What is (La)TEX Basic Structures References

#### ATEX in a Nutshell Master on Libre Software 2011-12

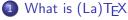




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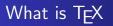


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- A computer program (language and interpreter) created by Donald Knuth in 1977.
- Knuth wrote the TEX typesetting engine to explore potential of the digital printing equipment.
- He aimed to revert trend of deteriorating typographical quality that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

LATEX in a Nutshell

• Two main aims: highest quality and highest durability.

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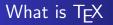
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#### What is T<sub>E</sub>X

- T<sub>E</sub>X 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<sub>E</sub>X!

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- 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)

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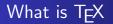
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• Functionality is provided by format files (predumped memory images of T<sub>E</sub>X after large macro collections have been loaded).

LATEX in a Nutshell

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- 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).

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#### METAFONT

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

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

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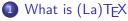
• It is possible to use TEX and LATEX without METAFONT. Adobe PostScript fonts may be used instead.

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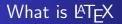


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- Set of macros from TEX primitives that abstracted away many of the TEX complexities.
- A "format" originally developed by Leslie Lamport.
- It incorporates document styles for books, letters, slides, etc.
- The current version is LATEX2e.
- LATEX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

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#### 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")
- $\chi$ : Ji letter (voiceless velar fricative, as "ojo" or "Bach"), Chi /kai/ in English.
- IPA (International Phonetic Alphabet): [x] phonem

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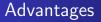
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- Control
- Quality
- Flexibility
- Portability
- Scalability
- Stability

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- 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.

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- 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".

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- 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.

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#### MS Word vs LATEX

Compare kerning:

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#### MS Word vs LATEX

Compare kerning:

### Table

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**AT<sub>F</sub>X** in a Nutshell

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Compare kerning:

### Table

Compare Small Caps:

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**MTFX** in a Nutshell

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#### MS Word vs LATEX

Compare kerning:

Table

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**MTFX** in a Nutshell

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

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#### MS Word vs LATEX

### Table

MS Word (*wrong* default kerning)

### Table

LATEX (correct kerning)

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#### 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)

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#### MS Word vs LATEX

### Table

MS Word (*wrong* default kerning)

Table

LATEX (correct kerning)

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### 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)

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#### MS Word vs LATEX: ligatures

## fire flower fjörd

# fire flower fjörd

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#### MS Word vs LATEX: ligatures

## fire flower fjörd

# fire flower fjörd

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#### 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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#### MS Word vs LATEX: ligatures

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## 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)

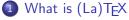
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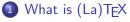
#### For using LATEX you need:

- 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.

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

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#### 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)

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#### **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).

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#### xdvi: DVI Previewer

File Navigate Zoom Mark Modes Options Help El sermón de las tabernas 4 E<sup>1</sup> 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

<sup>1</sup>El 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

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#### **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

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...)

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# 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}
```

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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 }
```

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# 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

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# Font Sizes

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

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

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## 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:

 $\Delta T_{EX}$  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

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## Environments

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

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

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## Environments: example

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

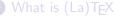
#### Output:

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.''

#### $\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."

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# References

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