

L^AT_EX in a Nutshell

Master on Libre Software 2011-12

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What is TeX

- A computer program (**language** and **interpreter**) created by Donald Knuth in 1977.
- Knuth wrote the TeX typesetting engine to explore potential of the digital printing equipment.
- He aimed to revert trend of deteriorating typographical quality that affected his own books and articles.
- Two main aims: highest **quality** and highest **durability**.

What is TeX

- TeX as we use it today was released in 1982, with some slight enhancements added in 1989 (8-bit characters support).
- One of the most sophisticated digital typographical systems (“The greatest contribution in the printing world since Gutenberg”).
- Popular in academia, especially in mathematics, computer science, engineering, and physics.
- **Open Source Software** (“public domain” dedication): but any modified version must not be called TeX!

What is TeX

- TeX understands about 300 low-level commands (“primitives”). Primitives are rarely used directly by users.
- The smallest unit of length handled by TeX is 0,000005356mm! (*scaled point*, 1 mm = 186712sp)
- Functionality is provided by **format files** (predumped memory images of TeX after large macro collections have been loaded).

What is TeX

- Written in a ‘literate’ programming language called **Web**.
- TRIP and TRAP tests (“conformance test”): portable, same output with all versions.
- The design was frozen (and dedicated to Public Domain) in October 1990 (v3.1* $-\pi-$, no new features, only bug fixes).

METAFONT

- Font description language to describe characters (glyphs) algorithmically with geometrical equations.
- It uses Bézier curves (vector graphics).
- Also created by Knuth but not strictly part of TeX.
- It is possible to use TeX and LaTeX without METAFONT. Adobe PostScript fonts may be used instead.

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What is L^AT_EX

- **Set of macros** from T_EX primitives that abstracted away many of the T_EX complexities.
- A “format” originally developed by Leslie Lamport.
- It incorporates document styles for books, letters, slides, etc.
- The current version is L^AT_EX2e.
- L^AT_EX is **Open Source Software** (LaTeX Project Public License - LPPL), OSI-compliant.

How to pronounce and spell “L^AT_EX”

- “T_EX”, “L^AT_EX”, or “LaTeX” (ASCII), no “Latex”.
- Pronounced /látej/ or /látek/, no ‘latex’!
- It derives from the Ancient Greek: $\tau\epsilon\chi\nu\eta$ (*tejné*: “skill, art, technique”)
- χ : *Ji* letter (voiceless velar fricative, as “ojo” or “Bach”), *Chi* /kai/ in English.
- IPA (International Phonetic Alphabet): [x] phonem

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Advantages

- Control
- Quality
- Flexibility
- Portability
- Scalability
- Stability

Advantages (2)

- Typesetting, not “word processing” (LibreOffice, MS Office, etc.).
- Accurate, precise output (device independent).
- It prevents formatting errors (by forcing to declare logical structure).
- Separate content and styling.

Advantages (3)

- Modular (add-on packages), powerful and highly portable (text files).
- Easy to make global changes; encourage content reuse.
- Complex structures (footnotes, references, table of contents, and bibliographies) can be generated easily.
- Professional output: look as if “printed”.

Caveats

- Not WYSIWIG.
- Hard learning curve.
- Absolute space/positioning is tricky (it's very hard to write disorganized documents).
- Design of a whole new layout is difficult and takes a lot of time.
- Need to be compiled.

MS Word vs LaTeX

Compare kerning:

MS Word vs L^AT_EX

Compare kerning:

Table

Table

MS Word vs L^AT_EX

Compare kerning:

Table

Table

Compare Small Caps:

MS Word vs L^AT_EX

Compare kerning:

Table

Table

Compare Small Caps:

AAa AB BC CD

AAa AB BC CD

MS Word vs L^AT_EX

Table

MS Word (*wrong* default
kerning)

Table

L^AT_EX (**correct** kerning)

MS Word vs L^AT_EX

Table

MS Word (*wrong* default
kerning)

Table

L^AT_EX (**correct** kerning)

AAa AB BC CD

MS Word (*fake* small caps)

AAa AB BC CD

L^AT_EX (**real** small caps)

MS Word vs L^AT_EX

Table

MS Word (*wrong* default
kerning)

Table

L^AT_EX (**correct** kerning)

AaA AB BC CD

MS Word (*fake* small caps)

AaA AB BC CD

L^AT_EX (**real** small caps)

Source images: Dario Taraborelli
<http://nitens.org/taraborelli/latex> (CC-by-sa)

MS Word vs LaTeX: ligatures

fire flower fjörd

fire flower fjörd

MS Word vs LaTeX: ligatures

fire flower fjörd

fire flower fjörd

MS Word vs LaTeX: ligatures

fire flower fjörd

MS Word (*wrong* use of ligatures)

fire flower fjörd

LaTeX (*correct* use of ligatures)

MS Word vs LaTeX: ligatures

fire flower fjörd

MS Word (*wrong* use of ligatures)

fire flower fjörd

LaTeX (*correct* use of ligatures)

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Installing LaTeX

For using LaTeX you need:

- A **text editor** for editing your LaTeX source files.
- A **LaTeX distribution** for processing (compiling) your LaTeX source files into PDF or DVI documents.
- A **PDF/DVI viewer** for previewing and printing documents.

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The simplest document

```
% Example #1  
\documentclass{article}  
\begin{document}  
Hello World! This is a minimal \LaTeX{} document.  
\end{document}
```

Hello World! This is a minimal LaTeX document.

Document workflow

Editor ('foobar.tex') → **L^AT_EX processor** ('foobar.dvi') →
display (viewer/screen) → **drivers** ('foobar.ps', printer)

```
$ latex foobar.tex ('tex &latex foobar.tex')  
$ dvips -o foobar.ps foobar.dvi (ps output)  
$ pdflatex foobar.tex (pdf output)  
$ hevea foobar.tex (html output)
```

DVI Output

- Device independent file format (`.dvi`)
- Binary data independent on any specific image format, display hardware or printer.
- A **L^AT_EX distribution** for processing (compiling) your L^AT_EX source files into PDF or DVI documents.
- DVI is not a document encryption format.
- Not support embedded fonts (fonts must be already installed).

xdvi: DVI Previewer

I

El sermón de las tabernas

El mar era de un fantástico verde claro y la tarde había recibido ya el toque misterioso del anochecer; cuando una joven moza, vestida con traje de color cobrizo y de corte caprichoso, caminaba despreocupada bajo una sombrilla que no le impedía lanzar repetidas miradas al horizonte marino. El motivo por el que miraba insidiosamente la línea que separa las dos inmensidades era el mismo que tuvieron tantas y tantas muchachas desde que el mundo es mundo. Pero no se divisaba ningún barco.

En la playa, junto al paseo marítimo, se formaban cornas en torno a los charlatanes habituales en tales sitios: negros, socialistas, payasos y pastores. Había un hombre que manipulaba unas cajas de cartón, y los desocupados le rodeaban con la esperanza de descubrir en qué acabarían sus trajes. Pocos pasos más allá, un personaje con sombrero de copa, provisto de una Biblia muy grande y acompañado de una mujer muy pequeña que permanecía callada, combatía violentamente la herejía subalpatriano-miliana,¹ tan frecuente en los balnearios de moda. Era tal su exaltación que costaba seguir el hilo de su discurso, pero a cada momento alzaba con sacanismo a «nuestros amigos los subalpatrianos», lo que bastaba para saber que continuaba machacando sobre el mismo tema. A poca distancia peroraba un joven de forma tan incomprensible para los oyentes como para el mismo, y que si atraía la atención del público lo debía quizás a la guimaldá de zarabotías que colaba su sombrero. Lo cierto es que las monedas se amontonaban en su platillo con mayor abundancia que en el de sus rivales. Después venían los negros. Más allá un servicio religioso de niños, dirigido por un individuo de cuyo linaje interminable, que llevaba el compás de los cánticos con una palita de madera. A continuación, un abate agitado por una especie de frenesí religioso señalaba con índice agresivo al coro infantil, mientras hablaba de «las más bellas creaciones de la naturaleza, corrompidas por los secretos de la Inquisición española» o sea, por el individuo de la palita de madera. El abate, en cuyo ojal se adivinaba una condecoración encajada, tampoco escatimaba insultos para su auditorio: «¡flípeeeeee!», los gritaba, y las monedas caían, decían, a sus pies. «¡mposiores, papanatas!», y las monedas se multiplicaban. Cerca, entre el coro religioso infantil y el abate, se alzaba un vejele con perfil de lechuzca, tocado de un fez rojo y provisto de una sombrilla verde que su mano agitada debilmente. Su rostro era moreno y arrugado como una cascara de nuez; su nariz se encorvaba según el patrón que asociamos a los tribos de Judes; su habla era negra y rápida según el modelo que solemos mojar de persa. Era un ejemplar aparte en aquel museo de charlatanes y chillados. Y como la muchacha, que le veía por primera vez, pertenecía a esa clase de persona en que el sentido de lo cómico va acompañado de una cierta tendencia al odio o a la melancolía, se detuvo un instante y se apoyó en la barandilla del paseo para oír mejor.

File

Navigate

Zoom

Mark

Modes

Options

Help

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¹El subalpatriano, también conocido como subalpatriano, es una doctrina que considera que Dios decidió primero crear al hombre y tan le cuida optó por ofrecer la salvación a los cigayos, antes que a los que establecen los subalpatrianos, que muestran que le cuida antes de decidir por Dios desde el comienzo.

LaTeX Distributions

There are pre-compiled LaTeX distributions for different OS:

- **TeX Live** (Unix-like systems): Linux, BSD, Solaris, etc.
- **MacTeX** (TeX Live with the addition of Mac specific programs): <http://www.tug.org/mactex>
- **MiKTeX** (Windows): <http://www.miktex.org>

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Document Structure

Two main environments:

- **Preamble:** commands and macros that affect the entire document.
 - **Top matter:** author, title, date, institution, etc.
- **Document environment:** body text

Preamble

- Everything from the start of the L^AT_EX source file until the `begin{document}` command
- It normally contains global commands that affect the entire document.

```
\documentclass [options] { class }  
\usepackage [options] { package }
```

class (mandatory): book, article, report

package (optional): to utilize external macros (`inputenc`, `amssymb`...)

Top Matter

- Title, date
- Information about the authors, such as name, address, email etc.

```
\documentclass[11pt,a4paper,oneside]{report}
\usepackage[utf8]{inputenc} % utf-8 encoding
\usepackage{amssymb} % math symbols

\begin{document}
\title{How to Structure a LaTeX Document}
\author{Andrew Roberts}
\date{December 2004}
\maketitle
\end{document}
```

Body text

- Abstract
- Parts, chapters, sections, subsections,
- Appendices, Bibliography...

```
\begin{document}  
... text mixed with local commands ...  
\end{document}
```

How to Structure a L^AT_EX Document

L^AT_EX allows to structure documents with a variety of hierarchical constructs:

```
\part{Part Title}
\chapter{Chapter Title} %only books and reports
\section{Section Title}
\subsection{Subsection Title}
\subsubsection{Subsubsection Title}
```

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Font Styles

```
\textit {...} % italics  
\textbf {...} % bold  
\texttt {...} % monospace – teletype  
\textsc {...} % small capitals
```

Example:

```
\LaTeX{} was \texttt{originally} written in  
\textbf{1984} by \textsc{Leslie Lamport} and has become  
the \textit{dominant} method for using \TeX.
```

Output:

L^AT_EX was originally written in **1984** by LESLIE LAMPOR^T and has become the *dominant* method for using T_EX.

Font Sizes

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

Size related to font size default, declared in preamble (documentclass)

Font Sizes. Example

```
\LaTeX{} was \tiny originally written
\normalsize in \large 1984 \normalsize by
\LARGE Leslie Lamport \normalsize and has
become the \footnotesize dominant method
\normalsize for using \huge \TeX.
```

Output:

LaTeX was originally written in 1984 by Leslie Lamport and has
 become the dominant method for using TeX.

Some special features

- Text aligned
- $n > 1$ blank lines and empty spaces: one line or one space
- Start a new paragraph: `\\`
- Hyphenate the word (exceptional cases): `man\ -u\ -script`
- `\newline`, `\newpage`

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Environments

```
\begin{environment name}  
\end{environment name}
```

Environments: center, itemize, enumerate, figure, flushright, quotation...

Environments: example

Some FOSS Licenses :

```
\begin{enumerate}  
\item BSD license  
\item GPL license  
\item CDDL license  
\end{enumerate}
```

Output:

Some FOSS Licenses:

1. BSD license
2. GPL license
3. CDDL license

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A complete document

```
\usepackage[utf8]{inputenc}
\title{The beauty of \TeX}
\author{Donald E. Knuth}
\date{\1979}

\begin{document}
  \maketitle

  % This is the comment body.
  ''Mathematical books and journals do not look as
  beautiful as they used to. It is not that their
  mathematical content is unsatisfactory, rather that the
  old and well-developed traditions of typesetting have
  become too expensive. Fortunately, it now appears that
  mathematics itself can be used to solve this problem.''

\end{document}
```

A complete document

The beauty of T_EX

Donald E. Knuth

1979

“Mathematical books and journals do not look as beautiful as they used to. It is not that their mathematical content is unsatisfactory, rather that the old and well-developed traditions of typesetting have become too expensive. Fortunately, it now appears that mathematics itself can be used to solve this problem.”

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