Introduction to LaTeX

GEO1001 - 9/09/2020

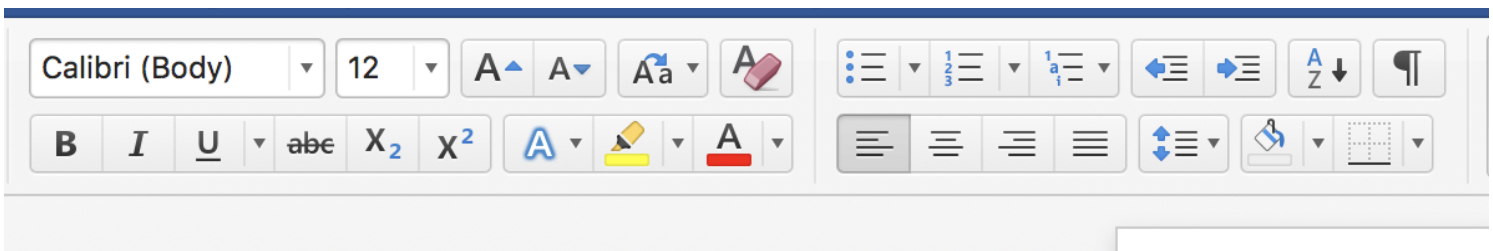
Stelios Vitalis, Hugo Ledoux, Clara García-Sánchez

Outline for Section 1

Typical Word Processor

Formatting Words

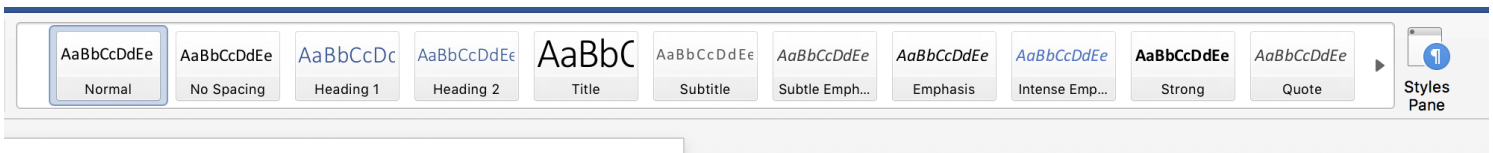
That's bad...



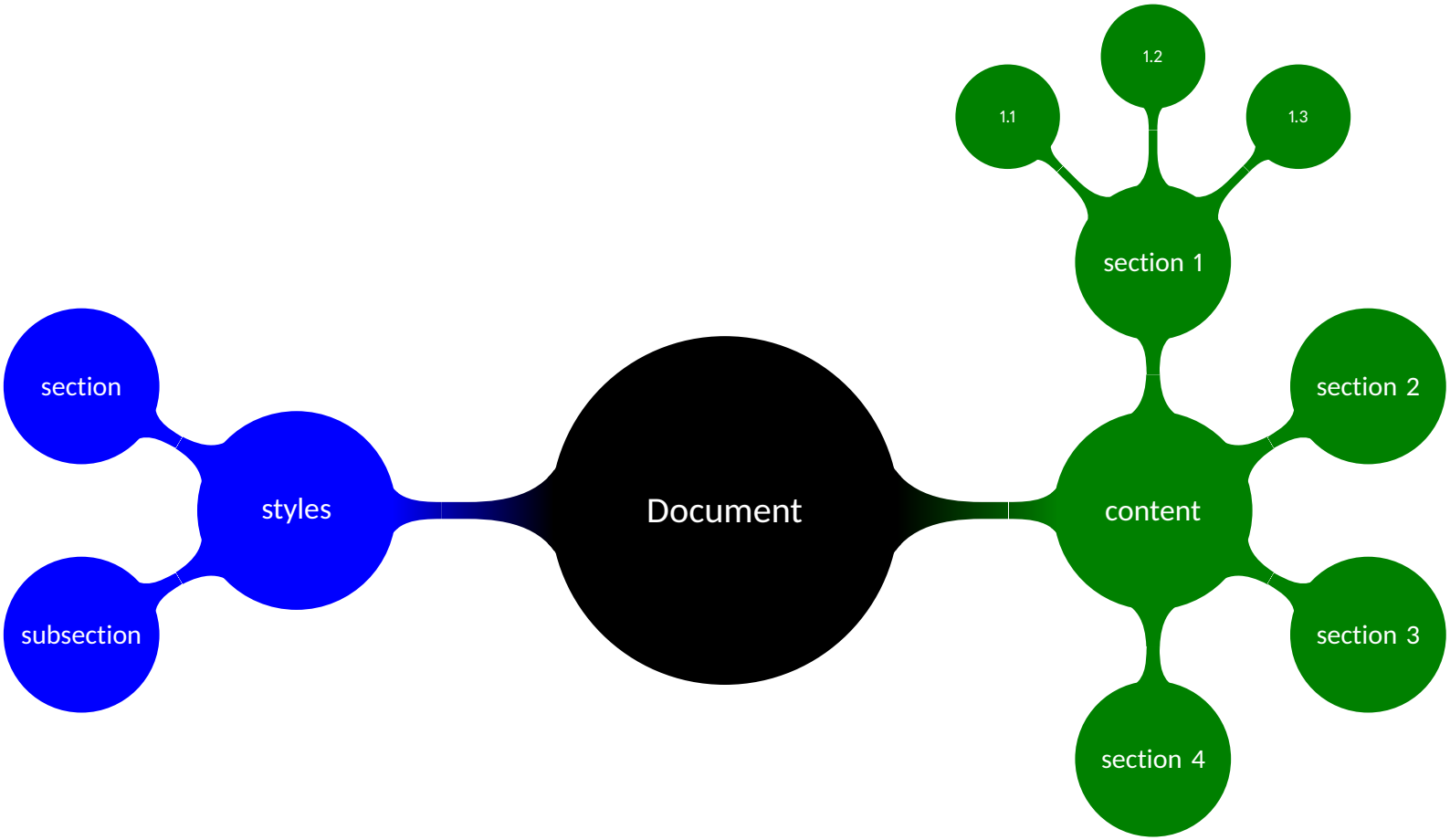
Typical Word Processor

Using Styles

That’s better…



Separating Content from Formatting



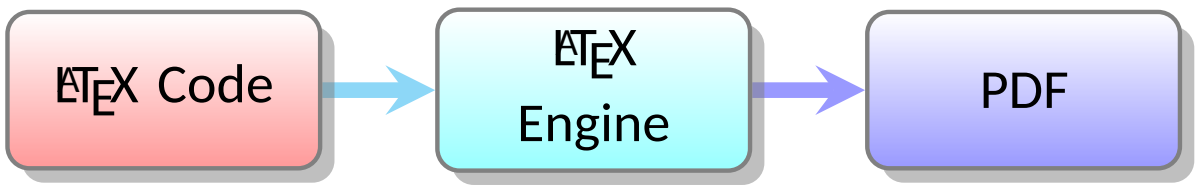
Attitude adjustment

A new approach

- Use commands to describe “what it is”, not “how it looks”
- Focus on your content
- Let LaTeX do its job

What is LaTeX

The Engine



Examples

A simple document

```
\documentclass{article}

\begin{document}
  Hello World! % This is just comments...
\end{document}
```

Outline for Section 2

Using LaTeX

Different options

- Install it locally:
  - A distribution (engine and packages):
    - MiKTeX (Windows)
    - MacTeX (OSX)
    - TeXLive (Linux)
  - An Editor:
    - TexStudio (Windows, OSX, Linux)
    - TexMaker (Windows, OSX, Linux)
    - Other (Wikipedia Comparison)
- Use it online:
  - Overleaf
  - ShareLatex

Examples

```
\documentclass{article}

\title{A Title}
\author{John Doe}

\begin{document}
  \maketitle

  \section{This is a section}
  Some text here.

  \subsection{This is a subsection}
  Some other text here.

  \subsection{This is another subsection}
  Guess what!

  This is another piece of information...
```

Examples

Simple Structure

A Title

John Doe

December 1, 2017

1 This is a section

Some text here.

1.1 This is a subsection

Some other text here.

1.2 This is another subsection

Guess what!

This is another piece of information...

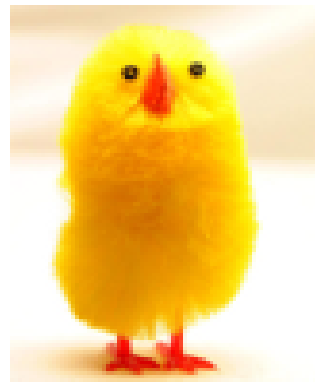
Examples

Structure Elements

```
\begin{itemize}
        \item Tea
        \item Milk
        \item Biscuits
\end{itemize}
```

- Tea
- Milk
- Biscuits

```
\begin{figure}
        \includegraphics{chick}
\end{figure}
```



```
\begin{equation}
        \alpha + \beta + 1
\end{equation}
```

$$\alpha + \beta + 1 \qquad (1)$$

Examples

Source code

- For the most part, you can just type your text normally.

```
Words are separated by one or more
spaces.

Paragraphs are separated by one
or more blank lines.
```

Words are separated by one or more spaces.

Paragraphs are separated by one or more blank lines.

- Space in the source file is collapsed in the output.

```
The   rain       in Spain
falls mainly on the plain.
```

The rain in Spain falls mainly on the plain.

- Add `\usepackage` to the pre-ample to add functionality

Examples

Math

- Why are dollar signs `$` special? We use them to mark mathematics in text.

```
% not so good:
Let a and b be distinct positive
integers, and let c = a - b + 1.

% much better:
Let $a$ and $b$ be distinct positive
integers, and let $c = a - b + 1$.
```

Let a and b be distinct positive integers, and let c = a - b + 1.

Let a and b be distinct positive integers, and let $c = a - b + 1$.

- Always use dollar signs in pairs — one to begin the mathematics, and one to end it.
- LaTeX handles spacing automatically; it ignores your spaces.

```
Let $y=mx+b$ be \ldots

Let $y = m x + b$ be \ldots
```

Let $y = mx + b$ be …

Let $y = mx + b$ be …

Examples

Math Notation

- Use caret ^ for superscripts and underscore _ for subscripts.

```
$y = c_2 x^2 + c_1 x + c_0$
```

$y = c_2 x^2 + c_1 x + c_0$

- Use curly braces { } to group superscripts and subscripts.

```
$F_n = F_n-1 + F_n-2$      % oops!

$F_n = F_{n-1} + F_{n-2}$ % ok!
```

$F_n = F_n - 1 + F_n - 2$

$F_n = F_{n-1} + F_{n-2}$

- There are commands for Greek letters and common notation.

```
$\mu = A e^{Q/RT}$

$\Omega = \sum_{k=1}^{n} \omega_k$
```

$\mu = A e^{Q/RT}$

$\Omega = \sum_{k=1}^{n} \omega_k$

Examples

Tables

- The argument specifies column alignment — **l**eft, **r**ight, **r**ight.

```
\begin{tabular}{lrr}
        Item   & Qty & Unit \$ \\
        Widget & 1   & 199.99  \\
        Gadget & 2   & 399.99  \\
        Cable  & 3   & 19.99   \\
\end{tabular}
```

Item	Qty	Unit $
Widget	1	199.99
Gadget	2	399.99
Cable	3	19.99

- It also specifies vertical lines; use **`\hline`** for horizontal lines.

```
\begin{tabular}{|l|r|r|} \hline
        Item   & Qty & Unit \$ \\\hline
        Widget & 1   & 199.99  \\
        Gadget & 2   & 399.99  \\
        Cable  & 3   & 19.99   \\\hline
\end{tabular}
```

Item	Qty	Unit $
Widget	1	199.99
Gadget	2	399.99
Cable	3	19.99

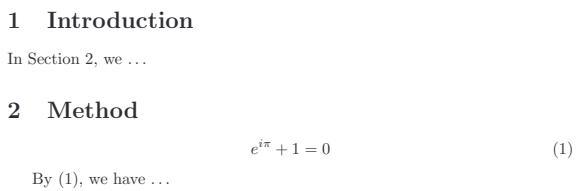
- Use an ampersand `&` to separate columns and a double backslash `\\` to start a new row (like in the **`align*`** environment that we saw in part 1).

Outline for Section 3

Cross-referencing

- Use **\label** and **\ref** for automatic numbering.
- The **amsmath** package provides **\eqref** for referencing equations.

```
\documentclass{article}
\usepackage{amsmath} % for \eqref
\begin{document}

\section{Introduction}
\label{sec:intro}

In Section \ref{sec:method}, we \ldots

\section{Method}
\label{sec:method}

\begin{equation}
\label{eq:euler}
e^{i\pi} + 1 = 0
\end{equation}

By \eqref{eq:euler}, we have \ldots
```



1 Introduction

In Section 2, we …

2 Method

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

By (1), we have …

bibTeX

- Put your references in a **`.bib`** file in 'bibtex' database format:

```
@Article{Jacobson1999Towards,
  author = {Van Jacobson},
  title = {Towards the Analysis of Massive Multiplayer Online
           Role-Playing Games},
  journal = {Journal of Ubiquitous Information},
  Month = jun,
  Year = 1999,
  Volume = 6,
  Pages = {75--83}}

@InProceedings{Brooks1997Methodology,
  author = {Fredrick P. Brooks and John Kubiatowicz and
            Christos Papadimitriou},
  title = {A Methodology for the Study of the
           Location-Identity Split},
  booktitle = {Proceedings of OOPSLA},
  Month = jun,
  Year = 1997}
```

bibTeX

- Use the **natbib** package[1] with **\citet** and **\citep**.
- Add **\bibliography** and **\bibliographystyle** at the end.

```
\documentclass{article}
\usepackage{natbib}
\begin{document}

\citet{Brooks1997Methodology}
show that \ldots. Clearly,
all odd numbers are prime
\citep{Jacobson1999Towards}.

\bibliography{bib-example}
% if bib-example' is the name of
% your bib file

\bibliographystyle{plainnat}
% try changing to abbrvnat

\end{document}
```

Brooks et al. [1997] show that .... Clearly, all odd numbers are pri
[Jacobson, 1999].

References

Fredrick P. Brooks, John Kubiatowicz, and Christos Papadimitriou. A metho
ology for the study of the location-identity split. In *Proceedings of OOPSL*
June 1997.

Van Jacobson. Towards the analysis of massive multiplayer online role-playi
games. *Journal of Ubiquitous Information*, 6:75–83, June 1999.

Manage Refereces

External Program

- Use a tool like JabRef.
- All scientific websites can export to bibTeX format.
- Save references as **`.bib`** file and link it from your LaTeX document.

Designing Graphics

Suggested Tools

- Vector graphics (Graphs, Charts, Figures):
  - Adobe Illustrator (Proprietary)
  - Inkscape (Open Source)
  - draw.io (Free and Online)
  - TikZ package on LaTeX (for brave people)
- Image Editing
  - Adobe Photoshop (Proprietary)
  - GIMP (Open Source)

Templates for GEO2020

Use them as starting point

- P2 Template: `https://tinyurl.com/mscgeomp2`.
- Final Thesis: `https://tinyurl.com/mscgeomthesis`.

Let's do an exercise

Try to make the source look like the final example.

- Source: https://tinyurl.com/latex-exerc-source
- Final: https://tinyurl.com/latex-exerc-final

Your main source of information:

- https://en.wikibooks.org/wiki/LaTeX