Introduction to LaTeX

Lecture 1: Hello, LaTeX

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What is LaTeX

From Wikipedia, the free encyclopedia

LaTeX (lah-tekh, lah-tek or lay-tek, a shortening of Lamport TeX) is a document preparation system. When writing, the writer uses plain text in markup tagging conventions to define the general structure of a document (such as article, book, and letter), to stylise text throughout a document (such as bold and italic), and to add citations and cross-references. A TeX distribution such as TeX Live or MikTeX is used to produce an output file (such as PDF or DVI) suitable for printing or digital distribution. Within the typesetting system, its name is stylised as LaTeX.

Installation of LaTeX

Though there are some other distributions of LaTeX(like MikTeX), TexLive is recommended in this lecture.

Windows & Linux

Download TeXLive on the following website (a mirror provided by HUST, Huazhong University of Science and Technology)
http://mirror.hust.edu.cn/CTAN/systems/texlive/Images/

MacOS

Download MacTeX on the following website
http://tug.org/mactex/mactex-download.html

Linux (Ubuntu or Debian)

Enter the command (fast if you have mirror apt sources)
sudo apt-get install texlive-full

Selection of IDEs

There are various IDEs recommended that support LaTeX, for example

Texmaker

http://www.xm1math.net/texmaker/

Sublime Text

http://www.sublimetext.com/

Follow the instructions on https://www.zhihu.com/question/36038602

Tex Studio

http://www.texstudio.org/

They all have cross-platform support for Windows, Linux and MacOS.

Documentation on your computer

If you've installed a full version of TeXLive (as strongly recommended), the LaTeX documentation about all you want to is in front of you.

Open the command line and input the command
texdoc docname

For example, you can use the following types for the docname

tex	about TeX
article	about documentclass article
beamer	about documentclass beamer (used to create slides)
pgf	about TikZ and PGF (used to draw graphs)

Try to texdoc about all new things and then you'll be an expert in LaTeX.

1 Getting Started

2 The Basic Usages
- A simple document
- Introduction of some basic document classes
- Common syntax
- Sections
- Geometry

A simple document

A typical (simplest) LaTeX example is presented here.

Example

```
1  \documentclass[a4paper]{article}
2  \usepackage{amsmath} % An important package of common maths symbols
3  \usepackage{amssymb} % Some other useful symbols
4  % Use other packages and setup them here
5  \title{A simple \LaTeX\ document}
6  \author{Liu Yihao}
7  \date{\today}
8
9  \begin{document}
10     Hello, \LaTeX !
11 \end{document}
```

The main body of your document starts with `\begin {document}` and ends with `\end {document}` the document environment. All of the contents you'd like to display should be in it, and it MUST be unique in the whole file.

All begins with documentclass

Definition

In a LaTeX file, the first line must be

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

For example, you can use the following types for the class

- **ariticle** Write a report or an science article
- **book** Write a book
- **beamer** Produce a lecture silde like this!

Actually some options can be added, such as

```
1  \documentclass[11pt,twoside,a4paper]{article}
```

Some details about the article class will be introduced later in the lecture. More features about other classes and options can be found in the LaTeX Document on your own.

Magic of packages

Some environments or commands cannot be used directly. In this case, packages should be included between documentclass and document environment.

Command

`\usepackage[optional_args]{name}`

There are some very useful packages that you can ALWAYS include:

- **amsmath** Define various maths environments
- **amssymb** Define various maths symbols
- **geometry** Adjust the margin, paper size, and etc.
- **enumerate** Generate a list like this!
- **graphicx** Insert image of all types

The usages of these and more packages will be introduced further.

Title, Author and Date

It's very useful to generate a title on the first page of a document, then these commands can be added between documentclass and document environment.

Command

```
\title{the title}
\author{the author}
\date{the date}
```

You can simply use \date{\today} to display today's date.

Then in the document environment, use the command \maketitle to generate a title.

The article class

The article class is the most basic class in LaTeX, it provides you with some normalized structure and format for report writing. So usually you will use the following command as the first line of your tex document

```
1  \documentclass [options]{article}
```

Some of the options values are listed below (the default values are alerted)

- 10pt, 11pt, 12pt - the font size of the document
- a4paper, a5paper, letterpaper - the size of paper
- fleqn - make the math equations left aligned (default middle aligned)
- leqno - display the serial numbers of math equations on the left (default on the right)
- titlepage, notitlepage - whether to make the title an entire page
- onecolumn, twocolumn - the number of columns of the document
- twoside, oneside - influence the position of something on the page

The common syntax of LaTeX commands

Definition

Command is a word which can be identified by Latex and represents a certain function in output file, or in relation with some specific character or format

All LaTeX commands have the following syntax

\command_name<special_args>[optional_args]{required_args}

special_args Seldom used in basic usage, for certain special usages in some packages

optional_args Used to define mode of the command, if not specified, LaTeX will use the default mode

required_args Must be filled

If you want to connect a letter after a command, a space must be appended after the command or LaTeX won't be able to compile it correctly. But two commands can be directly connected since there is a \ before each command.

The common syntax of LaTeX environments

Definition

Environment is an encapsulated part which has a certain format so that it will not be influenced by outer context

All LaTeX environments have the following syntax

```
\begin{environment_name}<special_args>[optional_args]
...
\end{environment_name}
```

special_args Similar to commands

optional_args Similar to commands

It is recommended to have a tab indent in each environment or your tex codes will be difficult to read by others or even yourself.

Environment in enviornment

Of course, the environments can be nested.

Example

```
\begin{environment_name}
    ...
    \begin{environment_name_2}
        ...
    \end{environment_name_2}
    ...
\end{environment_name}
```

Dividing into sections

Command

\section(*){name}
\subsection(*){name}
\subsubsection(*){name}

The default style of sections is like

1 Example Section Name

1.2 Example Subsection Name

1.2.3 Example Subsubsection Name

If a star(*) is added, the sequence number of the section, subsection or subsubsection won't be displayed.

Notice: Sections can be sorted into commands, not environments, so it doesn't have begin and end clauses. However, the whole contents between two sections is belonged to one section

Geometry package

The settings of the layout of the pages is in geometry package.

Command

```
\usepackage{geometry}
\geometry{options}
```

Some of the options are listed below:

- paper - same as the paper settings in documentclass
- layout - use another type of paper's layout
- left/right - the blank length on the left/right
- top/bottom - the blank length on the top/bottom

Example

```
\geometry{paper=a4paper,layout=a5paper}
\geometry{left=2.5cm,right=2.5cm,top=2.5cm,bottom=2.5cm}
```