Producing
Beautiful
Documents
With TeX and
LaTeX: An
Extremely
Brief
Introduction

Lawrence
Hubert

Producing Beautiful Documents With TeX and LaTeX: An Extremely Brief Introduction

Lawrence Hubert

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What is TₑX and LᴬTₑX?

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TₑX is a very mathematically savvy typesetting engine produced in the 1980's by Donald Knuth from Stanford.

It is open-source (which means it is free, and freely available); implemented for every conceivable operating system; it is currently in Version 3.141592, so it is, in effect, now "fixed" forever.

Extra Credit: can you tell why it is essentially "fixed"? And what will be the version number when Knuth dies?

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LaTeX is a set of macros sitting on top of TeX that makes our task easier.

It was produced by Leslie Lamport in the middle 1980's; it is also open-source and delivered conjointly with any TeX system. The current version is LaTeX2e and is under constant development and extension.

TeX and LaTeX work together, with LaTeX helping produce what is called the document mark-up, and TeX then being called upon to do the actual typesetting.

Features and Advantages

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Why you should use TEX and LATEX —

In contrast to word-processing methods such as Word, you do not worry about the visual formatting of your document. You are concerned only about the content. In other words, you separate content from layout.

The file you produce is ascii, the simplest you can have with no special symbols; it includes general commands for what you wish to do in the document.

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The subtext: you don't need to support the evil empire in
Redmond Washington, use their proprietary file formats, and
make Bill Gates even richer than he already is.

I have put the piece by Allin Cottrell, *Word Processors: Stupid
and Inefficient*, up at the website:
`http://cda.psych.uiuc.edu/latex_class_2014`
in a file called `wp.pdf`

Read and enjoy, and then use LATEX.

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Many places of publication (and now universally in any source
that has even the slightest quantitative tinge), ask for
manuscripts to be submitted as a LATEX ascii file (usually,
along with a corresponding typeset pdf file, i.e., one in
portable document format).

This might include the use of what is called a "class file" that
specifies and controls the unique appearance of the document
for the intended publication source.

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Class files all have the extension cls (so be sure to turn on the "show file types" option if you are using windows; it is off by default), and, in effect, drive the formatting of a document and provide special commands to use, whenever necessary, for the document at hand.

Class files are typically provided to you, or more likely, you will need to download these from some provided web site.

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Although the quantitative journals in psychology typically have
their own class files now (e.g., Psychometrika, Journal of
Mathematical Psychology), we will mention several which may
be germane to all of you.

These, we might note, are in addition to the standard LATEX
classes:

article.cls
report.cls
book.cls
slides.cls
letter.cls

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apa6.cls (guess what this class is for?)

uiucthesis.cls (let's hope some of you get to use this one)

beamer.cls (this is the class I'm using to produce these slides)

letter.cls (although a standard LaTeX class, I still use this for my letters of recommendation; I change the address to whom the letter is going, and typeset again)

slides.cls (this is the class I use for the "notes")

beamerposter.cls (for posters; see the documentation at:

http://www-i6.informatik.rwth-aachen.de/~dreuw/
latexbeamerposter.php

```
apa6_beitzel.pdf
beitzel_practex_apa6.pdf
apa6.cls
apacite.pdf
beameruserguide.pdf
```

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You can get anything TEX and LATEX related (for free) from the CTAN archive: The Comprehensive TEX Archive Network:

`http://www.ctan.org/tex-archive`
For example, the apa stuff is at:

/macros/latex/contrib/apa
for the UI thesis class, see:

/macros/latex/contrib/uiucthesis
for the newer beamer class:

/macros/latex/contrib/beamer

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If you have *any* reasonable mathematics in way of formulae to put into a manuscript;

or if you have tables that you would like to include and manage well;

or if you would like to easily "repurpose" your prose for other uses at times (a nice word, don't you think);

or if you would like to see your document in many forms easily (e.g., double-spaced rough draft; two-column final look, and so on);

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or if you have some simple graphics that you would like to include by way of text itself using the picture environment (as opposed to including a eps or pdf figure, which you can also do);

you are a *fool* (hear me, a *fool*) if you don't consider using TEX and LATEX.

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There is a very nice integration with all the modern file formats. The ascii markup file has traditionally used the extension tex, and when typeset produces a dvi (device independent) file, which could then be printed or viewed.

The situation is true to the present, but we now have a route to going from tex to pdf directly (or to ps and then to pdf; or first to dvi and then ps or pdf).

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At times I like to use eps for my included graphics; I then
generally go from tex to dvi to pdf (this is easy to do and has
no glitches; but many other paths are possible).

When I use pdf for my graphics, I go directly to a pdf file
(using the pdfLATEX option)

There are html file options (htm) as well; much of this is now
being replaced by the direct use of pdf

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There are very nice tools for long projects: automated indexing (including multiple indices such as Subject and Author — I've done these using the package multind.sty);

automatic construction and inclusion of Tables of Contents, Tables of Figures, and Tables of Tables;

easier preparation of Proceedings Volumes and Journals where the "chapters" are actually separate manuscripts;

On our website, I have a directory for a monograph I published in 2006 with SIAM that I did myself (with multiple indexing, tables of contents, etc); mono_stuff_11_1_05

You can see how a longer project can be done rather easily with these kinds of tools we have available

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if you really get into this, you can use Bibtex, which generates bibliographies from a master file (a .bib file) where you maintain "all" your references (from birth).

You can have bibliographies generated automatically by referencing according to a label placed in your text; if the bibliography entries need to be in a particular form, you can generate the appropriate style using a bibliographic style file (one with a .bst extension);

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for example, Erik Meijer has produced the package
`apacite.sty` and assorted items you need for APA citation
practice:

/biblio/bibtex/contrib/apacite

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When one does mathematics or statistics in any form, there is just *no* substitute for using TEX and LATEX.

The quality of production is incredibly high, even for very complicated mathematical presentation.

If you use apa6.cls and put jou in the document class options, the resulting manuscript will typeset two-column (like APA) and look exactly like a printed reprint;

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in fact, it is so good, maybe we should just skip the
submission/review/resubmission process.

Many journals (including, for example, *Psychometrika*) now use
LATEX markup to generate all the necessary files for printing the
journal.

Some of you might like to publish in Elsevier journals (e.g.,
NeuroImage); if so, look at
`http://www.elsevier.com/author-schemas/`
`latex-instructions`

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TEX considers the paragraph as the unit of typesetting, with the manner in which lines are set and broken, and how hyphenation is done, based on a very nice dynamic programming algorithm (one of my own research areas).

The only Desktop Publishing Program that uses such a method is Adobe's InDesign.

If you wish, I could tell you my experiences with typesetting by hand in 8th grade shop — we used what was called the "first-fit" method.

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There are many add-on packages (all free, and with a file extension of sty) that provide collections of new commands and environments for various purposes.

Also, there is language/font support for literally hundreds of languages (see the babel packages):

/macros/latex/required/babel

For handling Chinese/Japanese/Korean, see the CJK package and the file (on our web site): cjkintro600.pdf

A search on my MikTex distribution for sty, gets over 3000 hits; these packages were automatically included during a full install.

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Packages are continually under development and an installation such as Miktex has a mechanism for updating its distribution.

Also, when you use a .sty file that may not be in the distribution as yet, MikTex is so smart that it goes out to the Web, gets the package, and installs it for you.

This all says, by the way, that we need to be on high-speed internet access to function effectively. No more dirty-dialup.

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Packages are included with the command \usepackage{},
placed in the preamble (the area between \documentclass{}
and \begin{document};

the ones I routinely use are:

curves.sty (this adds a few nice drawing capabilities to the
picture environment);

graphicx.sty (the standard for incorporating and
manipulating all sorts of graphics into a manuscript);

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`multind.sty` (for creating both subject and author indices);
`amsmath.sty`, `latexsym.sty`, `amsfonts.sty` (these add new
symbols from the American Mathematical Society).

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GNU (Gnu is not Unix, recursively) —

The newest extension of the picture environment is loaded with `pgf.sty` and `tikz.sty` (portable graphics format).

TikZ ist kein Zeichenprogram

Just as `beamer.cls` is all the rage now for slides, TikZ/pgf has a similar appeal for drawing your diagrams and pictures. These are written by the same person (apparently, with a lot of time on his hands) — Till Tantau

Resources and Documentation

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There are a few sources that we all should have available. The first costs money ($45.00):

Leslie Lamport, *LATEX: A document preparation system*, 1994, Addison-Wesley.

and a number are free as .pdf's (and on our web site):

The not so short introduction to LATEX2e:

`lshort_157minutes.pdf`

A beginner's introduction to typesetting with LATEX:

`beginlatex-3.6.pdf`

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The Comprehensive LATEX Symbol List:

symbols-letter.pdf

A two-page "cheat sheet":

latexsheet.pdf

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Two other Addison-Wesley products are worth buying if you have the money:

Frank Mittelbach and Michel Goosens, *The LaTeX companion (2nd Edition)*, 2004.

Helmut Kopka and Patrick Daly, *Guide to LaTeX (4th Edition)*, 2003.

Also, from George Grätzer (author of *Math Into Latex*), we have a short course from his book:

math_into_latex_short_course.pdf

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There is no better place for all things TEX and LATEX than the
TeX Users Group (TUG):

http://www.tug.org

The group's printed journal (TUGboat) and online source
(PracTeX) are available for free, as well as all sorts of other
information and items. I am a member for \$75.00; students pay
\$45.00.

You get a lot of stuff for this price (TexLive; Tugboat; CTAN
snapshots; etc.).

I have put a few items up on my web site that you can access. We will use some in the demonstrations to follow:

`cda.psych.uiuc.edu/latex_class_2014`
latex_presentation_beamer_version_2014.tex (the source file for the slides you are now looking at);

latex_presentation_beamer_version_2014.pdf (the actual file I am showing to you now);

wp.html (Allin Cottrell's piece on Stupid and Inefficient Word Processors)

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An aside on file names —

Make sure your titles are meaningful. We are no longer limited to less than or equal to eight characters in our file names. Always use the extensions. It will make things much easier to find (later as well as more immediately).

The underscore mark is very helpful in avoiding the use of spaces (which still can cause problems, so avoid them). Also, remember that names are generally case-sensitive, so I generally only use lower-case.

Files for the Demonstration

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ED2007.cls (the class file for Edwin Diday's Festschrift)
ED2007manuscripts.pdf (instructions on how to use the class file)
ED2007manuscripts.tex (the source file)
diday_rev.pdf (the Hubert and Köhn paper for the Festschrift)
diday_rev.tex (the source file)
AR_Monte_Carlo_box_plots_all.pdf (the included .pdf file for the paper, with name violating my lower-case rule)

The Mechanics

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An Editor and a Distribution
For the Mac:

http://www.tug.org/mactex

Download the large image file (in MacTex.pkg) and install
(easily by clicking). You are given Texshop as an editor and
interface (see the file: WelcomeToMacTex.pdf at our website).

For Windows:

First download and do a complete install of the typesetting
engine MikTex from:

http://miktex.org (Version 2.9 now)

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For your (Zen-like, and chroma-coded) editor, use WinEdt and download from

http://winedt.com (Version 5.5 for the license immediately below; the current Version is 7 with license to follow that for 5.5)

After installed, call up the Registration box (under Help), and enter exactly as stated (including spaces and capitals):

Name: UIUC Psychology (50-user Site License)

Code: 7431692338750581620

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Version 6 or 7:

Name: Lawrence Hubert

Code: 5444201233798851783

For Version 8, you are on your own with a Shareware cost of
$40

This is good forever ...

For Linux/Unix:

You already know what to do and use.

Some Parting Comments

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LyX is a free visual document processor (they call it WYSIWYM) that can export LaTeX processable files and uses LaTeX itself as a backend:

`http://www.lyx.org`

A (rather expensive) commercial version of a LyX-type system is Scientific Word from MacKichan Software:

`http://www.mackichan.com`

For a comparison of the various editors to use, see
`http://en.wikipedia.org/wiki/Comparison_of_TeX_editors`

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I have some Lucida fonts that I bought from PcTeX; I think these are just beautiful and will give an example later.

You use them by putting a usepackage[] statement in your document (in the preamble), and then use the two options of lucidasmallscale and nofontinfo and the package name of lucimatx .

The only problem for me is that I haven't figured out (as yet) how to use them outside of PcTeX; I get an error message about not all fonts being located when I try within WinEdt, for example.

If you want to buy PcTex and the Lucida fonts yourself (for $105 with Academic pricing), go to:
http://www.pctex.com/

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Once you know how to makeup a document in LaTeX, you can write questions in simple email that might involve formulas using these same LaTeX commands (this is the nerd version of text messaging).

Also, if you are adventuresome, you can use your knowledge of LaTeX commands to ask for, among other things, dates:
\dinner
This is read "backslash dinner?" —