
Thème - 1 *Basic notions of Latex*

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1 Latex Document

A research activity will benefit the community only if it is followed by a vulgarization. This last can be achieved either by writing reports, papers or given talks at national or international conferences.

It thus appears necessary to get familiar, as earlier as possible, with available tools that can help build vulgarization supports of high quality.

The tool \LaTeX comes out as one of such tool that can help produce documents of good quality and of different extension format : .pdf, .ps, .dvi.

The \LaTeX offers some classes to realize papers, reports and many others.

More precisely, the following classes are available:

1. *article*,
2. *report*,
3. *book* .

The selected class should figured as the first instruction in our \LaTeX file:

Listing 1: First line of the document

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

These classes give attractive functionalities which unfortunately are still of basic level. However there are several ways to extend them even if not straightforward from the first sight. In this direction, in order to simplify the writing and the submission procedure, several scientific journals have developed their own extension which are freely available on their web pages. They are advised to authors who wish to submit a paper to those scientific journals.

Moreover when attending conferences or seminars, you might have to give a talk using video projector. In order to prepare adequate documents in such context the \LaTeX is again an appropriate tool. It offers the following classes:

1. *seminar*
2. *prosper*
3. *beamer*

We are going to briefly describe the classes **article** and **beamer**. It is advised to look for available references for further descriptions.

1.1 Formatting a document for an article

An example of formatting for an article is given by the following listing:

Listing 2: File: exemplearticle.tex

```
\documentclass[a4paper,12pt]{article}
%
\usepackage[latin1]{inputenc}
\usepackage[english]{babel}

\usepackage[dvips]{graphicx}
%Mettre le titre du document
\title{Tritre du comment}
%Mettre les informations sur l'auteur
\author{Prénom et Nom de l'auteur}
\begin{document}
\maketitle
%\tableofcontents % table des matières
\begin{abstract}
Votre résumé ici
\end{abstract}
%Organisation du document à sa guise
\section*{Section sans numero}
%contenu de cette section ici
\section{Section avec numero}
%contenu de cette section ici
%On peut citer la référence bibliographique
Voir \cite{glow}
%Bibliographie
\begin{thebibliography}{99}
\bibitem{glow} R. Glowinski, J. L. Lions and R. Tr\u{m}oli\u{e}res,
Numerical Analysis of Variational Inequalities, North-Holland Publishing Company, 1981.
\end{thebibliography}
\end{document}
```

1.2 Inserting mathematical tools

The insertion of **theorems**, **propositions**, **lemmas**, **remarks**, . . . , as well as mathematical formulas in mathematics documents is a common practice. In order to achieve this using the \LaTeX , some environments need to be either loaded or redefined.

If extended classes proposed by scientific journals offer these environments by default, it is unfortunately not the case for our basic class **article** where their activation is required. This activation is achieved by using the command **newtheorem**. A sample procedure might be as followed: **insert in the document, just before the instruction `begin{document}`, the following lines:**

Listing 3: Chargement des environnements: lemmes, propositions, theorem, remarques

```
\newtheorem{theo}{Théorème}[section] % les théorèmes sont numérotés par section
\newtheorem{prop}[theo]{Proposition} % propositions ont le même compteur que les théorèmes
\newtheorem{lem}{Lemme}[section] % les lemmes sont numérotés par section
\newtheorem{def}{Définition}[subsection] % les définitions numérotées par sous sections
\newtheorem{rem}{Remarque}[section] % les remarques numérotées par section
```

Therefore the inclusion of a proposition will be as follows:

Listing 4: Inclusion d'une proposition

```
\begin{prop} % ouverture de l'environnement proposition
\label{p:1} % pour pouvoir référer cette proposition
% contenu de la proposition ici
\end{prop} % fermeture de l'environnement proposition
```

Moreover to enter **mathematical formulas**, one must use the dedicated environment for equations. This can be loaded through one of the following instructions

- `$... $`. The equation is inserted in the current line of the text.
- `\[... \]` or `$$... $$`. The equation is inserted on a new line without an attached number.
- `\begin{equation} ... \end{equation}`. The equation is numbered on its own line

As an illustration:

Listing 5: Insertion of an equation in the text line

```
voici une formule $\sum_{n=1}^N \int_{\Omega_i} f(x) dx$\
```

result: voici une formule $\sum_{n=1}^N \int_{\Omega_i} f(x) dx$

Listing 6: Insertion of an equation

```
voici une formule $\displaystyle \sum_{n=1}^N \int_{\Omega_i} f(x) dx$\
```

result: voici une formule $\sum_{n=1}^N \int_{\Omega_i} f(x) dx$

Listing 7: Insertion of an equation in a line without a number

```
voici une formule $$\sum_{n=1}^N \int_{\Omega_i} f(x) dx$$
```

result: voici une formule

$$\sum_{n=1}^N \int_{\Omega_i} f(x) dx$$

Listing 8: Insertion of a numbered equation on its own line

```
voici une formule
\begin{equation}
\label{eq:1}
\sum_{i=1}^N \int_{\Omega_i} f(x) dx
\end{equation}
```

result: voici une formule

$$\sum_{i=1}^N \int_{\Omega_i} f(x) dx \tag{1}$$

Remark 1.2.1.

- It is advised to get closed to you a printed version of a \LaTeX table of **mathematical formulas**.
- Some special characters may require specific *packages*: **amsmath** **amssymb**, ... These package should thus be inserted in the document using command **usepackage**.
- Some integrated \LaTeX environments are available. They greatly simplify the insertion of special characters as well as mathematical formulas through a simple mouse click. The most common of these integrated \LaTeX environments in the linux community are **kile** and **texmaker**.

1.3 Inserting a table

The insertion of a Table in a \LaTeX document can be achieved through the association of the environments **table** and **tabular** as illustrated by the following listing.

- **Precondition: not mandatory**

Listing 9: Precondition a Table insertion

```
%\usepackage{multicol} \usepackage{multirow} \usepackage{float}
```

- **Sample insertion of a Table**

Listing 10: File: exempletableau.tex

```
\begin{table}[htp] % options pour objet flottant voir remarque ci dessous
\begin{center}
\begin{tabular}{|c|c|c|c|c|} \hline
& \multicolumn{2}{|c|}{\mathcal{P}_1} & \multicolumn{2}{|c|}{\mathcal{P}_2} \\ \hline
\mathcal{P}_1 & Erreur & \mathcal{P}_1 & Erreur & \mathcal{P}_1 \\ \hline
\mathcal{P}_2 & Erreur & \mathcal{P}_2 & Erreur & \mathcal{P}_2 \\ \hline
\mathcal{P}_3 & Erreur & \mathcal{P}_3 & Erreur & \mathcal{P}_3 \\ \hline
\mathcal{P}_4 & Erreur & \mathcal{P}_4 & Erreur & \mathcal{P}_4 \\ \hline
\mathcal{P}_5 & Erreur & \mathcal{P}_5 & Erreur & \mathcal{P}_5 \\ \hline
\end{tabular}
\end{center}
\caption{Un tableau.}
\label{tab:1}
\end{table}
```

- **Result after compiling:** voir TABLE.1
- **Referring to a table:** The keyword **label** can help attach an identifier to a table. This identifier will help refer that table within the document. For instance by writing: see TABLE. `\ref{tab:1}` the result will be : see TABLE.1.

	\mathcal{P}_1		\mathcal{P}_2	
h^{-1}	Erreur	taux	Erreur	taux
	$\ u - u_h\ _{0,\Omega}$			
8	$7.997e - 03$	—	$1.274e - 03$	—
16	$2.528e - 03$	1.66	$3.157e - 04$	2.01
32	$8.489e - 04$	1.57	$7.869e - 05$	2.00
64	$3.027e - 04$	1.49	$1.965e - 05$	2.00
128	$1.148e - 04$	1.40	$4.910e - 06$	2.00

Table 1: Un tableau.

Remark 1.3.1 (Parameters to constraint floating objects).

Tables are floating objects in a \LaTeX document since they do not necessary appear at their insertion position in the final pdf document.

If at the insertion position there is not enough available space, the table will appear in a random manner in forthcoming pages in the produced document. Therefore it is better to always attached label to floating objects and use it to refer to them to them in the document. However it is possible to constraint a floating object with the following options:

- option **h** : force it to appear at the insertion position.
- option **p** : force it to appear at the next page from their insertion position in case of failure.
- option **t** : force it to appear at the top page of its appearing page.
- option **b** : force it to appear at the bottom page of its appearing page.

As mentioned in the example above, it is possible to combine several options: **[hbp]**.

1.4 Inserting a figure

The insertion of a figure in a \LaTeX document, can be done through the environment **figure**.

- **Precondition:**

Listing 11: Precondition for image insertion

```
\usepackage[dvips]{graphicx}
```

- **Sample insertion:**

Listing 12: File: exemplefigure.tex

```
\begin{figure} [hbp]
\centering
\includegraphics[width=8cm,height=4cm, angle = 0]{pressure.eps}
\caption{Une figure}
\label{fig:1}
\end{figure}
```

- **Options :**

[width=8cm] : set the width of the figure to 8 cm

[height=4cm] : set the height of the figure to 4 cm

[angle=0] : apply a rotation of 0 degree

- **Referring a figure:** just put `FIGURE.\ref{fig:1}`
- **Result after execution:** see FIGURE 1

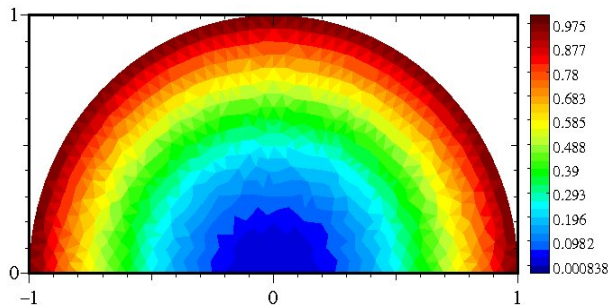


Figure 1: Une image

1.5 Formating a document to make a presentation

The class *beamer* is at present speaking the most adapted tool for generating a document in order to make a presentation. For its best usage the simplest procedure and the less constraining is to go from a model example and to adapt it as wishes. Models are available at the following link address:

<http://latex-beamer.sourceforge.net/>

A usage can be performed as follows, with almost no change of the syntax used for writing an article.

Listing 13: File: `exemplebeamer.tex`

```
\documentclass{beamer}
\mode<presentation> {
  \usetheme{Madrid}
  \usecolortheme{seahorse}
  \setbeamercovered{transparent}
}
\usepackage[english]{babel}
\usepackage[latin1]{inputenc}
\usepackage[T1]{fontenc}
\DeclareGraphicsExtensions{.pdf, .jpg, .tif}

\title[titre]{TITRE}
\author[J.-B. A. K. ]
{J.-B. Apoung Kamga}
\institute[AN-EDP]
{
  Université Paris Sud-ORSAY
}
\date[16/09/13]{Orsay 16 Septembre 2013}

\begin{document}
\begin{frame}
  \titlepage
\end{frame}
\begin{frame}{Plan}
  \tableofcontents
\end{frame}
\section{On peut mettre une section}
\begin{frame}{Titre du nouveau {\it slide} ici}

\begin{block}{Un bloc simple}
  TODO
\end{block}

\begin{exampleblock}{Un bloc exemple}
```

```

TODO
\end{exampleblock}

\begin{alertblock}{Un bloc d'alerte}
TODO
\end{alertblock}

% mon texte ici
\end{frame}
\end{document}

```

2 Generating the final document (from .tex to .pdf)

The generation of final document in **.pdf** format (**exemple.pdf**) from a file in **.tex** format (**exemple.tex**) can be done in the following five steps:

1. Edition
Edit the file with any editor at hand
2. Shaping
latex exemple
latex exemple
This will generate a file in **.dvi** format. In our case **exemple.dvi**.
3. Proofing Or visualising the .dvi file.
Enter : **xdvi exemple.dvi &**
4. Creating a printed file.
dvips [-t landscape] exemple.dvi -o exemple.ps
The option **-t landscape** help print in landscape mode.
There are two ways to get the .pdf file :
Either going from the .dvi file : **dvipdf exemple.dvi -o exemple.pdf**
Or from the produced .ps file : **ps2pdf exemple.ps exemple.pdf**
5. Printing. Use any printing device at hand.

3 Complements

3.1 Clean up behind

A LATEX session can generate several unnecessary files which can be deleted at the end of the session. Those files can eventually clutter your workspace. Take care of quotas !

Those files are suffixed by:

.aux : list of cross-references, tables and lists.

.bbl : database generated by bibtex.

.dvi : Tex or LaTeX output.

.glo : files generated by the glossary.

.idx : files generated by the index.

.ilg : state generated by makeindex.

*.ind : file created from *.idx by makeindex.*

.lof : file read by listoffigures.

.log : messages from TeX.

.lot : file read by listoftables.

.toc : file read by tableofcontents.

3.2 Some useful commands

acroread without which one can use **evince** Display and help print PDF files.

Syntax : **acroread &** (or **evince &**)

acroread (Acrobat Reader) est a tool that can help read an print PDF files.

The & is a special character for the shell to launch the acroread in background.

a2ps

Translate a text int PostScript.

Syntax : **a2ps [-h] [options] input -o output**

Prinipal Options:

** -h : display the list of options for a2ps.*

** -B : prevent the printing of header informations (date, filename,...)*

** -l : layout 1 page of file per page of paper (instead of 2 by default)*

** -fn : use font of size n (real) for the body text*

** -r : write in landscape mode.*

***a2ps** recognize several types of source files: **C**, **FORTRAN**, **shell**, ... In this case keywords are written in bold and comments in italic,... producing a nice result at printing.*

*Example : **a2ps -B -l docu1.txt -o docu1.ps** : translate the text file docu1.txt in a PostScript file docu1.ps, 1 page of the file per page, without headings.*

ghostview or simply **gv**

Display and help to print PostScript files.

Syntax : **ghostview &** ou **gv &**

ghostview is a multi-window utility: one window where the postscript file is displayed, another window with menu that can help rotate scale or print selected pages of the document, ...

*NB : Recent versions of **ghostview** can also help display pdf files but with less possibilies compared to **acroread**.*

psselect Splits the PostScript files.

Syntax : **psselect -pi[-j] input output**

It can happen that we wish to print just a part of a PostScript file. May be after some correction.

psselect help to extract from the source file the pages from *i* to *j*, and to print them in a target file.

*Examples: **psselect -p14-19 t1.ps t2.ps** : extract pages from 14 to 19 of file t1.ps and to copy them in the file t2.ps*

***psselect -p20 t1.ps t2.ps** : extract the page 20 of file t1.ps and copy it in file t2.ps*

***psselect -p31- t1.ps t2.ps** : extract in file t1.ps from page 31 up to the end of the file and copy them in file t2.ps*

psnup writes several pages of a PostScript file on a single page.

*Syntax : **psnup [-2 | -4 | -8] source > cible***

Principal Options:

** -2 : write 2 pages of the file per page.*

** -4 : write 4 pages of the file per page.*

** -8 : write 8 pages of the file per page.*

*Example: **psnup -2 t1.ps > t2.ps** : create the file t2.ps by writing 2 pages of file t1.ps per page.*