LaTeX Lecture for UNIST

Jaewoong Lee

Ulsan National Institute of Science and Technology

jwlee230@unist.ac.kr

September 13, 2019

Overview

1. Introduction myself
2. What is LaTeX?
3. Hello World Example
4. Introduction to LaTeX
5. Advanced typesetting of LaTeX
6. Equation, Figure and Table
7. Reference Control

I am...

- Jaewoong Lee
- Senior at UNIST
- LaTeX user since 2014
- Graduated Gyeonggi Science High School for the Gifted in 2016
- Full Member of GSHS TeX User Association

What you could with LaTeX?

LaTeX?

- LAH-tekh or LAY-tekh
- TeX-like editing tool
- In simple, that which is making a paper.
- Donald Knuth made TeX $\Rrightarrow$ LaTeX: a macro for TeX
- WYSIWYM

WYSIWYG vs. WYSIWYM

WYSIWYG

- What you see is what you get
- MS Word or HWP

WYSIWYM

- What you see is what you mean
- HTML, LaTeX

LaTeX *(cont.)*

- You write the contents, then LaTeXmakes it!
- Useful to write an equation
- As an equation editor, LaTeX is a *de facto* standard
- Convenient labeling & referencing
- After initial setting, you only think about contents; not design
- Table of contents, List of figures? $\Rrightarrow$ Only one line command!
- Cross-referencing: 'As figure 8a' $\Rrightarrow$ You can see 'Big Picture'
- Easily attach vector image like SVG & PDF

LaTeX vs. MS word

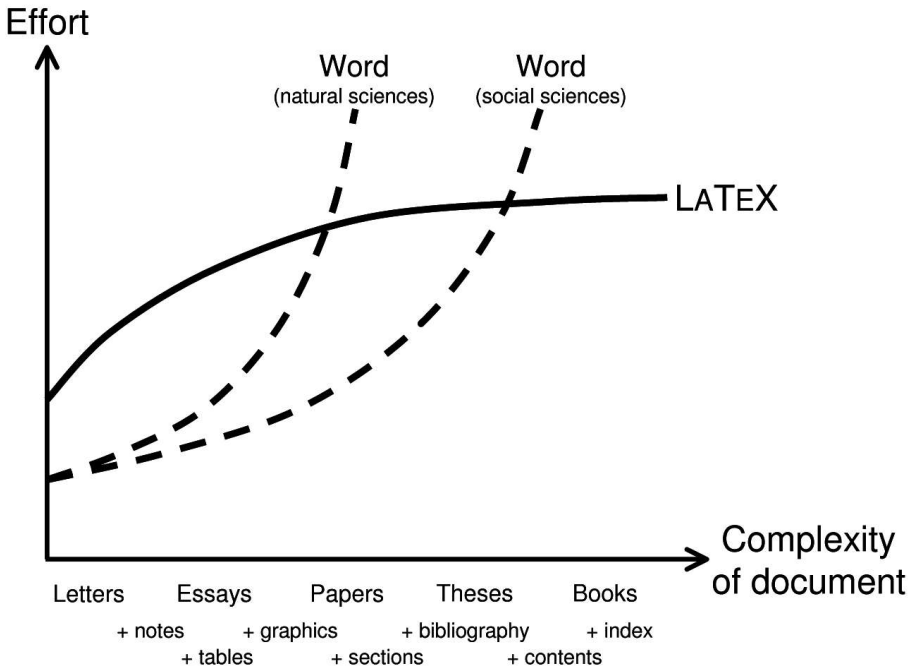

Figure: LaTeX vs. MS word

LaTeX vs. MS word *(cont.)*

- LaTeX users were slower than Word users.
- LaTeX users wrote less text in the same amount of time.
- LaTeX users produced more typesetting, orthographical, grammatical, and formatting errors.
- LaTeX users more often report enjoying using their respective software.

According to Knauff, M., & Nejasmic, J. (2014). An efficiency comparison of document preparation systems used in academic research and development. PloS one, 9(12), e115069.

Hello World for LaTeX

Example (Hello World)

```
\documentclass{article}
\title{Hello world}
\author{John Doe}
\date{September 2019}
\begin{document}
\maketitle
Lorem ipsum dolor sit amet.
\end{document}
```

1. This is an article.
2. The title is 'Hello world'.
3. The author is 'John Doe'.
4. Written in September 2019.
5. This document contains a title and a sentence.

Structure of LaTeX

Preamble

- In simple, a header of document.
- Declare class of document, packages, *et cetera*.
- Make a declaration of settings, also.

Body

- Whole thing after `\begin{document}`
- Similar as editing mode in Wikipedia.

Hierarchy of Document

1. \document
2. \part
3. \chapter
4. \section
5. \subsection
6. \subsubsection
7. \paragraph
8. \subparagraph

Table of Contents

Only one line command is required to make 'Table of Contents'.

Example (ToC code)

```
\documentclass{article}
\begin{document}
\tableofcontents
\section{one}
\subsection{two}
\end{document}
```

As the example, just add `\tableofcontents` command where you want.

Special Characters

You cannot use these character directly:

Special Characters

\, #, $, %, &, {, }, _

As following block, this problem has been solved by adding backslash in front of the character:

Using Special Characters

\textbackslash, \#, \$, \%, \&, \{, \}, _

Moreover, % means one line comment in LaTeX. Please refer here[1] when you want multiple line comment.

[1] http://bit.ly/2iZi3yn

Spacing & Line Break

Even if there are so many spaces in LaTeX code, there is only one space in the result. If you want to use many spaces, use '\ ' instead.
In the same way, there are so many line breaks in LaTeX code, there is only one line break. When you want to line breaks, use '\\' instead.
Furthermore, twice of line break start new paragraph in LaTeX.

Page Break

Use \newpage or \clearpage.
When make a book, use \cleardoublepage.

Text Aligning

Align Text Left. Use `flushleft`.

Justify Text. Use `center`.

Align Text Right. Use `flushright`.

In using `flushleft`, `center` or `flushright`, please refer following:

Text Aligning

```
\begin{flushright}
Right Aligned Text is here.
\end{flushright}
```

Text Color

This example shows different examples on how to user the `xcolor` package to change the color of elements in LaTeX.

Example (xcolor code)

```
\documentclass{article}
\begin{document}
\textcolor{green}
    {Hello,}
\colorbox{orange}
    {world!}
\end{document}
```

Example (color showing)

Hello, world!

[1] Reference: http://bit.ly/2UssO6a

Font Styles

- **Bold**: `\textbf{...}`
- *Italic*: `\textit{...}`
- *Sans-serif*: `\textsf{...}`
- Underline: `\underline{...}`
- Small Capitals: `\textsc{...}`

Strikethrough

There are two ways to add strikethrough.
First, use `ulem` package.

Example (`ulem` code)

```
\documentclass{article}
\usepackage{ulem}
\begin{document}
\sout{Hello, world!}
\end{document}
```

Example (`ulem` showing)

~~Hello, world!~~

Strikethrough *(cont.)*

Second, use `cancel` package.

Example (`cancel` code)

```
\documentclass{article}
\usepackage{cancel}
\begin{document}
\[ x + \cancel{y}=0 \]
\[ x + \bcancel{y}=0 \]
\[ x + \xcancel{y}=0 \]
\[ x + \cancelto{0}{y}=0 \]
\end{document}
```

Example (`cancel` showing)

$$x + \cancel{y} = 0$$

$$x + \bcancel{y} = 0$$

$$x + \xcancel{y} = 0$$

$$x + \cancelto{0}{y} = 0$$

Page Setup

Suppose you have to create a document in a4paper and text should not exceed 18 cm in width and 20 cm in height. To create it with `geometry` package is easy, include this one line in the preamble.

`geometry` Example

```
\usepackage[a4paper, total={18cm, 20cm}]{geometry}
```

If you need detailed page setting, you can do like this:

`geometry` Detailed Example

```
\usepackage{geometry}
\geometry
    {a4paper, left=20mm, right=25mm, top=3cm, bottom=4in}
```

[1] Reference: http://bit.ly/34nbbJC

Multi-Column

In LaTeX, you can use multi-column as:

Example (Multi-column Example)

```
\documentclass[twocolumn]{report}
```

If you want to change columns in the document, you can use

Example (Multi-column Example 2)

```
\twocolumn
\onecolumn
```

However, this commands always starts new pages.

Multi-Column *(cont.)*

In case of that problem, use `multicol` package.

Example (`multicol` code)

```
\documentclass{article}
\usepackage{multicol}
\setlength{\columnseprule}
    {0.4pt}
\begin{document}
    \begin{multicols}{2}
        Lorem ipsum
        \newpage
        dolor sit amet,
        \newline
        consectetur
    \end{multicols}
\end{document}
```

Example (`multicol` showing)

Lorem ipsum

dolor sit amet,
consectetur

Text Box

You can add text box with `tcolorbox` package.

Example (`tcolorbox` code)

```
\documentclass{article}
\usepackage{tcolorbox}

\begin{document}
    \begin{tcolorbox}
        The quick brown fox
        jumps right over
        the lazy dog.
    \end{tcolorbox}
\end{document}
```

Example (`tcolorbox` showing)

The quick brown fox jumps right over the lazy dog.

Equation

For entering equation, `amsmath` package is required.

- \(... \): In-line equation. $e^{i\pi} + 1 = 0$
- \[... \]: Equation without number.

$$e^{i\pi} + 1 = 0$$

- \begin{equation} ... \end{equation}: Equation with number.

$$e^{i\pi} + 1 = 0 \tag{1}$$

You can reference the number of equation. (In advance)

Equation *(cont.)*

- \sin{...}: sin{...}
- \log {...}: log{...} To avoid italic style.
- \frac {num}{den}: $\frac{num}{den}$
- \sqrt[n]{x}: $\sqrt[n]{x}$
- \begin{pmatrix} x & y \\z & v \end{pmatrix} : $\begin{pmatrix} x & y \\ z & v \end{pmatrix}$
- dt \operatorname{d}t, \partial \!t, \nabla \psi: $dt, \operatorname{d}t, \partial t, \nabla \psi$
- f', f'', f\hat{3}, \dot y, \ddot y: $f', f'', f\hat{3}, \dot{y}, \ddot{y}$
- \int _{-N}^{N} e\hat{x} \, dx: $\int_{-N}^{N} e\hat{x} \, dx$
- \oint _{C} x\hat{3}\, dx : $\oint_{C} x\hat{3}\, dx$

[1] Reference: `http://bit.ly/2UALRLP`

Equation*

When you do not want number while using \begin{equation}, using equation* instead:

Example (equation* example)

```
\begin{equation*}
e^{i \pi}+1=0
\end{equation*}
```

Or, add \nonumber just after equation:

Example (\nonumber example)

```
\begin{equation}
e^{i \pi}+1=0
\nonumber
\end{equation}
```

Figure

Basic example of figure is following:

Example (Basic Figure Example)

```
\begin{figure}[htbp]
\centering
\includegraphics[width=5cm]{example.png}
\end{figure}
```

`htbp` means Here ⇛ Top ⇛ Bottom ⇛ Page. The ordering means priority of figure location. You can change figure location setting.
You can add JPG, GIF, PNG, PDF, and more.

Table

Use online LaTeX table generator. [2]

Example (Table code)

```
\begin{table}[htbp]
\centering
\begin{tabular}{l||c|r}
No. & Name & Sex \\ \hline
1 & John & M \\
2 & Jane & F
\end{tabular}
\end{table}
```

Example (Table example)

No.	Name	Sex
1	John	M
2	Jane	F

[2] https://www.tablesgenerator.com

Caption

All figures and tables can be attached with caption. You can explain what a meaning of figure or table.

Example (Table code)

```
\begin{table}[htbp]
\centering
\caption{Example Table}
\begin{tabular}{l||c|r}
No. & Name & Sex \\ \hline
1 & John & M \\
2 & Jane & F
\end{tabular}
\end{table}
```

Example (Table example)

Table: Example Table

No.	Name	Sex
1	John	M
2	Jane	F

Label

A label can be attached to equations, figures, tables and section. Also, the number of label is automated increasing.
A label is added by `\label` command:

Example (Add label)

```
\label{tb:example}
```

Moreover, you can refer specific label with `\ref` command:

Example (Refer label)

```
\ref{tb:example}
```

LoF & LoT

As same as 'Table of Contents', you can easily add 'List of Figures' and 'List of Tables'. Just add one line command, `\listoftables` and `\listoffigures` where you want.

BibTex

BibTex is reference management software for formatting lists of references.
As you know, BibTex is came from bibliography and LaTeX.

How can I get BibTex?

Google Scholar gives BibTex citation. You can copy and paste it.

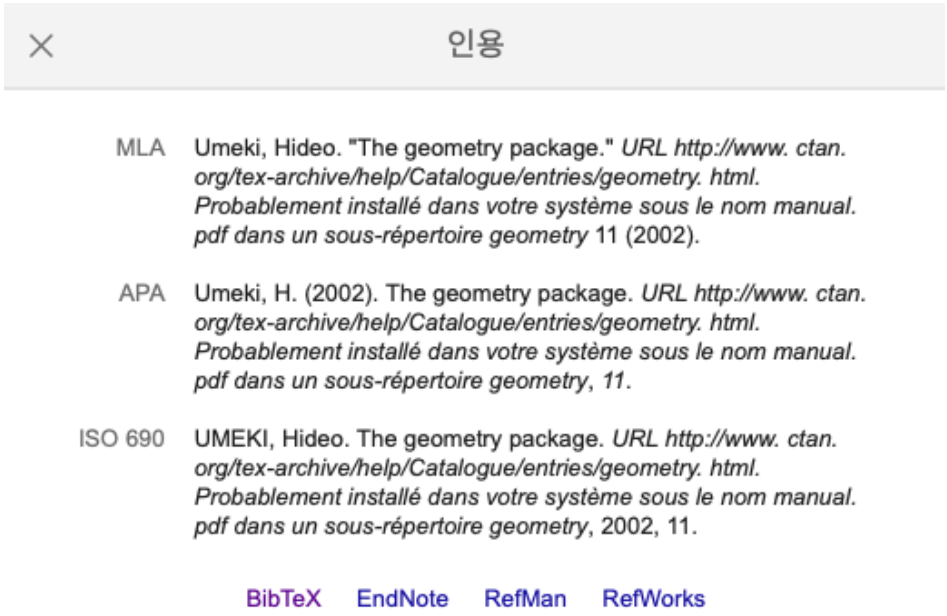

Figure: Google Scholar gives BibTex

How can I cite?

Only one line command is enough:

Example (Citation example)

```
\cite{ref:label}
```

If you want multiple citation at once, use this command instead:

Example (Multiple citation example)

```
\cite{ref:label1, ref:label2}
```

How can I cite? *(cont.)*

For a list of references, add these commands where you want:

Example (Reference example)

```
\bibliographystyle{apalike}
\bibliography{BibTex_Name}
```

Moreover, these styles can be used:

1. abbrv
2. acm
3. alpha
4. apalike
5. ieeetr
6. plain
7. siam

[2] Reference: http://bit.ly/34of80o