What is (La)TEX Basic Structures References

ATEX in a Nutshell Master on Libre Software 2011-12

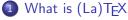




TEX LATEX Advantages and caveats Installing LATEX Creating a basic document

- **→** → **→**

Table of Contents

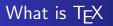


- TEX
- LATEX
- Advantages and caveats
- Installing LATEX
- Creating a basic document
- 2 Basic Structures
 - Document Structure
 - Fonts
 - Environments
 - A complete document

B References

TEX LATEX Advantages and caveats Installing LATEX Creating a basic document

< /i>



- 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.

LATEX in a Nutshell

• Two main aims: highest quality and highest durability.

Miguel Vidal

(cc) BY

TEX LATEX Advantages and caveats Installing LATEX Creating a basic document

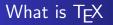
Image: A image: A

What is T_EX

- T_EX 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 T_EX!

TEX LATEX Advantages and caveats Installing LATEX Creating a basic document

Image: A image: A



- 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)

Miguel Vidal

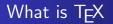
(cc) BY

• Functionality is provided by format files (predumped memory images of T_EX after large macro collections have been loaded).

LATEX in a Nutshell

TEX MTEX Advantages and caveats Installing MTEX Creating a basic document

<ロト < 同ト < 三ト



- 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).

TEX MTEX Advantages and caveats Installing MTEX Creating a basic document

▲ 同 ▶ → 三 ▶

METAFONT

- Font description language to describe characters (glyphs) algorithmically with geometrical equations.
- It uses Bézier curves (vector graphics).

(cc)) BY

• Also created by Knuth but not strictly part of TEX.

] Miguel Vidal

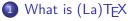
• It is possible to use TEX and LATEX without METAFONT. Adobe PostScript fonts may be used instead.

LATEX in a Nutshell

HTEX Advantages and caveats Installing LATEX Creating a basic document

□→ < □→</p>

Table of Contents

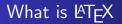


- T_EX
- l^{at}ex
- Advantages and caveats
- Installing ATEX
- Creating a basic document
- 2 Basic Structures
 - Document Structure
 - Fonts
 - Environments
 - A complete document

B References

IEA MTEX Advantages and caveats Installing MTEX Creating a basic document

Image: A = A



- Set of macros from TEX primitives that abstracted away many of the TEX complexities.
- A "format" originally developed by Leslie Lamport.
- It incorporates document styles for books, letters, slides, etc.
- The current version is LATEX2e.
- LATEX is Open Source Software (LaTeX Project Public License - LPPL), OSI-compliant.

IEX MTEX Advantages and caveats Installing MTEX Creating a basic document

< fi> ↓ fi

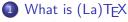
How to pronounce and spell "LATEX"

- "TEX", "LATEX", 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

TEX ΔTEX Advantages and caveats Installing ΔTEX Creating a basic document

□→ < □→</p>

Table of Contents



- TEX
- LATEX

Advantages and caveats

- Installing ATEX
- Creating a basic document

2 Basic Structures

- Document Structure
- Fonts
- Environments
- A complete document

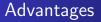
3 References

What is (La)TEX Basic Structures References TEX ΔΤEX Advantages and caveats Installing ΔΤEX Creating a basic document

æ

-

→日→ →目→



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

IEX IATEX Advantages and caveats Installing IATEX Creating a basic document

Image: A image: A



- 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.

TEX MTEX Advantages and caveats Installing MTEX Creating a basic document

▲ 伊 ▶ ▲ 三 ▶



- 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".

IEX MTEX Advantages and caveats Installing MTEX Creating a basic document

< A >



- 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.

What is (La)TEX Basic Structures References TEX ΔΤΕΧ Advantages and caveats Installing ΔΤΕΧ Creating a basic document

æ

<ロト <部ト < 注ト < 注ト

MS Word vs LATEX

Compare kerning:

TEX MTEX Advantages and caveats Installing MTEX Creating a basic document

< 🗇 > < 🖃 >

-

MS Word vs LATEX

Compare kerning:

Table

Table

(cc) BY

] Miguel Vidal

AT_FX in a Nutshell

IEX IATEX Advantages and caveats Installing IATEX Creating a basic document



Compare kerning:

Table

Compare Small Caps:

▲ 同 ▶ → 三 ▶

Table

(cc) BY

Miguel Vidal

MTFX in a Nutshell

TEX MTEX Advantages and caveats Installing MTEX Creating a basic document

MS Word vs LATEX

Compare kerning:

Table

Table

(cc)) BY

Miguel Vidal

MTFX in a Nutshell

Compare Small Caps: AAa AB BC CD AAa AB BC CD

▲ 同 ▶ → 三 ▶

TEX ΔΤEX Advantages and caveats Installing ΔΤEX Creating a basic document

< 🗇 > < 🖃 >

э

MS Word vs LATEX

Table

MS Word (*wrong* default kerning)

Table

LATEX (correct kerning)

TEX MTEX Advantages and caveats Installing MTEX Creating a basic document

MS Word vs LATEX

Table

MS Word (*wrong* default kerning)

Table

LATEX (correct kerning)

AAa AB BC CD

MS Word (fake small caps)

Ала Ав Вс Ср

LATEX (real small caps)

TEX MTEX Advantages and caveats Installing MTEX Creating a basic document

MS Word vs LATEX

Table

MS Word (*wrong* default kerning)

Table

LATEX (correct kerning)

(CC) BY

AAa AB BC CD

MS Word (fake small caps)

Ала Ав Вс Ср

LATEX (real small caps)

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

LATEX in a Nutshell

Miguel Vidal

IEX MTEX Advantages and caveats Installing MTEX Creating a basic document

▲ 同 ▶ → 三 ▶

MS Word vs LATEX: ligatures

fire flower fjörd

fire flower fjörd

IEX MTEX Advantages and caveats Installing MTEX Creating a basic document

▲ 同 ▶ → 三 ▶

MS Word vs LATEX: ligatures

fire flower fjörd

fire flower fjörd

IEX MTEX Advantages and caveats Installing MTEX Creating a basic document

MS Word vs LATEX: ligatures

fire flower fjörd

MS Word (wrong use of ligatures)

fire flower fjörd

LATEX(correct use of ligatures)

IEX MTEX Advantages and caveats Installing MTEX Creating a basic document

MS Word vs LATEX: ligatures

(CC) BY

fire flower fjörd

MS Word (wrong use of ligatures)

fire flower fjörd

LATEX(correct use of ligatures)

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

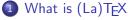
LATEX in a Nutshell

Miguel Vidal

TEX MTEX Advantages and caveats Installing MTEX Creating a basic document

□→ < □→</p>

Table of Contents



- TEX
- ATEX
- Advantages and caveats

• Installing LATEX

• Creating a basic document

2 Basic Structures

- Document Structure
- Fonts
- Environments
- A complete document

3 References

TEX MTEX Advantages and caveats Installing MTEX Creating a basic document

(日)



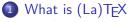
For using LATEX you need:

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

TEX MTEX Advantages and caveats Installing MTEX Creating a basic document

▲ 同 ▶ → 三 ▶

Table of Contents



- T_EX
- LATEX
- Advantages and caveats
- Installing LATEX
- Creating a basic document
- 2 Basic Structures
 - Document Structure
 - Fonts
 - Environments
 - A complete document

3 References

TEX MTEX Advantages and caveats Installing MTEX Creating a basic document

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 ${\rm L\!AT}_{\rm E\!X}$ document.

TEX MTEX Advantages and caveats Installing MTEX Creating a basic document

Document workflow

 $\begin{array}{l} \mbox{Editor} (\mbox{`foobar.tex'}) \rightarrow \mbox{& \sc MTEX processor} (\mbox{`foobar.dvi'}) \rightarrow \mbox{& \sc display} (\mbox{viewer/screen}) \rightarrow \mbox{& \sc drivers} (\mbox{`foobar.ps', printer}) \end{array}$

\$ 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)

TEX MTEX Advantages and caveats Installing MTEX Creating a basic document

DVI Output

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

IEX MTEX Advantages and caveats Installing MTEX Creating a basic document

29

30

xdvi: DVI Previewer

File Navigate Zoom Mark Modes Options Help El sermón de las tabernas 4 E¹ mar era de un fantiético verde claro y la tarde había recibido ya el toque misterioso del anochecer, cuando una joven morena, vestida con traje de color cobrizo y de corte caprichoso, caminaba despreocupada bajo una sombrilla que no le impedia lanzar repetidas miradas al horizonte marino. El motivo por el que miraba instintivamente la línea que sevara 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 corros en torno a los charlatanes habituales en tales sitios: negros, socialistas, payasos y pastores. Había un hombre que manipulaba unas caias de cartón, y los desocupados le rodeaban con la esperanza de descubrir en qué acabarian 10 sus tratines. Pocos pasos más alla, un personate con sombrero de copa, provisto de una Biblia muy grande y acompañado de una mujer muy pequeña que permanecía callada, combatia violentamente la herejía sublapsario-milniana,1 tan frecuente en los balnearios de moda. Era tal su exaltación que costaba seguir el hilo de su discurso, pero a cada momento aludía con sarcasmo 13 a «nuestros amigos los sublapsarianos», lo que bastaba para saber que continuaba machacando 14 sobre el mismo tema. A poca distancia peroraba un joven de forma tan incomprensible para los oyentes como para él mismo, y que si atraía la atención del público lo debía quizás a la guimalda 15 de zanahorias que ceñía su sombrero. Lo cierto es que las monedas se amontonaban en su pla tillo 16 con mayor abundancia que en el de sus rivales. Después venían los nerros. Más allá un servicio religioso de niños, dirigido por un individuo de cuello interminable, que llevaba el compás de los 18 cánticos con una palita de madera. A continuación, un ateo agitado por una especie de frenesí rabioso señalaba con índice agresivo al coro infantil, mientras hablaba de «las más bellas creaciones 19 de la naturaleza, corrompidas por los secretos de la Inquisición española- o sea, por el individuo 20 de la palita de madera. El ateo, en cuvo oial asomaba una condecoración encarnada, tampoco escatimaba insultos para su auditorio. «¡Hipócritas!», les gritaba, y las monedas caían, dóciles, a sus nies, «Impostores, paparatas!», y las monedas se multiplicaban. Cerca, entre el coro religioso infantil y el ateo, se alzaba un vejete con perfil de lechuza, tocado de un fez rojo y provisto de 23 una sombrilla verde que su mano agitaba débilmente. Su rostro era moreno y arrugado como una cáscara de nuez; su nariz se encorvaba según el patrón que asociamos a las tribus de Judea; su 24 barba era negra y tupida según el modelo que solemos moteiar de persa. Era un elemplar aparte 25 en aquel museo de charlatanes y chiflados. Y como la muchacha, que le veia por primera vez, 26 pertenecía a esa clase de persona en que el sentido de lo cómico va acompañado de una cierta tendencia al tedio o a la melancolía, se detuvo un instante y se apoyó en la barandilla del paseo 27 28

¹El sublaparianismo, también conocido como initalaparianismo, en una doctrine que considera que Dios decidió primero creat al hombre y tras la calda qubi par efrecer la sal acción a los elegidos, orden contrario al que estáblecen los surralascarianes, use matterene aue la calda estaba decretada ere Dios duede el corrieros.

LATEX in a Nutshell

Miguel Vidal

(cc)) BY

TEX WTEX Advantages and caveats Installing WTEX Creating a basic document

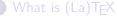
LATEX Distributions

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

Document Structure Fonts Environments A complete document

Table of Contents



- T_EX
- LATEX
- Advantages and caveats
- Installing LATEX
- Creating a basic document
- 2 Basic Structures
 - Document Structure
 - Fonts
 - Environments
 - A complete document

B) References

_ ₽ ▶

Document Structure Fonts Environments A complete document

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

Document Structure Fonts Environments A complete document

Preamble

- Everything from the start of the LATEX 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...)

Document Structure Fonts Environments A complete document

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}
```

< 17 ▶

Document Structure Fonts Environments A complete document

Body text

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

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

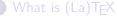
Document Structure Fonts Environments A complete document

How to Structure a LATEX Document

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

Document Structure Fonts Environments A complete document

Table of Contents



- T_EX
- LATEX
- Advantages and caveats
- Installing LATEX
- Creating a basic document

2 Basic Structures

- Document Structure
- Fonts
- Environments
- A complete document

B References

_ ₽ ▶

Document Structure Fonts Environments A complete document

Font Styles

Í	$textit{}$	%	italics
	$\det \{\ldots\}$		
	$\ \ texttt {}$	%	monospace — teletype
	$\ \ textsc {\ldots}$	%	small capitals

Example:

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

Output:

 $I\!\!AT_E\!X$ was originally written in 1984 by Leslie LAMPORT and has become the dominant method for using $T_E\!X.$

Image: A image: A

Document Structure Fonts Environments A complete document

Font Sizes

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

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

< □ > <

Document Structure Fonts Environments A complete document

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:

 ΔT_{EX} was originally written in 1984 by Leslie Lamport and has become the dominant method for using TEX.

Document Structure Fonts Environments A complete document

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

< /₽ > < 三

Document Structure Fonts Environments A complete document

Table of Contents

What is (La)T_EX

- T_EX
- LATEX
- Advantages and caveats
- Installing LATEX
- Creating a basic document

2 Basic Structures

- Document Structure
- Fonts

Environments

• A complete document

B References

____ ▶

Document Structure Fonts Environments A complete document

Environments

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

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

A D

Document Structure Fonts Environments A complete document

Environments: example

```
Some FOSS Licenses:
\begin{enumerate}
\item BSD license
\item GPL license
\item CDDL license
\end{enumerate}
```

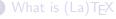
Output:

Some FOSS Licenses:

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

Document Structure Fonts Environments A complete document

Table of Contents



- T_EX
- LATEX
- Advantages and caveats
- Installing LATEX
- Creating a basic document

2 Basic Structures

- Document Structure
- Fonts
- Environments
- A complete document

3 References

___ ▶ <

Document Structure Fonts Environments A complete document

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.''

$\ensuremath{\mathsf{end}} \{\mathsf{document}\}\$

Document Structure Fonts Environments A complete document

A complete document

The beauty of $T_{\rm E}X$

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."

▲ 同 ▶ → 三 ▶

References

- LAMPORT, Leslie. *LATEX: A document preparation system*, Addison-Wesley, Reading, Massachusetts, second edition, 1994.
- KNUTH, Donald E. *The T_EXbook, Volume A of Computers and Typesetting*, Addison-Wesley, Reading, Massachusetts, second edition, 1984.
- CTAN: the authoritative collection of materials related to the TeX typesetting system. http://www.ctan.org
- Guide to the LATEXmarkup language: http://en.wikibooks.org/wiki/LaTeX

References (Spanish)

- SANGUINO-BOTELLA, Javier. *Iniciación a LAT_EX2e: Un sistema para preparar documentos*, Addison-Wesley, 1997.
- VV.AA. *PTEX: Una imprenta en sus manos*, ADI, 2000.
- TEX y tipografía (web de Javier Bezos): http://www.tex-tipografia.com
- CervanTeX: Grupo de usuarios hispanohablantes de TEX: http://www.cervantex.es/

ATEX in a Nutshell Master on Libre Software 2011-12

