Tools Seminar

Week 4 - LaTeX Configuration & Usage*

Hongzheng Chen

Dec 6, 2019

*This slide is based on pppppass's ToolsSeminar in PKU

1. Introduction
   - TEX and LATEX
   - Basic Concepts
2. Basic Typesetting
   - Text Mode
   - Math Mode
3. Further Topics

1

Introduction

What is TEX and LATEX?

1. TEX is a typesetting system originally designed by Donald Knuth. (*The Art of Computer Programming*)
2. LATEX is a typesetting system based on TEX designed originally designed by Lesile Lamport.
3. Basic idea of TEX and LATEX: "What you think is what you get", distinguished from "What you see is what you get" (WYSISYG)
4. Programming mechanism of TEX and LATEX is based on macros.

Why to Use LATEX?

1. Beautiful and elegant layout and fonts

Why to Use LATEX?

1. Beautiful and elegant layout and fonts
2. Full and explicit control of details

Why to Use LATEX?

1. Beautiful and elegant layout and fonts
2. Full and explicit control of details
3. Very easy to handle structured materials
   e.g. papers, books, notes, experimental reports

Why to Use LATEX?

1. Beautiful and elegant layout and fonts
2. Full and explicit control of details
3. Very easy to handle structured materials
   e.g. papers, books, notes, experimental reports
4. De facto standard for mathematics, physics and computer science

Why to Use LATEX?

1. Beautiful and elegant layout and fonts
2. Full and explicit control of details
3. Very easy to handle structured materials
   e.g. papers, books, notes, experimental reports
4. De facto standard for mathematics, physics and computer science
5. Widely used math modes for mathematical formulas
   e.g. Markdown, websites and even daily communication

Why to Use LATEX?

1. Beautiful and elegant layout and fonts
2. Full and explicit control of details
3. Very easy to handle structured materials
   e.g. papers, books, notes, experimental reports
4. De facto standard for mathematics, physics and computer science
5. Widely used math modes for mathematical formulas
   e.g. Markdown, websites and even daily communication
6. A great number of packages, and an activate community

Why to Use LATEX?

1. Beautiful and elegant layout and fonts
2. Full and explicit control of details
3. Very easy to handle structured materials
   e.g. papers, books, notes, experimental reports
4. De facto standard for mathematics, physics and computer science
5. Widely used math modes for mathematical formulas
   e.g. Markdown, websites and even daily communication
6. A great number of packages, and an activate community

Why to Use LATEX?

1. Beautiful and elegant layout and fonts
2. Full and explicit control of details
3. Very easy to handle structured materials
   e.g. papers, books, notes, experimental reports
4. De facto standard for mathematics, physics and computer science
5. Widely used math modes for mathematical formulas
   e.g. Markdown, websites and even daily communication
6. A great number of packages, and an activate community

When not to use LATEX: the material is highly unstructured

TeX & LaTeX Distributions & Engines

LaTeX Distributions:

- TeXLive (cross-platform), MacTeX (Mac OSX), MikTeX (Windows)
- CTeX (Chinese)
- Overleaf / shareLaTeX (online)

Engines:

- PdfLaTeX: `.dvi` $\rightarrow$ `.pdf`
- XeLaTeX: Unicode (UTF-8)
- LuaLaTeX: Support script language Lua

Basic Structure of a Document

1. Command `\documentclass{...}`: `article`, `ctexart` and `beamer`
2. Preamble: definitions and `\usepackage{...}`s
3. Top matters: `\title{...}`, `\author{...}` and `\date{...}`
4. Begin a document environment: `\begin{document}`
5. Section: `\section{...}`, `\subsection{...}` and so on
6. Paragraphs separated by a single blank line
7. End a document environment: `\end{document}`

* Demo

2

Basic Typesetting

Text Formatting

1. Comments: `%`
2. Special characters: `\&`, `\_`
3. Whitespace: ` `, `\ `, `\!`, `\hspace{...}`
   Use *two* blank lines to initiate a new paragraph (newline only adds one whitespace for English)
4. Paragraphs: `\\` (no indent), `\par` (indent), and two blank lines (indent)
5. Orthogonal coordinates of fonts:
   English: `\textbf{...}`, `\textrm{...}`, `\textit{...}`
   Chinese: `\kaishu`, `\heiti`
6. Emphasize: `\emph{...}`
7. Font size: `\tiny`, `\small`, `\large`, `\Large`, `\LARGE`
8. Align: `\centering`, `\raggedright`

Basic Environments

`\begin{environment_name}...\end{environment_name}`

1. Quotes: `quote`
2. Lists: `enumerate`, `itemize` and package `enumitem`
3. Theorems: `\newtheorem` and package `ntheorem`
4. Verbatim: `\verb'...'`
5. Program lists: `lstlisting` and package `listings` / `minted`

Mathematical Symbols

Use $ for inline formulas, and \[\] for displayed ones

1. Types: normal texts, operators, binary operators, relations accents
2. Fonts: `\mathrm{...}`, `\mathbf{...}`
3. Normal symbols: `\exists`, `\forall`
4. Operators: `\log`, `\sin`
5. Binary operators: `+`, `\setminus`, `\otimes`
6. Relations: `\le`, `\equiv`, `\approx`
7. Whitespace: `\,`, `\!`
   frequently used: `\mathop{\mathrm{d}\!} x`

Function lists: https://katex.org/docs/supported.html

Formula Structures

1. Subscript and superscript: `_` and `^`
2. Fraction and binominals: `\frac{...}{...}`, `\binom{...}{...}`
3. Roots and radicals: `\sqrt{...}`
4. Huge operators: `\sum`, `\product`, `\bigoplus`
5. Delimiters: `\left`, `\right`, and brakets like `\lfloor`
6. Matrices: environment `matrix`, `bmatrix` and package `amsmath`

Mathematical Environments

1. Basic equations: environment `equation`
2. Matrices: environment `matrix`, `bmatrix`
3. If-cases: environment `cases`
4. Gathered equations: environment `gather`
5. Aligned equations: environment `align`
6. Formulas in formulas: environment `split`, `gathered` and `aligned`

3

Further Topics

Bibliography

1. BibTeX
2. Footnote: `\footnote{...}`
3. Cite: `\cite{...}`
4. Display: `\bibliography{...}`

Floats

1. Environment `figure`
2. Environment `table`
3. Package `graphicx`
4. `[htbp]`, package `float` and `[H]`

Tables

1. Environment `tabular` and `array`
2. Column formats: e.g. `|c|rrrlr|`
3. Align: `&` and `\\`
4. Row lines: `\hline`

Other Useful Packages

1. Layout: `geometry`
2. Longer table: `longtable`
3. Algorithms: `algorithm2e` or `algorithm`
4. Hyper-links: `hyperref`
5. Include .pdf files: `pdfpages`

Other Useful Things

- Markdown $\times$ LaTeX (Web support)
  - KaTeX
  - MathJax
- VS Code $\times$ LaTeX
  - Make sure you have installed TeXLive first
  - LaTeX Workshop Extension

Other Useful Things

- Mathpix: PDFs or handwritings $\rightarrow$ LaTeX
- Detexify: Handwriting symbols $\rightarrow$ LaTeX
- Tables Generator
- Excel2LaTeX (online)
- Excel2LaTeX (macro)
- Pandoc: Markdown, Word, LaTeX, etc. translation