4: first.pdf

