

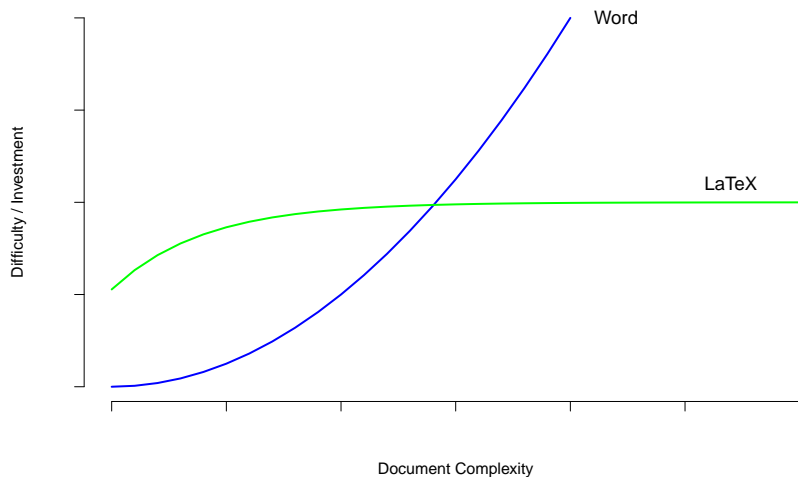
A very brief introduction to L^AT_EX

December 11-12, 2013.

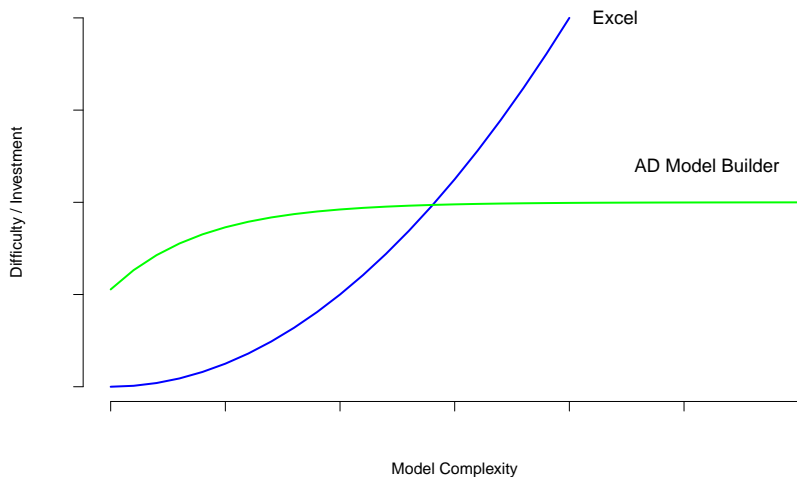
What is L^AT_EX?

- mark-up language and document preparation system
- originally invented in 1980s by Leslie Lamport
 - ▶ mature, powerful
- provides high level language on top of T_EX (Donald Knuth)
- continues to be widely used in academia, publishing and industry
- particularly well suited for developing complex documents and books
- excellent support for type-setting formulas and equations
 - ▶ widely used in mathematics and physics

Latex Learning curve versus Word



A fisheries analogy



Latex Basics

- philosophy remove formatting and presentation concerns from author
- author focuses on basic document structure and content, \LaTeX handles typesetting, formatting and cross references
- addon-packages (<http://www.ctan.org>) provide additional functionality
- different than Word and other “What-You-See-Is-What-You-get” applications
- \LaTeX uses plain text files (*.tex)

A Minimal Example

Example (/examples/0_minimal_latex/min.tex)

```
% minimal latex example
\documentclass{article}
\begin{document}
  \LaTeX{} is a document preparation system for the
  \TeX{}typesetting program.
\end{document}
```

Preamble

- precedes the `\begin{document}` command
- loads required packages
- document specific settings
- possible to define macros

Example

```
\documentclass[12pt,letterpaper]{article}
\usepackage{longtable}
\usepackage{ctable}
\graphicspath{{figures/}}
\title{Fill in title here}
\author{Your Name}
```

Top Matter

Example

```
\title{Basic \LaTeX{} Document Structure}  
\author{Homer Simpson\\  
  742 Evergreen Terrace,\\  
  Springfield,\\  
  United States,\\  
  123456\\  
  \texttt{hsimpson@simpsons.com}}  
\date{\today}  
\maketitle
```


Sections

- define document structure with sections

Examples

```
\section{Introduction}  
\subsection{A Subsection Under Introduction}  
\subsubsection{A Subsubsection}  
\paragraph{paragraph}  
\subparagraph{subparagraph}  
  
% suppress numbers with asterisk  
\section*{Introduction}
```

Environments

- provide specific functionality associated with type setting various document components
- environments can be nested within one another
- examples include:
 - ▶ center
 - ▶ table
 - ▶ figure
 - ▶ equation

Figures

Example

```
\begin{figure}  
  \begin{center}  
    \includegraphics[width=\textwidth]{figurename}  
  \end{center}  
  \caption[short caption]{full caption}  
  \label{fig:figurename}  
\end{figure}
```

Tables

Latex:

```
\begin{table}
  \begin{center}
    \begin{tabular}{l l}
      Name & Value \\
      \hline
      A1 & B1 \\
      A2 & B2 \\
    \end{tabular}
  \end{center}
  \caption[shortcaption]{longcaption}
  \label{tbl:simpletable}
\end{table}
```

Produces:

Name	Value
A1	B1
A2	B2

Equations

- L^AT_EX excellent support for mathematical type setting
- simple in-line formula can be included by wrapping statement in `$`
 - ▶ `$\alpha + \beta = \delta$` will render as $\alpha + \beta = \delta$
- more complicated equations require either `displaymath` or `equation` environment

Equations (cont'd)

\LaTeX

```
\begin{equation}  
L_i = L_{\infty} (1 - e^{-k(t_i-t_0)}) + e_i  
\end{equation}
```

will appear as:

$$L_i = L_{\infty}(1 - e^{-k(t_i-t_0)}) + e_i \quad (1)$$

References

- \LaTeX comes with built-in support for references
- add-ons make using references much easier
 - ▶ BibTeX - an application comes with \LaTeX to compile bibliography
 - ▶ natbib - a latex package that provides additional commands and flexible formatting of references
 - ▶ RefTeX - built-in emacs mode for handling cross reference in (\LaTeX) documents

BibTeX

- stand alone application that is bundled with \LaTeX
- references are maintained in ‘*.bib’ file
 - ▶ plane text format widely available and easily generated by most reference management software
- `bibtex` must be called independently on *.tex file
- what `bibtex` does:
 - ▶ `bibtex` parses *.tex document
 - ▶ compiles references (`\cite{<key>}`)
 - ▶ replaces `\cite{<key>}` with “Quinn and Deriso (1999)”
 - ▶ formats and builds References section of report

BibTeX (cont'd)

- requires additional processing to get references and labels correct
 - ▶ instead of a single call to `pdflatex`
 - ▶ requires multiple calls:
 - ★ `pdflatex - bibtex - pdflatex - pdflatex`
 - ▶ a custom emacs function has been provided in the workshop configuration file to automate this. (`M-x ac-run-lb11`).

natbib package

- provides additional commands and more flexible formatting options

usage

```
\usepackage[numbers]{natbib}
\bibpunct{(}{)}{;}{a}{,}{,}
\begin{document}
....
\bibliographystyle{<bst_filename>}      % without .bst
\bibliography{<bib_filename>}           % without .bib
\end{document}
```

natbib package (cont'd)

helpful commands

```
\citet{QuinnDeriso1999} -> Quinn and Deriso (1999)  
\citep{QuinnDeriso1999} -> (Quinn and Deriso, 1999)
```

- bibliographic styles
 - ▶ contained in '*.bst' file
 - ▶ several included with natbib (e.g. plainnat)
 - ▶ dozens of journal specific formats available on web
 - ▶ cjfas.bst included in ~/workshop/utils

RefTeX

- emacs minor mode to facilitate working with cross referenced objects
 - ▶ references, tables, figures, index, glossary, table of contents, etc.
- configured to start automatically in latex mode in workshop configuration

Some useful RefTeX key bindings

C-c	[reftex-citation
C-c	(reftex-label
C-c)	reftex-reference

Abstracts

- so common have designated environment

Example

```
\begin{abstract}
Your abstract goes here...
...
\end{abstract}
```

Multi-part Documents

- for multiple parts documents use `\input{}` or `\include{}`
- `main.tex` contains preamble and document-wide settings (TOC, lists of figure and tables, etc.)

`main.tex`

```
...    % preamble
\begin{document}
...
\include{first_chapter.tex}
\include{second_chapter.tex}
\include{third_chapter.tex}
...
\end{document}
```

Presentations

- Beamer package for producing slides and presentations
- provides a number of specialized functions and commands
- `frame{...}` environment produces a slide
- dozens of pre-built themes available (see:
<http://www.hartwork.org/beamer-theme-matrix/>)
- an example beamer presentation has been provided in
`~/examples/beamer`
- all of the presentations in this workshop were created using
beamer

Debugging

- errors in can be difficult to diagnose
- ~! I can't write on file '<YourFile>.pdf'~
- 'Runaway argument' 2nd most common - caused by missing closing delimiter
- defensive coding
 - ▶ compile early and often
 - ▶ use tools that insert closing delimiters (e.g. - yasnippets)
- debugging strategies
 - ▶ M-x check-parens
 - ▶ M-x how-many
 - ▶ isolate errors by:
 - ★ commenting out blocks
 - ★ moving `\end{document}`

Resources

- Official Repository of packages:
 - ▶ <http://www.ctan.org/>
- A useful tutorial:
 - ▶ <http://www.andy-roberts.net/writing/latex>
- symbols
 - ▶ <http://www.artofproblemsolving.com/Wiki/index.php/LaTeX:Symbols>
- TexStackExchange (similar to stackoverflow.com)
 - ▶ <http://tex.stackexchange.com/>

Recap