Basic L^AT_EX

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what is LaTeX?

- it's a typesetting markup language

- it's a set of macros that use TeX to format documents

- it's a powerful set of formatting commands that includes support for mathematical formulae, tables, sectioning, indexing, bibliographic referencing and citation, etc.

what is LaTeX not?

- it's not a stretchy natural rubber product

- it's not a word processor

- it's definitely not WYSIWYG

- it's not for unstructured documents

history

- TeX is a programming language for specifying typesetting

  - designed by Donald Knuth

  - first release in 1978
          mostly finished by 1989

  - really complicated, low-level, and picky!

  - rhymes with Blecchh…

history

- LaTeX is a set of macros that builds upon TeX

- started as a set of macros by Leslie Lamport in the early 1980's ("Lamport's TeX")

- infinitely easier to deal with than "plain TeX"

- pronounced "lah-tekh" or "lay-tekh"

how does it work?

- write a plain ASCII text file

- add LATEX markup commands in the text

- **compile** that file into a professional-looking document layout

  - let LATEX make a myriad of detailed typesetting and page-layout decisions…

why LaTeX?

- separates the content of the document from the format

- allows very high-quality typesetting during the compilation process

- allows consistent look and feel for a family of documents

- great support for bibliographic databases / citations

(very) basic document structure

```
% comments start from %, go to end of the line
% commands all start with "\"

\documentclass{…}        % what sort of doc?
\usepackage{…}           % any special add-ons?
\begin{document}         % setup done, start doc

text of your document

\end{document}           % end of the document
```

```
% Perhaps the simplest LATEX document possible…
\documentclass{article}
\begin{document}

Hello world!

\end{document}
```

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\documentclass{article}
\begin{document}

Hello world!

\end{document}
```

switch to demo….

LaTeX IDEs

- I use TeXShop on my Macbook

  - http://pages.uoregon.edu/koch/texshop/texshop.html

- TeXmaker, TeXstudio, TeXworks, … (local IDE)

- ShareLaTeX, Overleaf, Authorea, …(web-based)

- TeXlipse (if you really like Eclipse)

more details

- **special characters:** # $ % ^ & _ { } ~ \

  - these will not print as regular characters

- you can escape them with a backslash
  (except for backslash!)

  - \# \$ \% \^{} \& _ \{ \} \~{}
    \textbackslash

more details

- Commands start with a \

  \command [*optional-parameter*] {*parameter*}

  You can \textsl{lean} on me!

  You can *lean* on me!

font styles

- Generally two techniques

  \emph{ emphasized }   {\em emphasized }
  \textsf{ sans-serif }   {\sffamily sans-serif }
  \textit{ italic text }   {\itshape italic text }
  \textbf{ boldface }   {\bfseries boldface}

  \textnormal{}, \textrm{}, \texttt{}, \textsl{}, \textsc{},
  …

font sizes

- commands hold until changed
  so you might want a new scope

  {\small this is very small text}

  \tiny, \scriptsize, \footnotesize, \small, \normalsize,
  \large, \Large, \LARGE, \huge, \Huge

font choices

- surprisingly complex… TeX/LaTeX are old enough
  that they predate modern conventions…

  % change serif to Times, sans-serif to Helvetica,
  % monospaced to Courier
  \usepackage{times}

  other choices: <default>, lmodern, mathptmx,
  palatino, bookman, newcent, charter, chancery,
  avant, …

font choices

- surprisingly complex… TeX/LaTeX are old enough that they predate modern conventions…

  % change to a better font! (Some people have
  % **strong** opinions about fonts!)
  \usepackage{mathptmx}

  other choices: <default>, **lmodern, mathptmx**, palatino, bookman, newcent, charter, chancery, avant, …

font choices

- LaTeX style files will usually choose fonts for you

- best to stick with the defaults, or the simple "usepackage" options for now

- or go somewhere like http://www.tug.dk/FontCatalogue/ for examples

sectioning commands

- LaTeX is all about structure…

  \chapter{}, \section{}, \subsection{},
  \subsubsection{}, \paragraph{}

```
\documentclass[11pt]{article}  % resize the overall font

\title{Very Small Document} % define the title and author
\author{Erik Brunvand}

\begin{document}   % begin the document
\maketitle              % generate the title

\section{Introduction}
This is the start of the article.

\section{Second Section}
Here's some additional text in another section
\subsection{Really?}
I don't think I really need a sub-section yet, but just for fun
\ldots{}

\end{document}
This text will not show up in the output.
```

```latex
\documentclass[11pt]{article}  % resize the overall font

\title{Very Small Document} % define the title and author
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\ldots{}

\end{document}
This text will not show up in the output.
```

options

```latex
\documentclass[options]{types}
```

options: 10pt, 11pt, 12pt, a4paper, letterpaper, twocolumn, twoside, landscape…

native types: article, report, book, proc

provided types: IEEEtran,ieeeconf, sig-alternate, acmsiggraph, nsfprop, egpubl, vgtc, jpaper…

other environments

\begin{itemize}
\item This is the first item
　　\begin{itemize}
　　\item Here's a sub-bullet
　　\item And another sub-bullet point
　　\end{itemize}
\item Here's another item
\item And another \ldots{}
\end{itemize}

other environments

\begin{enumerate}
\item This is the first item
　　\begin{enumerate}
　　\item Here's a sub-bullet
　　\item And another sub-bullet point
　　\end{enumerate}
\item Here's another item
\item And another \ldots{}
\end{enumerate}

other environments

```
\begin{description}
\item[First:] This is the first item
    \begin{enumerate}
    \item Here's a sub-bullet
    \item And another sub-bullet point
    \end{enumerate}
\item[Another Point:] Here's another item
\item[Still Another:] And another \ldots{}
\end{description}
```

figures

```
%Latex needs help including images…
\usepackage{graphicx}

\begin{document}

\begin{figure}
  \centering
  \includegraphics[width=4.2in]{images/AnImage}
  \caption{Images can be jpg, png, pdf, eps (eps may
          require the epstopdf package)}
  \label{figure-handle}
\end{figure}

In the text you can refer to this as Figure~\ref{figure-handle}.
```

bibliography

- two parts:

    1. the bibliographic database (another text file)

    2. the bibtex program (compiles the bibliography)

bibliography

In the text you can cite things with \cite{citation-key}.
This will extract the citation from the database,
generate a citation number, and put the reference
into your references section.

\bibliographystyle{reference-type}
\bibliography{/path/to/your/bib/file}

bib file format

```
@InProceedings{kopta-HPG13,
    title =     {An Energy and Bandwidth Efficient Ray Tracing Architecture},
    author =   {Daniel Kopta and Konstantin Shkurko and Josef Spjut and Erik Brunvand and Al Davis},
    booktitle =   {High-Performance Graphics (HPG  2013)},
    year =    2013,
    organization  = {ACM}
}

text outside of the entries is treated as a comment…
@Article{kopta-CGF14,
    author =   {D. Kopta and K. Shkurko and J. Spjut and E. Brunvand and A. Davis},
    title =        {Memory Considerations for Low Energy Ray Tracing},
    journal =   {Computer Graphics Forum},
    volume =  {34},
    number = {1},
    issn =        {1467-8659},
    url =          {http://dx.doi.org/10.1111/cgf.12458},
    doi =         {10.1111/cgf.12458},
    pages =  {47--59},
    year =       {2015},
}
```

bibliography

In the text you can cite things with \cite{kopta-HPG13,kopta-CGF14}. This will extract the citation from the database, generate a citation number, and put the reference into your references section.

\bibliographystyle{plain} % plain, alpha, acm, ieeetr
\bibliography{/bib/example.bib} % file path

moving on…

- equations and mathematical formatting

- figures

- tables

- modifying standard environments

- using ACM/IEEE templates

- etc. etc. etc…