Introduction to Latex

A short overview on using LaTeX for typesetting research papers

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University of Kabul, Afghanistan

Wakil Sarfaraz

(based on Andrei Gurtov slides)

Introduction

- Essentially a Markup Language (like HTML, XML and RTF)
- An extension to TeX system
- TeX written by Donald Knuth in 70´s

Latex vs. Word Processors

- High typeset quality
- Easy to include math formulas
- Source file format id not bounded to a particular OS or platform
- Latex implementations exists for all platforms (DOS, Windows, Unices,..)
- Latex is free

Latex vs. Word Processors

- De facto standard for scientific publishing
- Very few bugs
- Good for large documents
- Can run even on 386 PC
- Not very easy to learn

Creating Latex Files

Your Latex File

Your Bibtex File

↓ Latex compile x3

↓ Bibtex compile x2

↓ Latex compile x3

↓ Dvips compile x1

Your Postscript File

Latex File Structure

- Document Class
  - Predefined Formats (article, report, book,..).
- Packages used
  - Added Functionality (graphics, reference style,...).
- Main Body
  - Text and Bibliography References.

The Basics

- ## Document Class

  `\documentclass[`*options*`]{class}`

  options = a4paper, 11pt, 12pt, 10pt, twocolumn, landscape,...

  class = article, report, book,...

- ## Packages

  `\usepackage{package name}`

  `epsfig = insert PS pictures into the document`

  `fancyhdr = easy definition of footer and header`

Body of Text

- Start with `\begin{document}`
- End with `\end{document}`
- Typesetting Text
  - `\\` or `\newline` and `\newpage`
  - Quotations
  - Bold `\textbf{...............}` or `\bf`
  - Italics `\emph{............}` or `\textit{.........}` or \it
  - Underline `\underline{............}` or `\ul`

Body of Text cont...

- Including Multiple Files
    - `\input{filename.tex}`

Format

- **Sections**
  - `\section{…}`   = 1. Latex is Great
  - `\subsection{…}`   = 1.1 Why Latex is Great
  - `\subsubsection{…}` = 1.1.1 Reason One
  - `\appendix` - changes numbering scheme
  - `\chapter{…}` - To be used with book and report document classes
- **Titles, Authors and others**
  - `\title{…}`   `\author{…}`
  - `\footnote{…}`

Format Contd.

- `\maketitle` - Display Title and Author
- `\tableofcontents` - generates TOC
- `\listoftables` - generates LOT
- `\listoffigures` - generates LOF
- Labels
  - `\label{`*marker*`}` - Marker in document.
  - `\pageref{`*marker*`}` - Displays page no. of marker.
  - `\ref{`*marker*`}` - Displays section location of marker.
- Itemise
  - Use either *enumerate, itemize* or *description.*
  - *see handout for example.*

Lists

■ Source

    – \begin{itemize}

    – \item Apple

    – \item Orange

    – \end{itemize}

■ Result

    – Apple

    – Orange

Lists

- `Enumerate` instead of `itemize` gives a numbered list
- Lists can be recursive

Environment

- Something between
  - `\begin{name}`
  - `\end{name}`
- Many command, for example `\bf` affect the text until the end of environment
- Can be recursive
- Examples:
  - `itemize, center, abstract`

Group

- Text between { and }
- Many commands work until the end of the group
- Code
  - put {one word \bf in bold} here
- Result
  - put one word **in bold** here

Alignment

- **Environments** `center,` `flushleft,` `flushright`

- **Example**
  - `\begin{flushright}`
  - `Right aligned`
  - `\end{flushright}`

- **Result**

`Right aligned`

Font size

\tiny \scriptsize \footnotesize

 \small \normalsize

\large \Large
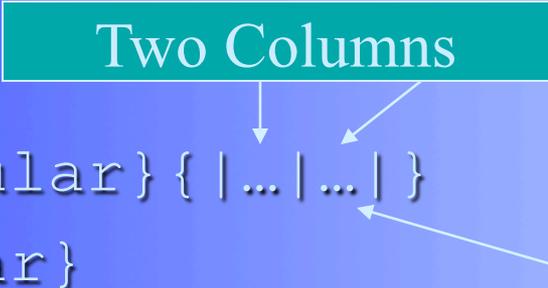
\LARGE \huge

\Huge

Example of Latex document

```
\documentclass{article}
\title{Simple Example}
\author{Andrei Gurtov}
\date{March 2000}
\begin{document}
\maketitle
Hello world!
\end{document}
```

Tabular

- **Columns**
  - `\begin{tabular}{|...|...|}`
  - `\end{tabular}`
- **Rows**
  - `&` - Split text into columns
  - `\\` - End a row
  - `\hline` - Draw line under row
  - **e.g.** `123123 & 34.00\\ \hline`

Two Columns

l = automatically adjust
    size, left justify
r = automatically adjust
    size, right justify
p = set size
    e.g p{4.7cm}
c = centre text

Example of table

```
\begin{tabular}{|l|r|c|} \hline
Date & Price & Size \\ \hline
Yesterday & 5 & big \\ \hline
Today & 3 & small \\ \hline
\end{tabular}
```

Date	Price	Size
Yesterday	5	Big
Today	3	Small

Floating Bodies

■ Floating bodies can stop splitting of tables and images over pages.

```
\begin{figure}[options]
\begin{table}[options]
```

Options (recommendations)
h = place table here
t = place at top of page
b = place at bottom of page

■ They will now appear in the LOF and LOT.

Example of floating figure

- \begin{figure}[ht]
- \centering\epsfig{file=uni.ps, width=5cm}
- \caption{University of Helsinki}
- \label{uni}
- \end{figure}

Figure~\ref{uni} shows...

Images

- Use epsfig package
  - `\usepackage{epsfig}`
- Including images in main body
  - `\epsfig{file=filename.eps, width=10cm, height=9cm, angle=90}`
- Creating EPS - Use xv and/or xfig.
- MS Power Point, save as GIF and convert to EPS.

Bibliography by hand

\begin{thebibliography}{}

\bibitem[Come95]{Come95} Comer, D. E., {\it Internetworking with TCP/IP: Principles, Protocols and Architecture}, volume 1, 3rd edition. Prentice-Hall, 1995.

\end{thebibliography}

Bibliography using Bibtex

- Bibliography information is stored in a *.bib file, in Bibtex format.
- Include chicago package
  - \usepackage{chicago}
- Set referencing style
  - \bibliographystyle{chicago}
- Create reference section by
  - \bibliography{bibfile with no extension}

Bibliography using Bibtex

@book{Come95,

author="D. E. Comer",

title={Internetworking with TCP/IP:
    Principles, Protocols and Architecture},

publisher="Prentice-Hall",

year=1995,

volume=1,

edition="Third"}

Bibliography contd.

- Citing references in text
  - `\cite{cuc98}` = (Cuce 1998)
  - `\citeN{cru98}` = Crud (1998)
  - `\shortcite{tom98}` = (Tom, et. al. 1998)
- Creating Bibtex Files
  - Use Emacs with extensions.
  - or copy Bibtex entries from bibliography database.

Some Math

\begin{center}
{\large
$$ y=\frac{a^3+2c_{x}}{1+\sqrt{b_{x}}} $$ \
  \
\vspace{0.2in}
$$ Q=\sum_{i=1}^{j}\int_{\mu}^{\infty} f(x_{j})dx $$ \\
\vspace{0.2in}
$$ \Psi = \oint_{- \infty}^{\infty}f_{xy} ({\frac{\partial
Qx}{\partial Qy}})^{\Im_{\pi}^ \prime} $$ \
  \ }

$$ y = \frac{a^3 + 2c_x}{1 + \sqrt{b_x}} $$

$$ Q = \sum_{i=1}^{j} \int_{\mu}^{\infty} f(x_j)dx $$

$$ \Psi = \oint_{-\infty}^{\infty} f_{xy}\left(\frac{\partial Qx}{\partial Qy}\right)^{\Im'_x} $$

Tools

UNIX based systems

- xdvi, ghostview, fixps, emacs with latex/ bibtex support.

Windows 98/NT

- Ghostview, Acrobat Distiller, Acrobat Reader, Scientific Workplace (not the best), the Bibtex viewer is good. Paint Shop Pro, Latex and Emacs

Open access physics journals

- https://www.sciencedirect.com/
- https://scholar.google.co.uk/
- https://www.journals.elsevier.com/nuclear-physics-b/
- https://www.journals.elsevier.com/reviews-in-physics
- https://www.journals.elsevier.com/results-in-physics
- https://www.journals.elsevier.com/physics-letters-b

Conclusions

- Mathematical Formulae are easy.
- Avoid GUI latex creators. (Lyx, Klyx, Scientific Word).
- Use the bibtex search engine: *http://*

  www.cs.monsh.edu.au/mirrors/bibliography

- Consider converting Postscript files to PDF to conserve space.

Thank you for attention,

Questions are welcome!