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L^AT_EX2_ε

An overview

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- **Description:** typesetting system
Donald Knuth, 1977
- **Motivation:** writing of
“The Art of Computer Programming”
- **Current version:** 3.14159 (converges towards π)
- **Status:** 1982
 - ▶ Some improvements in 1989 (internationalization)
 - ▶ Extensions: ϵ -T_EX, X_YT_EX, LuaT_EX
- **Pronunciation:** “ $\tau\epsilon\chi$ ”
- **Typesetting:** (ASCII) T_EX



- **Description:** macros library
Leslie Lamport, early 80s
- **Specificity:** layer on top of T_EX
- **Motivation:** *logical* layer on top of T_EX
(physical layer)
- **Pronunciation:** “léï-τ_εχ” ou “la-τ_εχ”
- **Typesetting:** (ASCII) L^AT_EX



Distinctive features ($\text{T}_\text{E}\text{X}$ and $\text{L}^\text{A}\text{T}_\text{E}\text{X}$)

$\text{L}^\text{A}\text{T}_\text{E}\text{X} 2_\epsilon$

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- Mathematical typesetting
- Visual rendering
- Compiler rather than “word processor”



History (I)

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- **1436:** printing (Gutenberg)
- **1690:** Royal Alphabet (Louis XIV)
- **1977:** T_EX (Donald Knuth)
- **1979:** “T_EX And METAFONT: New Directions In Typesetting” (Donald Knuth)
- **1983:** First L^AT_EX manual (Leslie Lamport)
- **1984:** “The T_EXbook” (Donald Knuth)
- **1984:** L^AT_EX 2.06a
- **1985:** B_IB_TE_X 0.98
- **1985:** L^AT_EX 2.09 (last version from Leslie Lamport)



History (II)

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- **1985:** “L^AT_EX, A Document Preparation System” (the “Lamport”)
- **1988:** `makeindex`
- **1989:** L^AT_EX 3 (Frank Mittelbach)
- **1990:** $\mathcal{A}\mathcal{M}\mathcal{S}$ -L^AT_EX 1.1
(port of $\mathcal{A}\mathcal{M}\mathcal{S}$ -T_EX for L^AT_EX 2.09)
- **1994:** L^AT_EX 2_ε
- **1994:** “The L^AT_EX Companion”
- **1994:** The “Lamport”, second edition
- **1995:** $\mathcal{A}\mathcal{M}\mathcal{S}$ -L^AT_EX 1.2 (port for L^AT_EX 2_ε)
- **2004:** “L^AT_EX Companion”, second edition
- **xxxx:** L^AT_EX 3



Getting $\text{\LaTeX}$

$\text{\LaTeX}2\text{e}$

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- $\text{\TeX}$ and $\text{\LaTeX}$ are free software
- $\text{\TeX}$ (and so $\text{\LaTeX}$) is extremely portable
- **$\text{\TeX}Live$** : multi-platform, *de facto* standard
Note: $\text{\TeX}Live$ 2019 was released on April 29...
- **$Mik\text{\TeX}$** : Windows
- **$Mac\text{-}\text{\TeX}$** : MacOS, based on $\text{\TeX}Live$
- $Te\text{\TeX}$ obsolete (not maintained anymore)

Do not confuse “distribution” and installer / package (ex. $\text{\TeX}Live$ for Debian, MacPorts / Fink / $gw\text{\TeX}$ / i-Installer for Mac OS-X *etc.*)



Documentation

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■ Books:

- ▶ L^AT_EX, A Document Preparation System
- ▶ The L^AT_EX [web|graphics] companion
- ▶ Guide to L^AT_EX
- ▶ L^AT_EX par la pratique (french)

■ Public resources:

- ▶ The Not So Short Introduction To L^AT_EX 2_ε
- ▶ latex-project.org
- ▶ google ...

■ And of course:

- ▶ **The Comprehensive T_EX Archive Network**
ctan.org



Source code organization

Text, comments, commands and environments

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```
\documentclass[12pt]{article}

%% Document preamble
\usepackage[french]{babel} %% <-- command

\begin{document}                %% <-- environment opening
%% Document body
Small, but strong.
\end{document}                  %% <-- environment closing

%% Everything else is discarded
```

- **Commands:** \ followed by one or more letters ($\text{\TeX}$), or a single, non-alphabetic character ($\text{\text{'}}$)
- **Arguments:** surrounded by curly braces ($\text{\section{Introduction}}$)
- **Options:** first argument surrounded by square brackets ($\text{\usepackage[T1]{fontenc}}$)



Syntactic pitfalls

There had to be some...

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- Several whitespace characters ↔ a single one
- Empty line ↔ new paragraph
- Special characters (escaped with `\`): `#` `$` `%` `^` `&` `_` `{` `}` `~`
- Exception: `\ ($\backslash slash$)`. `\\` = newline
- Comments: `%` until the end of line / next non-whitespace character
- Whitespaces after commands are “eaten” by T_EX. Use curly braces or special whitespace-insertion commands.



Examples

let's be crystal clear

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The number of spaces doesn't count
 in the source code.

Here is a comment. *% silly,*
% but useful

The `\TeX{}` users belong to 3 groups:
the `\TeX{}`nicians, the `\TeX` perts,
and the others`\ldots\`

`\^o`, `\c c`, `\oe`, `\AE`, `\"i`

The number of spaces
doesn't count in the source
code.

Here is a comment. The T_EX
users belong to 3 groups:
the T_EXnicians, the T_EXperts,
and the others...

ô, ç, œ, Æ, ï



Compilation pipeline

All hail automation!

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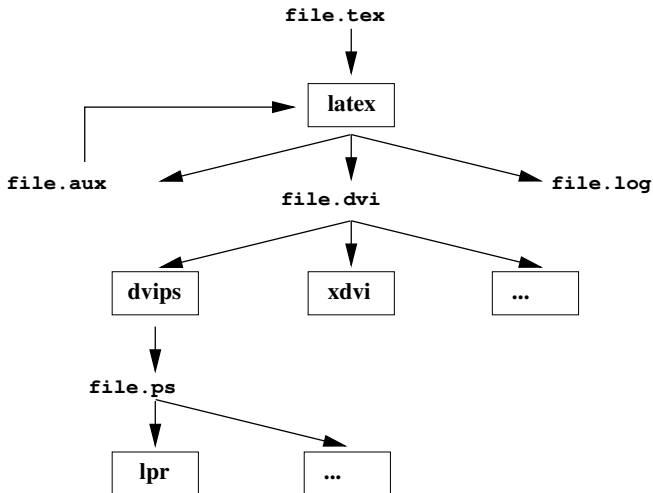
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Select features

Classes and packages

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■ Fundamental structure: the document *class*

```
\documentclass[11pt,a4paper]{article}[1994/06/01]
```

- ▶ Standard classes: article, report, book et letter

■ Additional features: specific *packages*

```
\usepackage[french]{babel}[2001/03/01]
```

- **Minimum version:** optional
- **Options:** standard to L^AT_EX, the class, or package specific
- **Propagation** of options given to `\documentclass`



The letter class

Somewhat marginal

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■ Global declarations:

- ▶ `\signature{}`, `\address{}` (separate lines with `\\`)
- ▶ Depending on the style: `\name{}`, `\location{}` and `\telephone{}`

■ The letter environment:

```
\begin{letter}{Jacques Chirac}  
  \opening{Mister President}  
  Happy birthday !  
  %% blah blah blah ...  
  \closing{Regards,}  
\end{letter}
```



The article, report, and book classes

Similar classes

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■ Common commands:

- ▶ **Global declarations:** `\title{}`, `\author{}` (`\and`), `\date{}` (`\today`)
- ▶ **Title:** `\maketitle`
- ▶ **Abstract:** environment `abstract`
- ▶ **Sections:** `\chapter{}` (except for `article`), `\section{}`, `\subsection{}`, `\subsubsection{}`, `\paragraph{}`, `\subparagraph{}`
- ▶ `\part{}`, `\appendix`

```
\section*{Unnumbered, no TOC entry}  
\section[TOC title]{Text title}
```

■ Specific commands:

- ▶ book **class:** `\frontmatter`, `\mainmatter`, `\backmatter`



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Warning: 2 passes of $\text{\LaTeX}$ are required!!

$\text{\LaTeX}$ 2e

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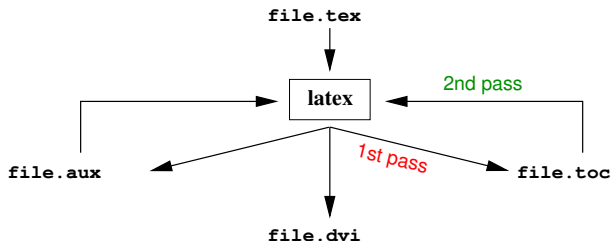
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`\tableofcontents`





Internationalization (i18n)

Non-english documents, even polyglot

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Challenges:

- Adapt automatic contents (section names, table of contents, bibliography, index. . .)
- Adapt hyphenation rules
- Adapt typesetting conventions
- Change character sets in source code
- Change their encoding



Hyphenation

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- **Rules:** language-dependant

- **Automatic** *in principle*

- **Explicit:**

- ▶ **Global declaration:** `\hyphenation`

```
\hyphenation{blah-blih-bloh-bluh FORTRAN}
```

- ▶ **Special characters:** forbidden

- ▶ **On the fly declaration:** `\-`

```
bl\ae h\ -bl\oe h\ -bl\"uh
```



Spacing

A first example of a typesetting convention

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- Additional space after every sentence
- A sentence ends with an (exclamation / interrogation) mark or dot
- Exception: upcase letters followed by dots (acronyms)
- `\@:` before a dot, indicates that this dot ends a sentence
- `\frenchspacing:` suppresses this behavior

```
Call him Mister X.  
That will have to do.\  
Call him Mister X\@.  
That will have to do.
```

Call him Mister X. That will
have to do.
Call him Mister X. That will
have to do.



Other typesetting conventions

Why respect them?

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- **Elision dots:** `\ldots`
- **Emphasis:** `\emph{ }` ou `{\em ...}`, `ulem` package
- **Quotation marks:** do not use `"`, but `` `` and `‘ ’`
- **Dashes:** `-` (hyphen), `--` (en-dash) et `---` (em-dash), `$-``$` (mathematic “minus”)



Examples

Bicoz its more pritty!

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... or `\ldots`

... or ...

This is `\emph{very}` important.

This is *very* important.

Here are some ``quotation marks''.

Here are some “quotation marks”.

Alfred Saint-James\
pages 13--27\
--- hello!\
--- bye.

Alfred Saint-James
pages 13–27
— hello!
— bye.



Babel

l18n automatic management (except encoding), numerous languages

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```
\usepackage[french, ...]{babel}  
\selectlanguage{french}
```

French-specific commands:

- **Abbreviations:** `\up{}`, `\ier`, `\iere`, `\ieres`, `\ieme`, `\iemes`
- **Numbers:** `\No`, `\no`, `\nombre{}` (Cf. `numprint`)
- **Degrees:** `\degres`
- **Upcasing:** `\bsc`
- **Other:** `\og`, `\fg`



Examples

How practical!

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`M\up{me}, 1\ier, 1\iere,`

`1\ier, 2\ieme{} \emph{etc}\\\nNo 1, \no 2, et\nnombre{1294,9546}\\\n30\degres, enfin, 30~\degres C,\nc'est chaud.\\`

`M. et M\up{me} \bsc{Froid}\nont sept enfants\ldots\\`

`\og guillemets\fg`

`Mme, 1er, 1re,`

`1er, 2e etc\nº 1, nº 2, et 1 294,954 6\n30°, enfin, 30 °C, c'est chaud.`

`M. et Mme FROID ont sept\nenfants...`

`« guillemets »`



InputEnc

How about typing a é directly?

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```
\usepackage[encoding]{inputenc}  
\inputencoding{encoding}
```

- Declare source code encoding
- encoding: latin1 (Unix), applemac (Mac), ansinew (Windows), cp850 (DOS, OS/2) *etc.*
utf8 (Unicode)



FontEnc

Font encoding

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Problem:

- Original T_EX CM (Computer Modern) fonts: ASCII
- T_EX adds accents on top of regular characters. . .
- . . . and breaks hyphenation

Solution:

```
\usepackage[T1]{fontenc}
```

- Triggers use of EC (Extended Cork) fonts
- Same shape as CM only with accented characters
- Restores hyphenation



Choosing fonts

The big mess

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■ Standard:

- ▶ CM / EC fonts (not completely equivalent)
- ▶ **Package:** `lmodern` (2003, unification attempt)
- ▶ **Package:** `textcomp` (miscellaneous symbols)

■ PSNFSS:

- ▶ Level 2 PostScript fonts
- ▶ **Roman + maths:** `mathptmx` (Times), `mathpazo` (Palatino)
- ▶ **Sans Serif:** `helvet`, `avant`
- ▶ **Typewriter:** `courier`
- ▶ **Package:** `pifont` (miscellaneous symbols)

■ *etc.*



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The 0.5 € question

Death to the official `textcomp` way!

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■ **Package:** `eurosym` (METAFONTdescription)

- ▶ Official EU description
- ▶ `\euro: \officialeguro` (€, default), `\geneuro` (€),
`\geneuronarrow` (€) and `\geneurowide` (€)
- ▶ `\EUR{ }`: numerical amounts with symbol placement (2.35 €)
- ▶ Does not look good with every font...

■ **Package:** `europs` (Adobe fonts, Postscript Type 1)

- ▶ Adapts the symbol to the current font



Geometry and textual disposition

Two correlated notions

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■ Geometry:

- ▶ Options: 10pt (default), 11pt, 12pt
- ▶ Options: a4paper, a5paper, letterpaper (default) ...
- ▶ Options: portrait (default), landscape
- ▶ Options: oneside, twoside
- ▶ **Packages:** a4, a4wide (bugged!), but geometry above all

■ Disposition:

- ▶ Options: titlepage, notitlepage
- ▶ Options: onecolumn (default), twocolumn
- ▶ Options: openright, openany
- ▶ **Package:** multicol (variable number of columns)
- ▶ **Indentation:**
 - Automatic (except first paragraph)
 - **Package:** indentfirst (indent first paragraph)



Headers and footers

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```
\pagestyle{<style>}  
\thispagestyle{<style>}
```

■ Built-in styles:

- ▶ `plain` (default): bottom middle page number
- ▶ `empty`: as its name suggests
- ▶ `headings`: with current chapter name and page number

■ Package: `fancyhdr` (advanced configuration)



All kinds of notes

The abuse of notes causes harm to readability

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■ Footnotes: `\footnote{}`

- ▶ avoid when possible (non-linear reading)
- ▶ insert just after the concerned word, or *after* the punctuation (for {pieces of} sentences)
- ▶ **Package:** `footmisc` (advanced configuration)

■ Margin notes: `\marginpar{}`

- ▶ avoid at all cost (same reason)

■ Packages:

- ▶ `endnotes`: regroup notes at the end of the document
- ▶ `fn2end`: (conflicts with `endnotes`) turn “footnotes” into “endnotes”



Lists

<insert funny subtitle here>

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- **Environments:** `itemize`, `enumerate`, `description`
- **Command:** `\item[]`
- **Optional argument:** alternative prefix
- Environments can be nested

```
\begin{enumerate}  
  \item Number 1  
  \item Number 2  
    \begin{itemize}  
      \item Item 1  
      \item[-] Item 2  
    \end{itemize}  
\end{enumerate}
```

1. Number 1
2. Number 2
 - Item 1
 - Item 2

- **Package:** `enumerate` (customize the counter style)
- **Package:** `expdlist` (control over the `description` environment)



Quotations

Do not confuse with bibliographic citations

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- Narrower paragraphs
- **Short quotes:** `quote` environment
- **Long quotes** (several paragraphs): `quotation` environemtn
- **Poems** (verses separated with `\\`): `verse` environment

```
\begin{verse}  
To the mountain I went  
to have some fun\\  
And in the snow I  
fell and I jumped  
\end{verse}
```

*To the mountain I
went to have
some fun
And in the snow I fell
and I jumped*



Verbatim

Text “as-is”

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- **Short version:** `\verb+text+`
- **Delimiter:** anything except `*` and `<espace>`
- **Long version:** `verbatim` environment
- **Starification:** underline spaces

`\verb|\verb+text+|`

```
\begin{verbatim*}  
\LaTeX, it's a blast.  
\ is a command.  
\end{verbatim*}
```

```
\verb+text+  
  
\LaTeX, it's a blast.  
\ is a command.
```

- **Packages:** `alltt`, `verbatim`, `moreverb`



Spacing adjustment

Abusing space is not good for your health

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■ **New paragraph:** `\par` or (again) empty line

■ **Unbreakable:**

- ▶ **Space:** `~` (fixed size)
- ▶ **Box:** `\mbox{}` (`\mbox{01 44 08 01 85}`,
`\mbox{filename}`)

■ **When things go wrong: do it last!!**

- ▶ `sloppypar` environment, `\sloppy` command
- ▶ **Line breaks:**
 - `\linebreak[n]`, `\nolinebreak[n]`
 - `\newline`, `\\`: deactivates justification
 - `\\*`: prevent page breaks
- ▶ **Page breaks:**
 - `\pagebreak[n]`, `\nopagebreak[n]`
 - `\newpage`: deactivates vertical justification
 - `\clearpage`, `\cleardoublepage`: flush floats
- ▶ **Request level:** $n \in [0, 4]$



Manual tables

Ah! Those good ol'typewriters...

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```
\begin{tabbing} ... \end{tabbing}
```

- \=: define tabulation point, \>: use it
- \\ next line, \kill “kill” current line

```
\begin{tabbing}
  \EUR{1}   \=    6,55957 \= F\\
  \EUR{15}  \>   98,39355 \> F\\
\end{tabbing}
```

1 € 6,55957 F
15 € 98,39355 F

```
\begin{tabbing}
  \EUR{15} \= 98,39355 \= F\kill
  \EUR{1}  \> 6,55957 \> F\\
  \EUR{15} \> 98,39355 \> F\\
\end{tabbing}
```

1 € 6,55957 F
15 € 98,39355 F



Automatic tables

More powerful, more complicated

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```
\begin{tabular}[pos]{spec} ... \end{tabular}
```

- pos (t, b ou c): table alignment with respect to adjacent text
- spec: table format
 - ▶ **Columns:** l, r, c ou p{width}
 - ▶ **Vertical line:** |
 - ▶ **Column separator:** (alternative) @{ }
- **Within the table body:**
 - ▶ **Next column / line:** & / \\
 - ▶ **Horizontal lines:** \hline, \cline{num-num},
hhline package
 - ▶ **Multicolumn text:** \multicolumn{num}{format}{text}
- **Packages:** array, tabularx, supertab, longtable, ltxtable



Example

... summing it all up

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```
\begin{tabular}{|c|r@{,}lc|}  
  \hline  
  \multicolumn{4}{|c|}{\%  
    Conversion table}\\  
  \hline\hline  
  \EUR{1} & 6 & 55957 & F\\  
  \EUR{15} & 98 & 39355 & F\\  
  \hline  
  \multicolumn{1}{c|}{  
    & 104 & 95312 & F\\  
  \cline{2-4}  
  \end{tabular}
```

Conversion table		
1 €	6,55957	F
15 €	98,39355	F
	104,95312	F

- **Package:** dcolumn (Type D column for decimal alignment)



Other graphics

Beware the formats

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- **Inline:** PGF/Tikz, picture environment, [e]epic package ...
- **Specific:** curves, ecltree, bar, hetarom packages ...
- **Language-dependants:** pstricks, pdftricks (use of `\special` for direct inclusion in the target language)
- **External:** XFig, Dia, InkScape, OpenOffice, Gimp...
- **Conversion:** fig2dev, convert (ImageMagick), xv ...
- **Inclusion:**

```
\usepackage{graphicx}
```

```
\includegraphics[width=.5\linewidth]{pict}
```



Floats

Automatic placement of unbreakable material

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- **Environments** (equivalent): `figure` and `table`

```
\begin{figure}[placement] ... \end{figure}
```

- **Placement** (`[tbp]` default): sequence of suggestions by order of priority. `h` (“here”), `t` (“top”), `b` (“bottom”), `p` (“page”), and `!` (“even if it looks ugly”)
- Floats are stored in FIFO buffers (so one float can hinder the placement of all subsequent ones)
- Never use `[h]!`
- **Packages:** `float`, `subfigure`, `ntheorem`, `algorithms`, `listings`



Captions and references

References are not limited to floats

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```
\caption[short]{long} %% <short>: for the list of figures
```

- **“Fragile” commands:** do not work well in captions or section titles (i.e. `\footnote`)
- **Protection:** `\protect` (`\protect\footnote{...}`)
- **Package:** `caption`

```
\label{<marker>}  
\ref{<marker>}  
\pageref{<marker>}
```

- `\label{lbl}`: marker (section, figure, table *etc.*)
- `\ref{lbl}`: corresponding counter value
- `\pageref{lbl}`: corresponding page number
- **Packages:** `varioref`, `lastpage`.



Example

Beware the commands order!

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```
\begin{figure}
  \centering
  %% \includegraphics{pict}
  %% \begin / \end{tabular}
  %% etc.
  Blah blah blah
  \caption{Pict One}
  \label{fig:pict1}
\end{figure}
```

■ caption must precede \label

```
Figure \ref{fig:pict1}
is on page
\pageref{fig:pict1}.
```

Blah blah blah

Figure: Pict One

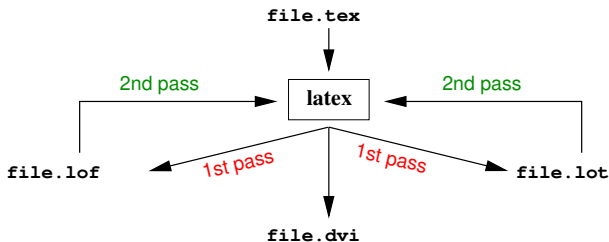
Figure 1 is on page 43.



List of floats

Warning: 2 to 3 passes of $\text{\LaTeX}$ necessary!!

`\listoffigures` and `\listoftables`



$\text{\LaTeX}$ 2e

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Mathematics

Different typesetting conventions $\Rightarrow$ specific mode

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- **Short math mode:**

`math` environment, `\( ... \)` or `$ ... $`

- **Long math Mode:**

`displaymath` environment, `\[ ... \]`

- **Equations:** `equation` environment, `fleqn`, `leqno`
(standard) options

- **Package:** `amsmath` (indispensable, additional symbols and constructions)

- **Other packages:** `stmaryrd`, `qsymbols`, `equation`,
`eqnarray`, `subeqnarray`



Symbols

Too many to mention them all

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- **Greek letters:** `\alpha`, `\beta`, `\gamma`, `\Gamma` ...
- **Binary operators:** `\oplus`, `\otimes`, `\times` ...
- **Binary relations:** `\leq`, `\geq`, `\subset`, `\in` ...
- **Arrows:** `\leftarrow`, `\rightarrow`,
`\Longleftarrow`, `\longrightarrow` ...
- **Symbols:** `\forall`, `\exists`, `\emptyset`, `\neg` ...
- **Adjustable symbols:** `\sum`, `\prod`, `\int` ...
- **Function names:** `\cos`, `\exp`, `\limsup` ...
- **Normal text:** `\textrm{}`
- **Accents:** `\tilde{}`, `\grave{}`, `\acute{}` ...
- **True spaces:** use `\!`, `\,`, `\:`, `\;`, `\quad` and `\qquad`



Examples

Tell me about the quality of the rendering. . .

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```
 $\alpha \beta \gamma \Gamma$   
 $\forall \exists \emptyset \neg$ 
```

$$\alpha \quad \beta \quad \gamma \quad \Gamma$$
$$\forall \quad \exists \quad \emptyset \quad \neg$$

```
 $\oplus \otimes \times \div$   
 $\leq \geq \neq \subset \in$   
 $\leftarrow \longleftrightarrow$ 
```

$$\oplus \quad \otimes \quad \times \quad \div$$
$$\leq \quad \geq \quad \neq \quad \subset \quad \in$$
$$\leftarrow \quad \longleftrightarrow$$

```
 $\sum \prod \bigcup \bigcap \int$   
 $\cos \exp \limsup$ 
```

$$\Sigma \quad \Pi \quad \cup \quad \cap \quad \int$$

```
 $\cos \exp \limsup$ 
```

$$\cos \quad \exp \quad \limsup$$



Mathematical constructs

Simpler than what you may think

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- **Exponents and indices:** `^{\{}}` and `_{\{}}`
- **Superposition:** `\widetilde{\{}}`, `\overline{\{}}`,
`\overbrace{\{}}`, `\overrightarrow{\{}}` ...
- **Misc.:** `\sqrt[\{ \}]{\{}}`, `\frac{\{ \}{\{ \}}`, `\cdots` ...

```
$A = x_{1}^{2} + y_{1}^{2} \\
\widetilde{abc} \backslash q \overline{abc} \backslash q \\
\overbrace{abc} \backslash q \\
\overrightarrow{abc} \\
\sqrt[3]{abc} \backslash q \frac{abc}{def} $
```

$$A = x_1^2 + y_1^2$$

$$\widetilde{abc} \quad \overline{abc} \quad \overbrace{abc} \quad \overrightarrow{abc}$$

$$\sqrt[3]{abc} \quad \frac{abc}{def}$$

```
$\underbrace{u_0 + \cdots + u_n}_{n+1} \text{\texttt{\textit{small~terms}}} $
```

$$\underbrace{u_0 + \cdots + u_n}_{n+1 \text{ terms}}$$



Additional constructs ($\mathcal{AMS-LAT}_{E}X$)

Indispensable (Did I say so already?)

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■ **Multiple integrals:** `\iint`, `\iiint` ... and `\limits`

■ **large vectors:** `\overrightarrow`, `\underrightarrow`
...

■ **Large arrows:** `\xleftarrow[]{}{}`, `\xrightarrow[]{}{}`

`\iint_{-\infty}^{+\infty} f(x) \neq`
`\iint \limits_{-\infty}^{+\infty} f(x) \ $`

$$\iint_{-\infty}^{+\infty} f(x) \neq \iint_{-\infty}^{+\infty} f(x)$$

`\[\overrightarrow{A_{\{i,j\}} B_{\{j,k\}}}\]`

$$\overrightarrow{A_{i,j} B_{j,k}}$$

`\[A\xrightarrow[below]{above}B\]`

$$A \xrightarrow[below]{above} B$$



Textual disposition

No change in the math code

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```
$\lim_{x\rightarrow+\infty}\infty f(x)  
= \sum_{i=0}^n u_i$
```

$$\lim_{x \rightarrow +\infty} f(x) = \sum_{i=0}^n u_i$$

```
[\lim_{x\rightarrow+\infty}\infty f(x)  
= \sum_{i=0}^n u_i]
```

$$\lim_{x \rightarrow +\infty} f(x) = \sum_{i=0}^n u_i$$

- `\displaystyle`: “equation” style, only inline
- **Similar commands**: `\textstyle`, `\scriptstyle` and `\scriptscriptstyle`



Delimiters

A question not to be put in parenthesis

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■ Syntax:

```
\left <delim> ... \right <delim>
```

■ Delimiters: (,), \{, \}, |, \| ...

■ Both delimiters required

■ Use a dot to specify an empty delimiter

```
\[f(x) =  
\left(\sum_{i=0}^n u_i(y)\right)  
(z)\]
```

$$f(x) = \left(\sum_{i=0}^n u_i(y) \right) (z)$$



Matrix = table + delimiters

This cannot get easier

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```
\[A =  
\left\llbracket  
  \begin{array}{ccc}  
    a_{11} & \cdots & a_{1n} \\  
    \cdots & \cdots & \cdots \\  
    a_{n1} & \cdots & a_{nn} \\  
  \end{array}  
\end{array}  
\right\rrbracket]
```

$$A = \left[\begin{array}{ccc} a_{11} & \cdots & a_{1n} \\ \cdots & \cdots & \cdots \\ a_{n1} & \cdots & a_{nn} \end{array} \right]$$

- **$\mathcal{A}\mathcal{M}\mathcal{S}$ -L^AT_EX addition:**
case, `matrix` environments ...
- **Package:** `vector` (automatic vectors)

```
$(\rvec{x}{1}{5})\\  
(\irvec{x})$
```

$$(x_1, x_2, x_3, x_4, x_5)$$
$$(x_1, \dots, x_n)$$



Mathematical alphabets

Curved characters, double-crosses *etc.*

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■ `\math*` commands: `cal`, `bb`, `rm`, `bf`, `sf` `et` `tt`

```
$ABC\\  
\mathcal{ABC}\\;\mathbb{ABC}\\  
\mathrm{ABC}\\;\mathbf{ABC}\\  
\mathsf{ABC}\\;\mathtt{ABC}$
```

ABC
$\mathcal{ABC} \mathbb{ABC}$
$\mathrm{ABC} \mathbf{ABC}$
$\mathsf{ABC} \mathtt{ABC}$



But why ?

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- Portable
- Widespread
- More compact
- Allows text searching
- Allows navigation (hyper-links)
- Preserves the rendering quality of L^AT_EX



Two approaches

Direct / indirect approach

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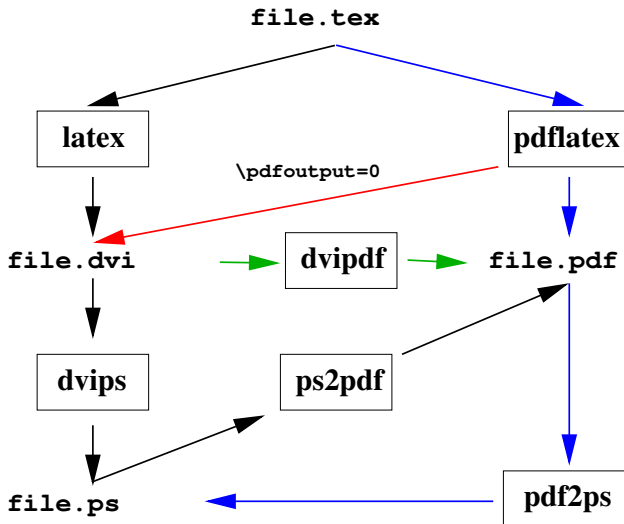
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Which one to choose? (1/2)

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■ Specificities of the direct approach:

- ▶ `pdflatex` and `latex` do not necessarily produce completely identical results
- ▶ Document specialization (target code) impossible
- ▶ Separate compilation often necessary
- ▶ Longer compilation times

■ Against the PDF $\Rightarrow$ PS conversion:

- ▶ Occasional problems with PostScript 1 or 2 printers
- ▶ Loss of PostScript elegance (Turing-complete) to PDF (not Turing-complete). But this is unavoidable.
- ▶ On the other hand, PDF accepts METAPOST.

■ Against the PS $\Rightarrow$ PDF conversion:

- ▶ The EPS $\Rightarrow$ PDF conversion is not trivial; better do it the sooner (hence the direct approach).



Which one to choose? (2/2)

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■ In favor of the PDF $\Rightarrow$ PS conversion:

- ▶ Some information (internal to T_EX) disappear in the DVI although they would be useful in the PDF. It seems however that `hyperref` solves most of these problems.
- ▶ `dvips` uses a raster grid $\Rightarrow$ scaling problems. `dvipsone` (commercial) produces true “scalable PostScript”.

■ Miscellaneous:

- ▶ There still are more PostScript tools than PDF ones
- ▶ The PDF rendering time is more deterministic than the PostScript one $\Rightarrow$ professional typesetters prefer “flat” PostScript.



Fonts in PDF

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- Standard L^AT_EX fonts (PK) produce horrific results. Better use PostScript Type 1 fonts...
- ...but there isn't a free implementation of the EC (Extended Cork) font in PostScript Type 1.
 - ▶ **The `aeguill` package:** triggers the use of the virtual *AE* fonts. Warning: this breaks the Acrobat Reader `find` function.
 - ▶ **Other PostScript Type 1 fonts:**
 - `pxfonts`: based on `palatino`
 - `txfonts`: based on `times`



Graphics in PDF

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- PDF doesn't support encapsulated PostScript (EPS)
- Provide (amongst others) PDF, PNG or JPEG
- `eps2pdf` does what its name suggests

- **Graphics inclusion:**

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

The driver may be omitted in most modern installations (automatic detection)

- **Portability:**

```
\includegraphics{<file>}
```

Do not specify an extension (the appropriate one will be chosen automatically)



hyperref

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```
\usepackage[pdftex]{hyperref} %% optional driver
```

- Automatic handling of bookmarks and keywords, generation of hyper-links (references, indexes, sections...)
- **New commands:**
 - ▶ `\href{<url>}{<text>}`: explicit hyper-link
 - ▶ `\texorpdfstring{<TeX text>}{<bookmark text>}`: to avoid bookmarks typesetting problems
- Also compatible with plain `latex`



Conditional compilation

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```
\usepackage{ifpdf}
```

```
\ifpdf
  %% PDF Stuff
\else
  %% PS stuff
\fi
```

Example:

- PDF requires the *physical* size of the paper (automatic with hyperref):

```
\pdfpagewidth=\paperwidth
\pdfpageheight=\paperheight
```



Other document classes

Help yourselves!

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■ Slides:

- ▶ slides (standard), seminar, foils
- ▶ Animation: [ha]-prosper, pdfscreen, texpower but above all beamer
- ▶ External tools: advi, PPower4
- ▶ A comparative study

■ Exams:

- ▶ exam
- ▶ QCM

■ Curricula Vitae:

- ▶ currvita, esieecv
- ▶ *CurVe*

■ etc.



Development support

L^AT_EX can be debugged...

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■ Standard options:

- ▶ `draft`, `final` (default)

■ Packages:

- ▶ `showkeys`, `draftcopy`, `changebars`
- ▶ ***FiXme***

■ Programs:

- ▶ `texi2dvi`, `latexmk`
- ▶ `texdoc`
- ▶ `kpsewhich`

■ *etc.*



The Great Wars

L^AT_EX: love and hate...

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■ Design mistakes:

- ▶ `\section*`{Not in the TOC :-(}
- ▶ BibT_EX styles i18n

■ T_EX inconsistencies:

- ▶ `\input`
- ▶ `\hskip`, T_EX glue and `\relax`

■ Macros are not functions!!

- ▶ `\@ifnextchar`
- ▶ `\if ... \else ... \fi`, `\yes et \no`, `\iftrue et \iffalse`



Word or $\text{\LaTeX}$?

The idiotic arguments

$\text{\LaTeX}$ 2e

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- **“Word, even a kid can use it”**

Wrong. A kid can also use $\text{\LaTeX}$. But a kid will use both Word and $\text{\LaTeX}$ as a kid.

- **“Word, for starters, it’s WYSIWYG”**

Wrong. Word is WYSIMOLWYG, or rather WYSIUNWYG. What’s more, there are WYSIWYG editors for $\text{\LaTeX}$.

- **“With all these packages, $\text{\LaTeX}$ is totally unstable”.**

True. But so is Word (try loading a Word 3 document in Word 7).

- **“Word can do this, $\text{\LaTeX}$ can do that...”**

These are not the important questions.



Word or $\text{\LaTeX}$?

The clever arguments

$\text{\LaTeX}2\epsilon$

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- **Grammar:** there is no satisfactory grammar checker for $\text{\LaTeX}$ (rather, for your favorite text editor).
- **Mathematics:** *nobody* rivals with $\text{\TeX}$.
- **Compilation vs. edition:** $\text{\LaTeX}$ is a (source code) *compiler*. Word is a (text) *editor*.
- **Learning by example:** *reading* $\text{\LaTeX}$ source code is much easier than *watching* a Word user.



Form / Contents separation

A die-hard idea

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- It is easy to use Word *badly*.
- Word even encourages you to do so.
- It's more difficult to use L^AT_EX badly.
- The WYSIWYG model is not the panacea. Some features can simply *not* be WYSIWYG. It's more important to focus on the contents first.
- For truly visual documents (e.g. ads, fliers), L^AT_EX is not the right tool. . . but neither is Word (Cf. Quark).

L^AT_EX 2_ε + Emacs + AUC-_TE_X !