\textbf{\LaTeX}Xday, morning session

Discovering \LaTeX

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ADSTIC

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Morning session outline

- general introduction to \LaTeX
- installation of \LaTeX on all the devices
- structuration and basic formatting of a document
- insertion of title pages, tables of content
- handling tables and figures
- basic introduction to mathematical expressions in \LaTeX
Introduction

What is LaTeX?

- a typesetting software
- a tool allowing to quickly produce professional/scientific documents of great quality
- a versatile tool: thesis, reports, publications, books, letters, C.V., presentations ...

What is not LaTeX?

- a word processor
- a tool that can be used without any skill (hence this session !)
Comparison with Microsoft Word and LibreOffice Writer

Microsoft Word / LibreOffice Writer

- What You See (on the screen) Is What You Get: WYSIWYG
- No skill are needed for a basic use
- Graphical interface
- Formatting your document can be difficult
- Incompatibilities between different versions
- Poor handling of bibliography and mathematical expressions
Comparison with Microsoft Word and LibreOffice Writer

\text{\LaTeX} distinguish the actual content of the document from its presentation format.

- initial learning required for a basic use
- handle more swiftly big documents
- better compatibility between installations
- good handling of bibliography and mathematical expressions
Base principle

- A \LaTeX document needs to be compiled to make a pdf document
  - At first: \LaTeX document in plain text (.tex)
  - In the end: PDF document (.pdf)
- The part of \LaTeX compiling your document is called the \LaTeX distribution
- The program that will help you write your \LaTeX document is called the editor
\LaTeX{} on different OS

Windows

Distribution MiKTeX ⇒ http://miktex.org
Editor Texmaker ⇒ http://www.xm1math.net/texmaker/index_fr.html

Mac OS

Distribution & editor Mac\TeX{} ⇒ http://tug.org/mactex

Linux

Distribution TeXlive ⇒ install packages texlive, cm-super
Editor Kile ⇒ install package kile
Download

Welcome to the MiKTeX project page

New here? Learn more about MiKTeX...

Want to support the project? Please give back!

Package Repository
Version: 4798
Date: 2/19/2013
Packages: 2519
Recent xetex-def tikzsymbols superiors scripts
Updates: plessse newtx miktex-xetex-base uuesthesis pst-uml explain

Discussions
graphics in miktex (2/19/2013 4:13:11 AM)

The MacTeX-2012 Distribution
[ for Mac OS 10.5, 10.6, 10.7, and 10.8 --- PPC and Intel ]

The current distribution is MacTeX-2012
This distribution requires Mac OS 10.5 Leopard or higher; see links below for Mac OS 10.3 or 10.4.

To obtain the distribution, visit the link below:
MacTeX.pkg

TeX Live
TeX Live is an easy way to get up and running with the TeX document production system. It provides a comprehensive TeX system with binaries for most flavors of Unix, including GNU/Linux, and also Windows. It includes all the major TeX-related programs, macro packages, and fonts that are free software, including support for many languages around the world.

How to acquire TeX Live:
download, on DVD, other methods
• Documentation and mailing lists
• Highlights of changes in the current release, and known issues
• Quick install for Unix; installation and release notes for Windows; for MacOSX, see the MacTeX distribution
MikTeX (Windows)

Installation de \LaTeX

Windows
Distribution \texttt{MiKTeX} \url{http://miktex.org}
Éditeur Textmaker \url{http://www.xmlmath.net/texmaker/index_fr.html}

Mac OS
Distribution \texttt{MacTeX} \url{http://tug.org/mactex} (distribution et éditeur)

Linux
Distribution \texttt{TeXLive} (installer les paquets \texttt{texlive}, \texttt{ca-super})
Éditeur \texttt{Kile} (paquet kile)
Installation

MacTeX (MacOS)

Image from http://trondlossius.no/articles/969-mactex-2009
Proverbe Chinois / Conte Chinois

Benjamin Barras

C’est un Chinois qui va visiter le paradis et l’enfer, il commence par visiter l’enfer. Là, il voit des gens assis à des tables, et sur ces tables, des mets délicieux. Mais étrangement, les gens assis à ces tables pleurent, gémissent, et la raison en est la suivante : les baguettes que ces gens ont sont tellement longues qu’ils n’arrêtent pas à porter la nourriture à leur bouche. Ensuite, notre visiteur arrive au paradis. Et là également, des gens assis à des tables, sur lesquelles il y a les mêmes mets délicieux. Mais la différence ici, c’est que ces gens sont joyeux, heureux, et pourtant ils ont les même baguettes qu’en enfer. La raison ici en est toute simple : ne parvenant pas à porter la nourriture à leur propre bouche, ils la portent à la bouche de leurs voisins.
Display

Two windows on every OS

- left window: \LaTeX editor allowing the modification of your document
- right window: PDF file generated

You can see immediately the generated result.
minimal-*.tex

\documentclass[a4paper]{article}
\usepackage[utf8]{inputenc}
\usepackage[T1]{fontenc}
\usepackage[french]{babel}
\author{Preacutenom Nom}
\title{Title of the document}
\date{\today}
\begin{document}
   \maketitle
   My first document
\end{document}
Base structure of a \LaTeX document

- Document class \texttt{\documentclass{classe}}
- Foreword
- Document body, between \texttt{\begin{document}} and \texttt{\end{document}}
Classy documents

\documentclass[⟨option1⟩, ⟨option2⟩]{⟨classe⟩}

Document classes

- **article** or **proc**: publications,
- **report**: thesis and reports,
- **beamer**: presentations,
- **book, letter, ...**: a lot of other classes or available

Class options

- **Xpt**: change the character size to $X$
- **a4paper**: margins to print in A4 format
- **twoside**: two-sides printing
Packages

Why?
- packages are library used for advanced functions
- allow to fill a gap or a need in \LaTeX
- a lot are preinstalled with your distribution
- when compiling a document, required packages will be automatically downloaded
A lot of packages

\usepackage[⟨option1⟩, ⟨option2⟩]{⟨paquet⟩}

Usual packages

%%% Paquets fondamentaux :
% Accents
\usepackage[latin1]{inputenc}
\usepackage[T1]{fontenc}
% For french documents
\usepackage[francais]{babel}
% Mathematical expressions
\usepackage{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}

%%% Other useful packages
% PDF file insertion
\usepackage{pdfpages}
% Figures positionning
\usepackage{float}
% Others
\usepackage[left,pagewise]{lineno}
\usepackage{graphicx}
\usepackage{array}
Special characters

Ten special characters
\ $ & % # ^ _ \{ \}

They can be used in the text
\textbackslash \$ \& \% \# \_ \{ \}

Each special character delineate special zones of the document
- % for a commentary
- $...$ for a mathematical expression
- \{ ... \} for a group of characters/words
- \... for a command
Chapiters, sections, sub-sections...

Each level of structuring has its own command

- \part{title}: part
- \chapter{title}: chapter (only with report and book document classes)
- \section{title}: section
- \subsection{title}: sub-section
- \subsubsection{title}: sub-sub-section
Some rule to format paragraphs

- A paragraph break happen when you leave a line blank
- \LaTeX{} ignore line breaks and multiple spaces (formatting is automatically done when compiling)

<table>
<thead>
<tr>
<th>First paragraph</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second paragraph</td>
</tr>
<tr>
<td>!</td>
</tr>
<tr>
<td>Last paragraph</td>
</tr>
</tbody>
</table>

First paragraph
Second paragraph!
Last paragraph with a lot of spaces.
Size and style of characters

Possible character sizes

\tiny tiny
\scriptsize scriptsize
\footnotesize footnotesize
\small small
\normalsize normalsize
\large large
\Large Large
\LARGE LARGE
\huge huge
\Huge Huge

Possible character styles

\textbf{Bold}
\textit{Italic}
\textsc{Small caps}
XXX\textsuperscript{Superscript}
\underline{Underline}
Environment

\begin{environment-name}
  ...
  ...
  \% Environment content
  ...
\end{environment-name}

Allow to define the start and end of an environment (figures, mathematical expressions ...).
itemize environment

\begin{itemize}
  \item first bullet
  \item second bullet
  \item ...
\end{itemize}

Command allowing to insert a bullet point list as the following

- first bullet
- second bullet
- ...

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Inserting other files

Insertion commands

- \texttt{\texttt{titlepage}}: insert a title page
- \texttt{\texttt{newpage}}: insert a new page
- \texttt{\texttt{clearpage}}: insert a page break
- \texttt{\texttt{cleardoublepage}}: insert a page break on uneven pages
- \texttt{\texttt{tableofcontents}}: insert a table of contents
- \texttt{\texttt{listoffigures}}: insert a table of figures
- \texttt{\texttt{listoftables}}: insert a table of tables
- ...
Including tex files

Why? To simplify the writing of important \LaTeX files by splitting them in several files. Included files must be in the same directory as the file including them.

Command:
\input{file1} to include file1.tex at the specified space.
Including a simple image

Command:
\includegraphics{file_name} to insert the image at the specified space.

When the image is located in a sub-directory, for example the directory "img".
\includegraphics{img/image_name}
Including a PDF file

Command:
\texttt{\includepdf[pages=-]{file_name}} to insert all the pages of a PDF file.

\texttt{\includepdf[pages={3,5-8,60}]{file_name}} to only insert some pages of a PDF file (here pages 3, 5, 6, 7, 8 and 60).

- useful to include big PDF documents
- command \texttt{\includegraphics{file_name}} is better for a figure in PDF.
The figure environment is a float:
- insert the figure in the text with an optimized layout
- the layout is automatically computed by \LaTeX
Float principle

You can tune the object position with a parameter:

\begin{figure}[(position)]
...
\end{figure}

Different possible positions:

- \( h \): the object is inserted at the specified place
- \( t \): the object is inserted on the top of the page
- \( b \): the object is inserted at the bottom of the page
- \( p \): the object is inserted on a page reserved to floats

You can select several parameters at once, the first parameter being prioritised:
\begin{figure}[ht] \textbf{(recommended)}
\end{figure}

“!”, overrides layout parameters of \LaTeX: 
\begin{figure}![h] \textbf{(not recommended)}
\end{figure}
Using the figure environment

Most common use:

\begin{figure}[⟨position⟩]
  \centering
  \includegraphics[⟨options⟩]{⟨image_name⟩}
\end{figure}

- Display a centered image (\centering command)
- options of \includegraphics allow to tune the size of the image:
  - width=width in cm
  - height=height in cm
  - scale=scale (1, 2, 0.5, ...)

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Caption and label

Most common use:

```latex
\begin{figure}[⟨position⟩]
  \centering
  \includegraphics[⟨options⟩]{⟨image_name⟩}
  \caption{⟨caption_name⟩}
  \label{⟨label_name⟩}
\end{figure}
```

- `\caption{caption\_name}` insert a caption
- `\label{label\_name}` add a label to an object. You can later refer to it with the commands `\ref{label\_name}` (figure number) and `\pageref{label\_name}` (page number).

Example:

See slide `\pageref{my_logo}`.  

See slide ??.
Exemple

\begin{figure}[h]
\centering
\includegraphics[width=5cm]{img/latex.jpg}
\caption{\LaTeX\ language logo}
\label{monlogo}
\end{figure}

Figure : \LaTeX\ language logo

(If the image latex.jpg is located in the img directory !)
Mathematics with LaTeX

- equation editor required
- knowledge of usual commands required
- possibility to insert equations in text:
  \[ 1 + 1 = 4. \]
- possibility to insert equations between two paragraphs and number them automatically:
  \[ 1 + 1 = 4 \quad (1) \]
For example:

If $x < 0$, then $\sqrt{x}$ doesn’t exist.

If $x < 0$, then $\sqrt{x}$ doesn’t exist.

Or, depending on the document police:

If $x < 0$, then $\sqrt{x}$ doesn’t exist.
Equation between paragraphs

\begin{equation} % Start of the equation environment
1+1=0 % equation
\label{eq_zero} % equation label
\end{equation} % End of the equation environment

Insert a numbered mathematical expression with a label.

\begin{equation}
1 + 1 = 0
\end{equation} \tag{2}

The label can then be used to make a reference to the equation (eq_zero):

See equation (\ref{eq_zero}).

See equation (2).
Most usual commands

- \texttt{\sqrt{1+2}}: square root \quad \sqrt{1+2}
- \texttt{\frac{1}{2}}: fraction \quad \frac{1}{2}
- \texttt{\sin(1+2)}: sinus \quad \sin(1+2)
- 1^{1+2} \text{ or } 1^2 \text{: power} \quad 1^{1+2} \text{ or } 1^2
- 1_{1+2} \text{ or } 1_2 \text{: index} \quad 1_{1+2} \text{ or } 1_2
- 1_{1+2}^{1+3} \text{ or } 1_2^3 \text{: power AND index} \quad 1_{1+2}^{1+3} \text{ or } 1_2^3
- \texttt{\vec{AB}} \text{ or } \texttt{\overrightarrow{AB}}: vector \quad \vec{AB} \quad \overrightarrow{AB}
- \texttt{\sum_a^b} \text{: sum} \quad \sum_{a}^{b} x
Equation array

\begin{eqnarray*}
1+1 &=& 4 \\
2+1 &=& 3 \\
2+2 &=& 2
\end{eqnarray*}

Result

\[
\begin{align*}
1 + 1 &= 4 \\
2 + 1 &= 3 \\
2 + 2 &= 2
\end{align*}
\]
Advance mathematic

\begin{equation}
\sum_{i=1}^{n}{\alpha_i} = \beta
\end{equation}

\begin{equation}
\sum_{n=1}^{\infty}{\frac{1}{n^2}} = \frac{\Pi^2}{6}
\end{equation}

Result

\begin{align*}
V1 & \quad \sum_{i=1}^{n} \alpha_i = \beta \\
V2 & \quad \sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\Pi^2}{6}
\end{align*}
How to build matrix

$$\begin{pmatrix}
e & 2 \\
3 & 5 \\
\end{pmatrix}$$

Result

$$\begin{pmatrix}
e & 2 \\
3 & 5 \\
\end{pmatrix}$$
Greek characters

- The command correspond to the name of the greek letter:
  - “Name” : corresponding letter in uppercase
  - “name” : corresponding letter in lowercase

Examples:
\Omega: \Omega
\omega: \omega

Other examples:
A, B, Γ, Δ, E
α, β, γ, δ, ϵ, ϖ
Tables with \texttt{\LaTeX}

- Poorly managed in \texttt{\LaTeX}, tables need to be handled with care
- Inserted thanks to the \texttt{table} environment
\begin{table} % Start of the table environment
\centering % Center table
\begin{tabular}{|l|c|r|} % Start of the tabular environment
\hline % Horizontal line
colonne 1 & colonne 2 & colonne 3 \\ 
\hline % Horizontal line
1 & 1 & 3 \\ 
2 & 2 & 4 \\ 
\hline % Horizontal line
\end{tabular} % End of the tabular environment
\label{table_label} % Table label (useful to make a reference to the table later)
\caption{Table caption} % Table caption
\end{table} % End of the table environment

results in:

<table>
<thead>
<tr>
<th>colonne 1</th>
<th>colonne 2</th>
<th>colonne 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Table : Table caption
Base code for a table tableau

- \texttt{\hline} makes an horizontal line
- The column number of the table must be written in the beggining, between the second pair of braces \texttt{\begin{tabular}{|l|c|r|}}, with:
  - \texttt{l} for a left-aligned column
  - \texttt{r} for a right-aligned column
  - \texttt{c} for a centered column
  - \texttt{l} for a vertical line between two columns (Alt Gr + 6)
  - \texttt{||} for a double vertical line between two columns
Multispan line/column

- Merging x columns: \texttt{\textbackslash multicolumn}\{x\}\{c|c\}\{text\}

- Merging lines is harder, you have to trace the horizontal line with \texttt{\textbackslash cline} instead of \texttt{\textbackslash hline}, for example between columns col1 and col2: \texttt{\textbackslash cline}\{col1-co12\}