Linux Users Group
at NC State University

Intro to LaTeX
Made in LaTeX

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Outline

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Background

Pronunciation

History

Pronunciation (Background)

- Pendants care
- The "X" in TEX is chi.
  - Technically a "voiceless velar fricative"
  - Correct: "tech" as in "technology"
  - Incorrect: "tex" as in "Texas"
- LATEX
  - Correct: "Ell A tech"
  - Correct: "Lah tech"

History (Background)

- TEX
  - Donald E. Knuth
  - Started in 1977
  - Completed 1989
- LATEX
  - Lesile Lamport
  - Manual published in 1986
  - Given to Frank Mittelbach in 1989
  - LaTeX2e released 1994

Why LaTeX?

- Text Files
- FOSS
- Aesthetics
- Flaws

Text Files (Why LaTeX?)

- Written in plaintext .tex files
  - Your favorite utilities work
- Scriptable
- Declared via text, not menu
- Inline comments
- Split lines for easy editing
- Multiple files

FOSS (Why LaTeX?)

- Free
- Can contribute/modify
- Syntax always valid
- Clearly documented

Aesthetics (Why LaTeX?)

- Looks nice
- Can micromanage
- Can just trust default

Flaws (Why LaTeX?)

- Niche
- Have to read the manual
- Syntax errors
- Compilation time

Engines

- pdfTex
- XeTeX
- LuaTeX

pdfTex (Engines)

- Hàn Thế Thành
- August 2001
- Extended from e-TeX
- Direct PDF output
- Typesetting improvement
- Needs fontenc and inputenc packages for Unicode

XeTeX (Engines)

- Jonathan Kew
- 2004 on MacOS X
- UTF-8
- Any fonts installed on OS
- More font control
- Reliant on OS

LuaTeX (Engines)

- Oriental TeX project
- 2006 start
- 1.0 released 2016
- Internals accessible from Lua
- UTF-8
- System fonts
- Default for ConTeXt

- Basic Input
  - Syntax
  - Preamble
  - Text
  - Math

Syntax (Basic Input)

- Every macro starts with \
- Free space after a macro is ignored
- % is for comments
- Commands: macros, made up of TeX syntax and/or other macros
  - Some have parameters, some don't
- Environments: commands in two halves

```
\command[optional parameters]{required parameter}
\begin{environment}[optional parameters]{required parameter}
        % Inside environment
\end{environment}
```

Preamble (Basic Input)

```
\documentclass[options]{type}
% Package Declarations
% (Optional) Command and Environment Declarations
% (Optional) Setting Declarations

\begin{document}
        % Text
\end{document}
```

- Document Options
  - 10pt, 11pt, 12pt
  - a4paper, letterpaper
  - draft
  - oneside, twoside
  - notitlepage, titlepage
- Document Types
  - article
  - report
  - book

Text (Basic Input)

```
\\
\textbackslash
\ % space afterwards
\vspace{[amount]}
\hbar

\emph{text}
\textbf{text}

\title{}
\author{}
\maketitle

\section{}
\subsection{}
\tableofcontents

\begin{center} \emph{Words}
Extra words

\textbf{more words} \end{center}
```

Words extra words

more words

Math (Basic Input)

```
$ $ % TeX In-line

\( \) % LaTeX In-line

\[ \] % LaTeX Displayed Math

\begin{equation} \end{equation} % amsmath

^ % Caret/Circumflex

_ % Underscore

\big % Also \Big, \bigg, and \Bigg

\left( \right)

\frac{numerator}{denominator}

\omega

\[ \left[ \frac{\omega}{2} \right] \Big\vert_{10}^{26} \]
```

$$\left[\frac{\omega}{2}\right]\Big|_{10}^{26}$$

- Packages
  - General
  - Fonts
  - Specialized

General (Packages)

```
\usepackage[options]{name}
```

- microtype
- amsmath
- TikZ
- minted
- graphicx

```
\includegraphics[width=\textwidth]{filename}
```

- biblatex

```
\addbibresource{file}
\cite{name}
```

Fonts (Packages)

```
\usepackage[options]{name}
```

- lmodern, etc
- fontspec
  - **Only** LuaTeX or XeTeX
  - main, mono, and sans fonts

```
\setmainfont[options]{name}
\setmonofont[options]{name}
\setsansfont[options]{name}
```

Specialized (Packages)

```
\usepackage[options]{name}
```

- geometry
- nopageno
- pdfpages
- tabularx
- CircuiTikZ
- Almost anything you can think of...

Installation and Tools

- TeX Live
- Editors
- Compiling

TeX Live (Installation and Tools)

- Sebastian Rahtz and TEX users groups
- 1996
- Free software
- Everything you need for LATEX
- LaTeX2e, pdfTex, XeTeX, LuaTeX, packages, latexmk
- In most package managers at various sizes

Editors (Installation and Tools)

- Overleaf
  - Online, like a Google Doc
- TexStudio
  - Word-like
- LyX
  - WYSIWYM
- TeXworks
  - auto-sync PDF Viewer
- Vim
  - latex-suite
    - Graphical and monolithic
  - vimtex
    - Minimal, use snippets engine
- Emacs
  - AUCTeX

Compiling (Installation and Tools)

```
pdftex file.tex
make
latexmk file.tex
```

- Direct Engine Calls
  - May need multiple calls
  - Not very automated
  - When called without argument, compiles every tex file
- Make
  - Wrap around engine calls
  - If using -j, make sure files aren't shared
  - Clean target!
- latexmk
  - Perl wrapper script
  - Runs as many times as necessary; calls auxiliary programs
  - -pdf, -pdflua, -pdfxe

- latexmk
  - latexmk options
  - latexmkrc
  - latexmkrc Example

latexmk options (latexmk)

- -pvc compiles continuously and previews
- -outdir=[dir] outputs to directory dir
  - *N.B.* Output goes to directory latexmk is run in, by default.
- -c cleans all created files but output
- -C cleans all created files
- -deps gives a list of dependent files
- -jobname=[name] uses a different job name
- -pdflatex="[command]" sets pdflatex to that command
  - e.g. -pdflatex="pdflatex -shell-escape"
  - -lualatex="[command]"
  - -xelatex="[command]"
- -quiet/-silent
- -time
- -shell-escape
- Exit on the command line is "X<CR>"

latexmkrc (latexmk)

- $preview_mode = [number];
  - 0 = no pdf, 2 = ps2pdf, 3 = dvipdf
  - 1 = pdflatex
  - 4 = lualatex
  - 5 = xelatex
- $pdftex = [command]
  - $lualatex = [command]
  - $xelatex = [command]
- @default_files = ([files])
- $dvi_previewer = "start [program]"
- $emulate_aux = [0 or 1]
- out_dir = [dir]
- aux_dir = [dir]
- $preview_continuous_mode = [0 or 1]

latexmkrc Example (latexmk)

Global latexmkrc

```
$pdf_previewer = 'start zathura';
$pdf_mode = 1;
```

Project latexmkrc

```
$pdf_mode = 4;
$lualatex = "lualatex --shell-escape";
```

Tips and Tricks

- Custom Macros
- Custom Macro Examples
- Multiple Files

Custom Macros (Tips and Tricks)

- Commands
  - The name must be \name, not name
  - 9 parameters max
  - parameters used as #1, #2, etc.
  - default is optional. Provides default value for #1.
  - Calling the command inserts the code in braces

```
\newcommand{\name}[num arguments][default]{#1 text}
\renewcommand{\name}[num arguments][default]{#1 text}
```

- Environment
  - The name cannot have a backslash
  - Same parameter rules as commands
  - Inserts first braces at \begin
  - Inserts second braces at \end

```
\newenvironment{name}[num arguments][default]{#1 text}{ending text}
\renewenvironment{name}[num arguments][default]{#1 text}{ending text}
```

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Custom Macro Examples (Tips and Tricks)

```
\newenvironment{slide}[1]
    { \begin{frame}[fragile, environment=slide]
        \frametitle{#1}
        \vfill }
    { \vfill
    \end{frame} }

\renewenvironment{slide}[1]
    { \subsection{#1}
    \begin{frame}[fragile, environment=slide]
    \frametitle{\subsecname \hfill (\secname )}
    \vfill }
    { \vfill
    \end{frame} }

\newcommand{\newsec}[1]
        { \section{#1}
        \begin{frame}
        \vfill
        \begin{Large}
        \tableofcontents[sectionstyle=show/hide, subsectionstyle=show/show/hide]
        \end{Large}
        \vfill
        \end{frame} }
```

Multiple Files (Tips and Tricks)

- \include{file}
  - \includeonly{files}
    - Preamble or command line
  - Starts a new page and processes file contents
  - Independent .aux files (auxillary information)
  - Cannot be nested
- \input{file}
  - Directly processes file contents

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Resources

- TeX Live: http://tug.org/texlive/
- Math Symbols (OEIS): https://oeis.org/wiki/List_of_LaTeX_mathematical_symbols
- Overleaf Documentation: https://www.overleaf.com/learn
- CTAN: https://www.ctan.org/
- LaTeX Wikibooks: https://en.m.wikibooks.org/wiki/LaTeX
- TeX FAQ: https://texfaq.org/
- TeX Stack Exchange: https://tex.stackexchange.com/
- Latexmk: http://personal.psu.edu/~jcc8/software/latexmk/