Introduction to Making Documents with LaTeX

Jupiter Subgroup

November 4, 2015

Introduction

What LaTeX is

- A cross-platform typesetting environment
- Best way to produce aesthetically pleasing, logically coherent documents, especially when dealing with mathematical equations
- Free and customizable

What LaTeX isn't

- WYSIWYG (What You See is What You Get)
    - MS Word, LibreOffice
- Bloated memory hog

How it Works

1. The TEX typesetting engine reads a plain text file, usually written using LATEX (a set of TEX macros)

```
\documentclass{article}
\begin{document}
Hello world
\end{document}
```

How it Works

1. The TEX typesetting engine reads a plain text file, usually written using LATEX (a set of TEX macros)

2. Produces a readable, formatted document image (.dvi)

How it Works

1. The TeX typesetting engine reads a plain text file, usually written using LaTeX (a set of TeX macros)
2. Produces a readable, formatted document image (.dvi)
3. Convert to pdf (or straight to pdf using pdflatex)

Hello world

How it Works

1. The TeX typesetting engine reads a plain text file, usually written using LaTeX (a set of TeX macros)
2. Produces a readable, formatted document image (.dvi)
3. Convert to pdf (or straight to pdf using pdflatex)

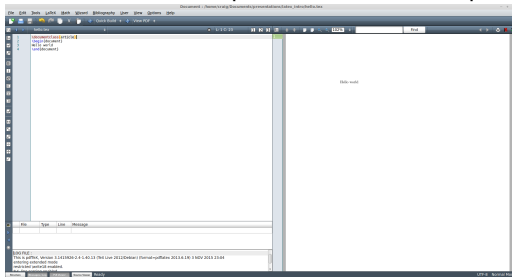Separates design from content $\rightarrow$ enhanced logical structure

What you Need

1. Text editor or IDE
   - Texmaker, Vim/Emacs/gedit with plugins, Notepad++, Sublime
   - Look for built-in output viewer, code completion

What you Need

1. Text editor or IDE
   - Texmaker, Vim/Emacs/gedit with plugins, Notepad++, Sublime
   - Look for built-in output viewer, code completion
2. Sane LaTeX installation
   - Windows - MikTeX
   - Mac - MacTeX
   - Linux - texlive

Special Characters, commands, and comments

- Special characters
  - tells LATEX to do something, won't print like you intend
  - # $ % ^ & _ { } ~ \
- LATEXcommands
  - Start with a \, i.e. \backslash, \alpha→ α
- Comment lines with %

Input file structure and layout

- Preamble
  - Contains document type and all formatting directions and information not directly related to content
  - Authors, date, institutions, title, external packages

```
\documentclass[11pt]{article}
\input{header}
\usepackage{verbatim}
\usepackage{amsmath}
\usepackage[top=1in, bottom=1in, left=1in, right=1in]{geometry}
\def\mn{{\mu \nu}}
```

Input file structure and layout

- Preamble
  - Contains document type and all formatting directions and information not directly related to content
  - Authors, date, institutions, title, external packages

    ```
    \documentclass[11pt]{article}
    \input{header}
    \usepackage{verbatim}
    \usepackage{amsmath}
    \usepackage[top=1in, bottom=1in, left=1in, right=1in]{geometry}
    \def\mn{{\mu \nu}}
    ```

- \begin{document} ... \end{document}

Packages and external files

- Packages add customization and fine tuning
- Commonly used:
    - amsmath – must have for mathematical formulae
    - geometry – adjust page margins
    - graphicx – including images
    - nag – ensures up to date syntax
    - cleverref – manages references in a clever way
    - hyperref – functional document and hyperlinks
- See: http://www.howtotex.com/packages/9-essential-latex-packages-everyone-should-use/

Typesetting

- Paragraphs and sentences
    - paragraphs broken by empty line
    - extra spaces after period ignored
    - line break without new paragraph \\ or \newline
    - * prohibits page break after new line
    - \newpage starts a new page
    - be careful after equations

```
The time-dependent Schr\"{o}dinger equation,
\begin{align*}
i\hbar\frac{\partial \Psi}{\partial t} = \hat{H} \Psi ,
\end{align*}

is important.        You should know it.
```

The time-dependent Schrödinger equation,

$$i\hbar\frac{\partial\Psi}{\partial t} = \hat{H}\Psi,$$

is imoprtant. You should know it.

```
The time-dependent Schr\"{o}dinger equation,
\begin{align*}
i\hbar\frac{\partial \Psi}{\partial t} = \hat{H} \Psi ,
\end{align*}
is important. You should know it.
```

The time-dependent Schrödinger equation,

$$i\hbar\frac{\partial\Psi}{\partial t} = \hat{H}\Psi,$$

is important. You should know it.

Typesetting

- Organize content in outline form using Sections, subsections, chapters, and subchapters

```
\section{This is a numbered section}
\subsection*{this is an unnumbered subsection}
\subsubsection{this is a numbered sub-sub-section}
\section{A second section}
\subsection{with a numbered sub-section}
\subsubsection{and a numbered sub-sub-section}
```

1   This is a numbered section

this is an unnumbered subsection

1.0.1   this is a numbered sub-sub-section

2   A second section

2.1   with a numbered sub-section

2.1.1   and a numbered sub-sub-section

Typesetting

- Make lists with "itemize" and "enumerate" environments

```
\begin{itemize}
\item This is an itemized list
\begin{itemize}
\item with a nested list
\end{itemize}
\item second item
\end{itemize}
```

- This is an itemized list

    – with a nested list

- second item

Typesetting

- Make lists with "itemize" and "enumerate" environments

```
\begin{enumerate}
\item This is an enumerated list
\begin{enumerate}
\item with a nested list
\end{enumerate}
\item second item
\end{enumerate}
```

1. This is an enumerated list

    (a) with a nested list

2. second item

Some useful commands and characters

- bold, italic, underline
    - \textbf{bold}→**bold**
    - \textit{italic}→*italic*, \emph{italic}→*italic*
    - \underline{underline}→<u>underline</u>
- other stuff
    - superscript $\^{...}$ A^n
    - subscript $\_{...}$ A_n
    - degree $\^\circ$C→$^\circ$C
    - quotation uses two grave accents (`) and two vertical quotation marks ('), "A"
    - Greek $\alpha_{\textrm{n}}^i$ α_n^i

emph, bold, under, degree, tilde, quotation, ö, A^n, α_i

Some useful environments

verbatim, tabular

Mathematical Formulae

AMS math, inline, single line display (numbered/unnumbered),
multiple line display

Some useful commands

Greek, super and sub script, sum (substack), integral, product
operators, dots, frac, predefined functions, partial

Arrays and matrices

uses array environment for arrays, amsmath uses matrix
environments

Graphics

use graphicx package (options), no real standard find what works,
figure env. center, caption, includegraphics, remove extensions to
avoid conflict b/w latex pdflatex

Bibliographies

Use BibTeX, keep main bib file w/ consistent naming convention,
bibliography command at end, bibliographystyle at beginning

Cross referencing and citation

Cleveref package, cite, ref, naming labels

Custom commands

newcommand-name, num of args, definition, hashtag w/ number
for arguments, bra, ket, braket, 2x2 matrix
newenvironment, renewenvironment to override existing commands

Chemistry specific packages

https://www.ctan.org/topic/chemistry, chemfig-rings, rxn, achemso

Putting it all together

Keep a universal header, bib, and main document template. Copy and edit as needed. Example file with header, equations, cross reference, citations, and sections

Resources

lshort, ctan, http://www.xm1math.net/texmaker/