LaTeX

Workshop – P. Stallinga

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Stallinga.org

Non-profit science organization

What is LaTeX?

A layer on top of TeX (Tau Epsilon Chi) of Donald Knuth*

TeX is a **typesetting** system
LaTeX is a set of 'macros' defined in TeX

LA stands for 'Level of abstraction'

LaTeX is very much like HTML. We define the text and its function, but never how it is actually displayed on the screen. Example is a hyperlink

```
Click on this <a href="http://www.benfica.pt">link</a>
to continue ...
```

Which normally becomes

```
Click on this link to continue ...
```

LaTeX can thus produce high quality output with low amount of work

Extremely useful for large documents and scientific communications

*: The computer pioneer Knuth is also famous for Metafont, a system to parametrize fonts

What is LaTeX?

How to write the word LaTeX?

logo created with `\LaTeX`

How to pronounce LaTeX? Any way you want!

- *lah-teck*
- *lay-teck*
- *lay-tecks*
- *lah-tecks*
- *lah-teχ*

How much does a license cost?

- Nothing!

What is LaTeX?

Reasons to use LaTeX?

- Very powerful. Better than Word. Flexible

- High quality output (remember, you are not a typesetter!!). You don't need knowledge of typesetting to produce a nice document.

- Unbeatable in equations! (see for instance comprehensive LaTeX symbol list)

- Easy to use (**after initial learning**)

- Standard all over the world

- Free. Gratis. At no cost. “There *is* such a thing as a free lunch!”

- Used in scientific communities

- It is completely bug free!

What LaTeX is not?

In contrast, LaTeX is not WYSIWIG as Word

WYSIWYG

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In practice, Word often turns out to be:

WYGINWYW

What LaTeX is not?

In contrast, LaTeX is not WYSIWIG as Word

WYSIWYG

In practice, Word often turns out to be:

WYGINWYW

or even worse:

YWIYGI (or worse: TTFY)

Word is good for writing short letters and memos

LaTeX is more suited for large documents and scientific communications

In LaTeX you have FULL CONTROL. The price to pay, of course, is that it can become rather complicated

LaTeX, like a language

Imagine, in LaTeX you only write

```
Text 1

Text 2

Text 3
```

etc. Together with specifying what the ***function*** is of each text. For example:

```
\begin{equation}
Text 1
\end{equation}
```

You do not specify how the equation is to be displayed. This you leave up to the processor, or the printer/publisher of your book or article.

Advantage: If you want to change the display style of all equations in your document, you only have to change the 'header' which is called **preamble** in LaTeX

The input file

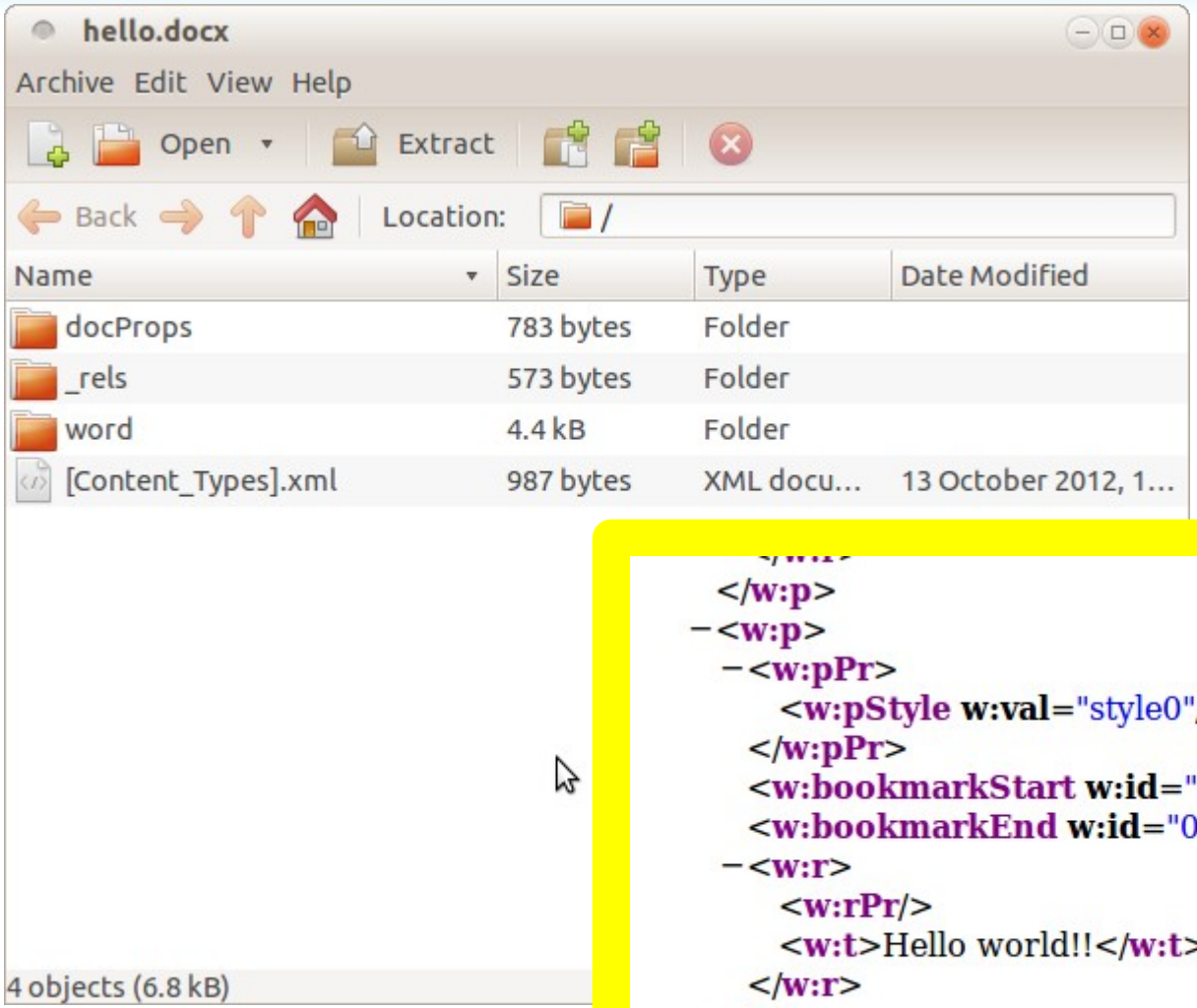
All input text is standard ASCII. That is, the 7-bit code for 128 characters
No problem with versions, or styles, or service packs. You can send your file to your colleague anywhere in the world, and it will work!

Difference with Word:
The 'formatting' statements are visible as they are also written in ASCII
(But, don't forget that Word also has formatting codes in the middle of the document!)

If you want to write Portuguese you can include a so-called 'package'

The input file

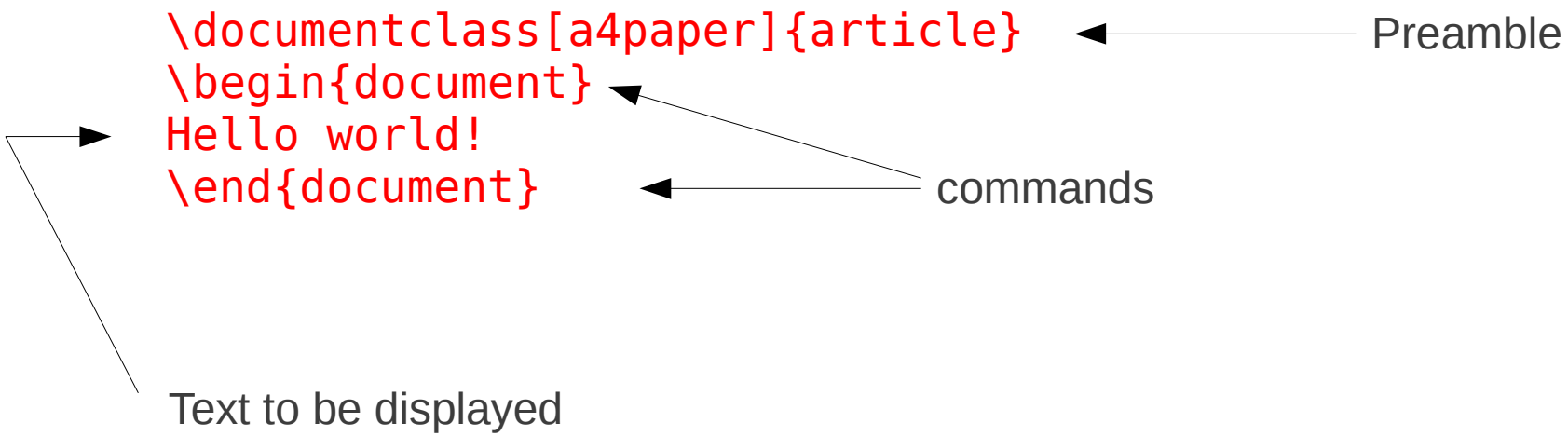
(But, don't forget that Word also has formatting codes in the middle of the document!)




```
  </w:p>
 −<w:p>
  −<w:pPr>
     <w:pStyle w:val="style0"/>
   </w:pPr>
   <w:bookmarkStart w:id="0" w:name="__DdeLink__0_1941337503"/>
   <w:bookmarkEnd w:id="0"/>
  −<w:r>
     <w:rPr/>
     <w:t>Hello world!!</w:t>
   </w:r>
  </w:p>
 −<w:p>
```

Word `hello.docx` document opened with archive manager and `word/document.xml` displayed in Firefox

example



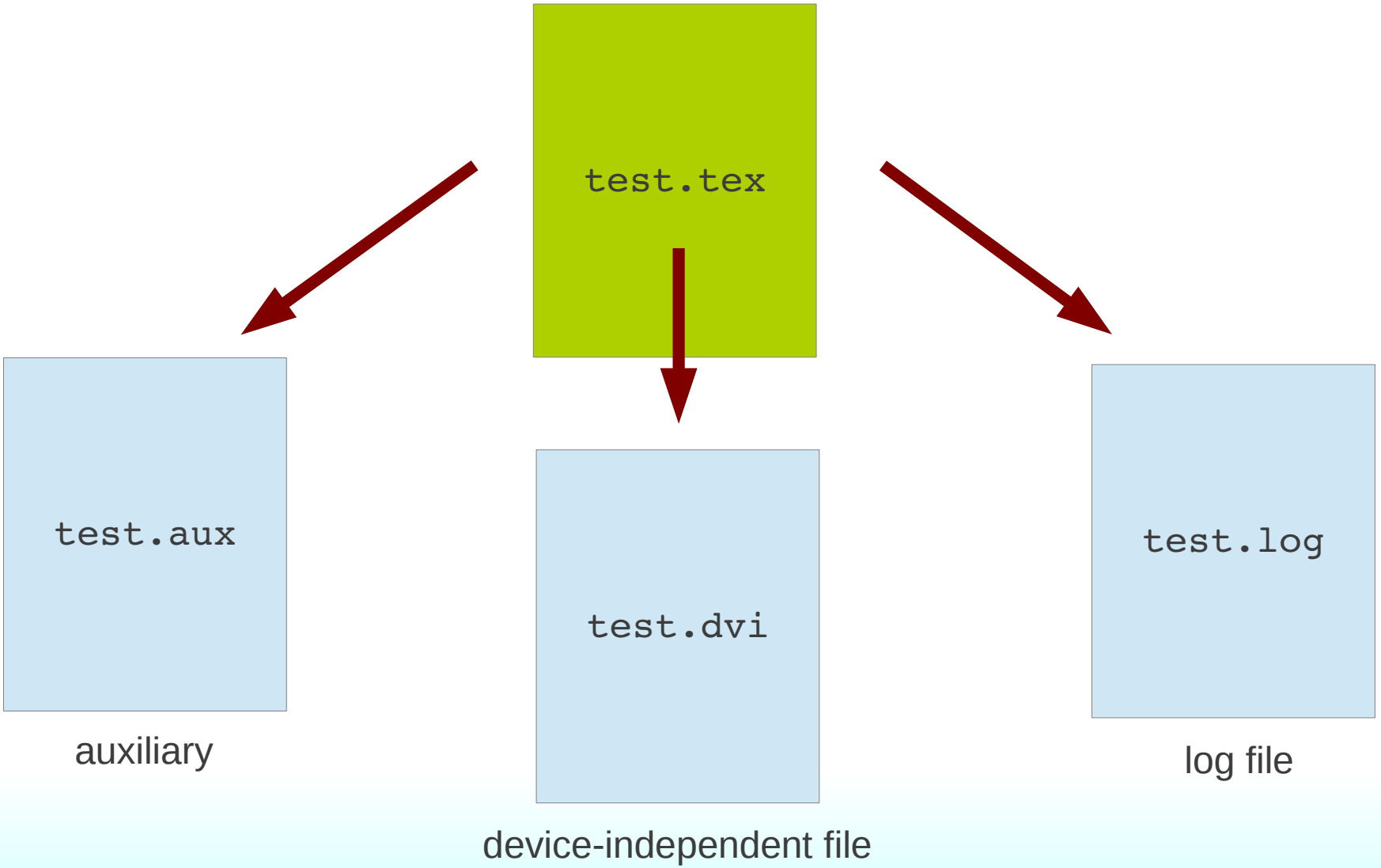
Commands start with a backslash \

One of 'reserved' special meaning characters: $, &, { } ~ % # _ ^ \

{ } is to join things together, to make them one logical element

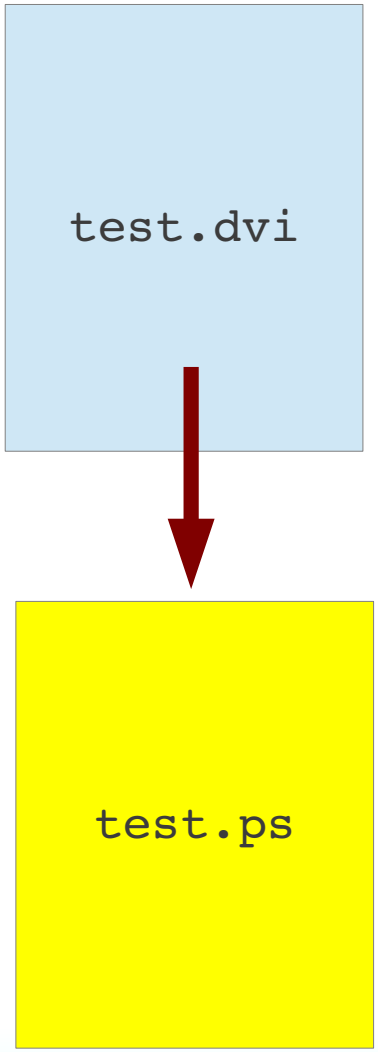
process

```
latex -interaction=nonstopmode hello.tex
```



process

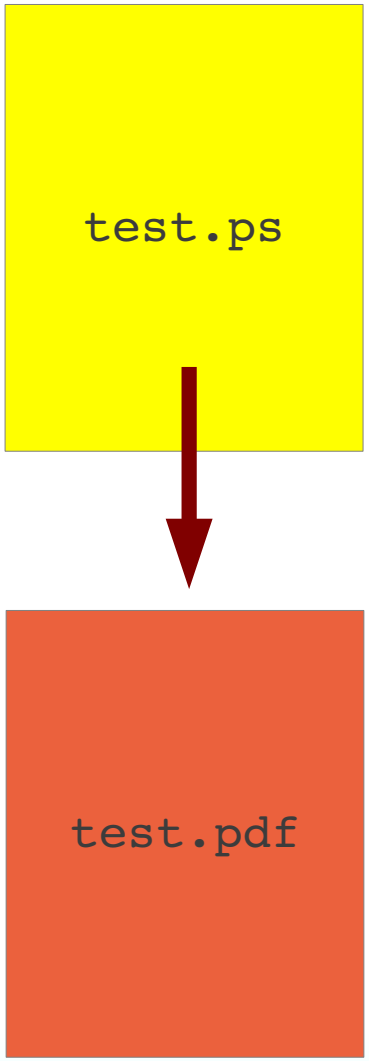
```
dvips -o hello.ps hello.dvi
```



postscript (printers)

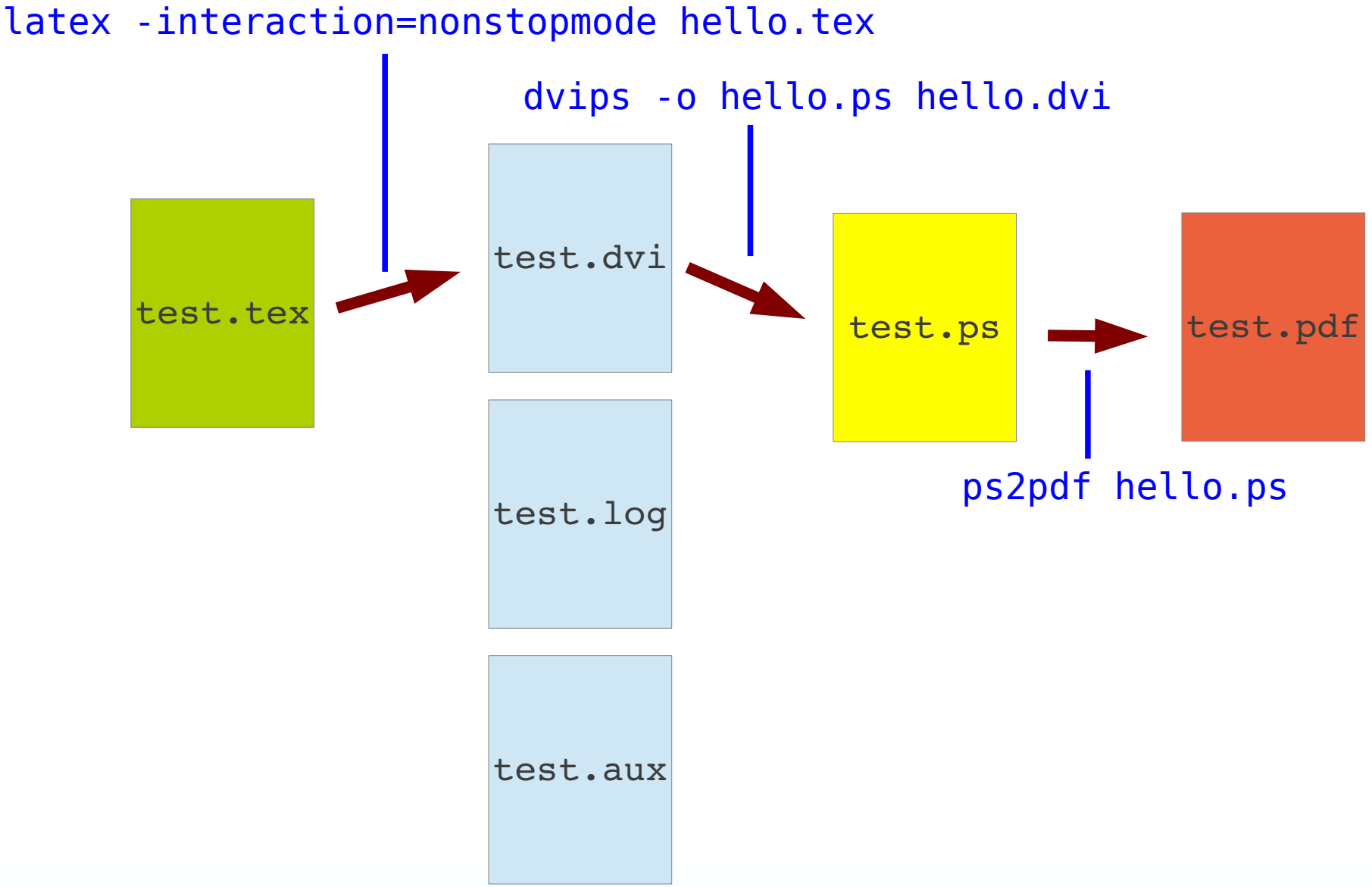
process

```
ps2pdf hello.ps
```



portable document format

process

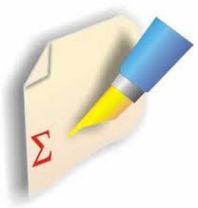

latex -interaction=nonstopmode hello.tex
dvips -o hello.ps hello.dvi
test.tex
test.dvi
test.log
test.aux
test.ps
test.pdf
ps2pdf hello.ps

IDE

This is 2012!! Integrated development environments:

Texmaker (Linux Gnome)

Kile (Linux KDE)



WinEdt (Windows)

Let's generate some random text:
http://johno.jsmf.net/knowhow/ngrams/index.php

IDE

Texmaker (Linux Gnome)

Spellchecking in Texmaker
copy en_US.dic to /usr/share/myspell/dicts/

https://dl.dropbox.com/u/22018719/en_US.dic

https://dl.dropbox.com/u/22018719/en_US.aff

packages

To add functionality, many many packages are written.
Nearly all of them are part of the 'distribution'

Example: writing Portuguese documents:

```
\documentclass[a4paper]{article}
\begin{document}
Olá mundo!
\end{document}
```

packages

To add functionality, many many packages are written.
Nearly all of them are part of the 'distribution'

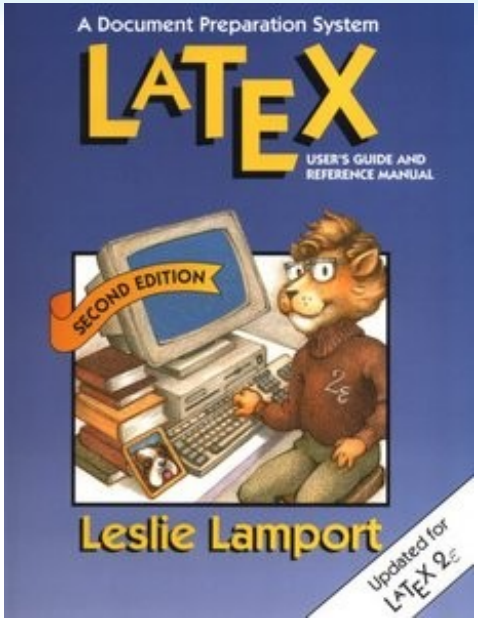
Example: writing Portuguese documents **(Look on-line for solution**):

```
\documentclass[a4paper]{article}
\usepackage[utf8]{inputenc}
\usepackage[portuges]{babel}
\begin{document}
Olá mundo!
\end{document}
```

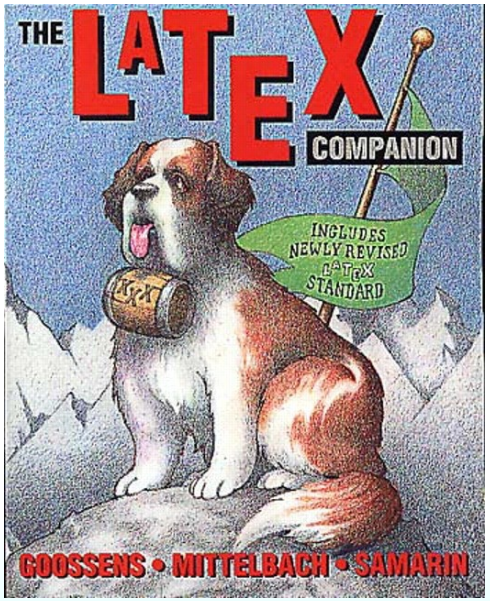
Be sure to save your file in UTF-8 format
(in other words, you lose the compatibility with rest of world)

Do not use this! Write in English. LaTeX is for scientific papers. **English**

books



LATEX
A document preparation system
- Leslie Lamport



The LATEX Companion
- Goossens, Mittelbach, Samarin

https://dl.dropbox.com/u/22018719/LaTeX%20-%20A%20simplified%20introduction%20to%20LaTeX.pdf

floats

A **float** is an element which you leave up to the typesetter to decide where to place

LaTeX basically has two:

- figure
- table

Look at any high quality book. Figures and tables are placed on the top of the page (or at the bottom). Never where the writer inserted them in the text.

In the extreme (stupid!) case that you still want the floats not to float, you can force them to appear there where you inserted them. But, even then, LaTeX will sometimes completely ignore your demands

tabular

A **tabular** environment is used to **align** things. “Put things on top of eachother”

```
\begin{tabular}{xxxx...}
A & B C & D … \\
E F & G H & I J  ...\\
\end{tabular}
```

x: alignment code (l, c or r}
&: item separation character

Examples to show:

example above
lines
multicolums

sectioning

Sectioning:
\chapter{chaptername}
\section{sectionname}
\subsection{sectionname}
\subsubsection{sectionname}
\newpage

Empty line: start new paragraph

A linebreak in LaTeX source has same effect as a space, or 100 spaces

```
Benfica will      win this
years supercup   for          sure,
   beating Porto   in    the  final
```

Force newline?: \\

formatting

Italics: `\textit{my text in italics}`

DO NOT USE THIS. Do not use formatting commands in the body of the doucment. Remember, in LaTeX the idea is to specify the *function* of text, not its *format*.
Probably you wanted to emphasize some text (like in sentence here), so then *tell* it you want to emphasize:

```
{\emph my text emphasized}
```

Imagine that you want to emphasize something in a text that itself is typeset as italics (by the editor). (Emphasis in italics is …. upright text!)

Abstract

In this paper, we focus on the Portuguese *part of the Iberian Peninsula only.*

Bold: `\textbf{text} or {\bf my  text}`

```
\texttt{Typewriter style ... }
\textsf{sans serif text, Arial or something like that)

\tiny
\large
\Large
\LARGE
\huge
\Huge
```

references

References

```
\label{labelname}
```

```
\ref{labelname}
```

Can be used for equations, figures, sections, tables

`\pageref` referencing to page of object
`\eqref` for formatting equation refes: Eq. (3.20) instead of Eq. 3.20

Remember (if it is a forward reference): LaTeX normally is a **two-pass compiler**, with normally only one pass executed. **You need to rerun the compiler to get the references correct!**

Given the fact that LaTeX is like programming, use programming techniques:
Chose your label-names well

```
\label{eq:maxwell}
\label{fig:noisesources}
\label{ch:introduction}
\label{sec:software}
```

equations

Two types of equations
- inline
- separate line

Both use Greek letters, like `\alpha`, etc. Outside equations, use `\textmu`, etc.

Inline: `$equation text$`

Separate line

```
\begin{equation}
Equation text
\end{equation}
```

or

```
\begin{eqnarray}
Equation text\\
Equation 2
\end{eqnarray}
```

Examples to show:

$$
equation
eqnarray
labels and refs
functions
fractions, sqrt
subscript/superscript
often made mistake a_i0
(no)numbering
\left(\right)

Do not use fractions in in-line equations

Greek

Intermezzo: If you are using Word, to write a μ don't use 'm' with symbol font, write an m on a Greek keyboard (install a Greek keyboard!)

This is a correct Greek letter 'mu' with Arial font (like rest), when typed with Greek keyboard: μ

This is a Latin letter 'm' in Symbol font: μ

Mathematics vs. physics

LaTeX was designed by mathematicians

A_i vs. A_{i}

Mathematics: i-th element of vector A
Physics, Engineering: Initial Gain

If a letter represents a value, it should be written as italics, otherwise not

LaTeX: default: mathematics

```
% To have roman subscripts:
\catcode`\_=\active
\def_{\sb\mathrm}
% roman subscripts with $X_{ff}$ and italic subscripts with
% $X\sb{ff}$.
% Be careful: no underscore _ can be used in filenames and labels!
```

graphics

```
\includegraphics{grafix.eps}

\scalebox{factor}{objecttoscale}

\rotatebox{angle}{objecttorotate}
```

Only encapsulated postscript!

Use GIMP or ImageMagic (“`convert image.jpg image.eps`”)

lists

```
\begin{itemize}
\item Benfica
\item Sporting
\item Porto
\end{itemize}
```

- **Benfica**
- **Sporting**
- **Porto**

```
\begin{enumerate}
\item Benfica
\item Sporting
\item Porto
\end{enumerate}
```

1 Benfica
2 Sporting
3 Porto

packages

Useful packages:

`color`: for color text
`picins`: inline graphics; wrap text around images
`multicol`: Multi-column format
`amsmath`: American mathematical society mathematical symbols

Etc. etc. etc. etc.

Read the LaTeX companion, or the LaTeX Graphics Companion

Large projects

```
\input{Chapter1/chapter1}
\input{Chapter2/chapter2}
\input{Chapter3/chapter3}
\input{Chapter4/chapter4}
\input{Chapter5/chapter5}
\input{Refs/REFS.TEX}
```

bibliography

At the end

```
\begin{thebibliography}{99}
%
% 1
\bibitem{wikiTransducer}
Wikipedia: Transducer (July 2010).
% 2
\bibitem{almeida}
G.\ de Almeida in "Sistema Internacional de Unidades (SI)",
3rd edition, Pl\'{a}tano Edi\,{c}\~{o}es T\'{e}cnicos (2002),
ISBN 972-707-162-7.
% 3
\bibitem{SI}
E.\ R.\ Cohen, P.\ Giacomo, Physica 146A, 1 (1987).
%
\end{thebibliography}
```

Note the .\ (because it is not an end-of-line dot)

And in the text

```
See Almeida\cite{almeida} for a complete reference.
```

examples

pagestyle

textwidth

setcounter

parbox

minipage

multicolumn

double spacing

article/abstract