Introduction to LaTeX

A Method for Scientific Writing

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UOIT
CHALLENGE INNOVATE CONNECT

Introduction

Common Problems in Typesetting Documents with Word or LibreOffice

Affordable AVAST firewall
Feline Table

Affordable AVAST firewall
Feline Table

Introduction

Common Problems in Typesetting Documents with Word or LibreOffice

- Poor typographic control (kerning and leading, missing ligatures).
- "Badness" is difficult to resolve.
- Image embedding (instead of external links) and limited image editing options.
- Unexpected surprises when using external text.
- Unprofessional look.
- All those weird things that happen during auto-correction, style change, formatting and by just looking at it.

Introduction

What is LaTeX?

TeX is a low-level markup and programming language created by Donald Knuth to typeset documents attractively and consistently.

LaTeX is a macro package based on TeXcreated by Leslie Lamport. Its purpose is to simplify TeX typesetting. Many later authors have contributed extensions, called packages or styles.

Introduction

Why LaTeX?

- LaTeX is the standard for mathematical typesetting
- LaTeX is turning into the standard everywhere else and especially on the web (google docs, wordpress...)
- LaTeX is free (as in free speech not free beer)

Introduction

Why LaTeX for Me?

- Separation of editing and processing
- Sources are simple text files
- Fast and easy uniformity
- Emphasis on content
- Facilitates collaborative working
- Very good pdf support
- Consistency and transparency of layouts and fonts
- Easy typesetting for scientific requirements
- Good handling of citations
- You are forced to structure your documents correctly

AND...

Introduction

Why LaTeX for Me?

... It looks great.

Table of Contents

Distributions and Editors

Requirements

System: The combination of the language and the macros.

Distribution: The collection of packages and programs that enable you to typeset without having to manually fetch files and configure things.

Engine: An engine is an executable that can turn your source code to a printable output format. (pdflatex, latex)

$\Rightarrow$ Distributions are an easy way to install what you need to use the engines and the systems you want.

Distributions and Editors

Distributions

TeXLive: A cross-platform TeX distribution

MacTeX: A TeXLive based distribution for Mac

MiKTeX: A TeX distribution for Windows

Distributions and Editors

Editors

- **Cross-Platform:** TEXmaker, gedit (latex-plugin), TEXworks, Lyx (WYSIWYG), (Vim, emacs)
- **Windows:** TEXnicCenter, WinShell
- **Linux:** Kile, LATEXila, Gummi (WYSIWYG)
- **Mac:** TEXShop, TEXnicle
- **Web-based:** LATEXLab, MonkeyTEX

Installation

On Windows, Linux and Mac

- **Windows:** Install MiKTEX or TEXLive. *After* that install your favourite editor. Configure the path to provide the editor with the exact location of the MiKTEX software.
- **Linux:** Make sure to have the full version of TEXLive, install your favourite editor (use the package manager).
- **Mac:** Install the MacTEX package (http://tug.org/mactex/). Either use the editor that comes with it (TEXShop) or install your favourite editor.

Hint:

If MiKTEX is not working try a different server.

Basics

Getting Started

```
\documentclass[a4paper]{article}

%my first hello world document

\begin{document}

hello world!

\end{document}
```

Basics

Environments, Commands, Comments

Commands:

```
\command_name[option1,option2,...]{argument1}{argument2}
```

Comments:

```
% this is a comment
```

Environments:

```
\begin{environmentname} text influenced \end{environmentname}
```

Groups:

```
 { \command Inside the group.} Outside the group.
```

Components

Document Format

Header: Determines the formatting

- Document class: *article*, *book*, *report*, *letter* with options for fonts and printing (equivalent KOMA Skript classes: scr)
  `\documentclass[options]{class}`
- Usepackages: Activation of special macros
  `\usepackage[parameters]{package}`

Main Body: The content of the document that is being formatted by the header

Special Pages: Bibliography, appendix commands

Components

Picking a Title

```
\documentclass[a4paper]{article}

\begin{document}

\title{My first LaTeX Document}
\author{You \and Me}
\date{\today}
\maketitle

\end{document}
```

Components

Writing an Abstract

```
\documentclass[a4paper]{article}

\begin{document}

\begin{abstract}
Your abstract goes here...
\end{abstract}

\end{document}
```

My first LaTeX Document

You Me

September 27, 2013

Abstract

Your abstract goes here...

Components

Main Body and Table of Contents

```
\begin{document}

\tableofcontents

\section{Title of the First Section}
... text ...
\subsection{Title of the First Subsection}
... text ...
\subsubsection{Title of the First Subsubsection}
... text ...
\subsubsection*{Title of the Second Subsubsection}
\addcontentsline{toc}{subsubsection}{Something Else}

\end{document}
```

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Contents

1 Title of the First Section

... text ...

1.1 Title of the First Subsection

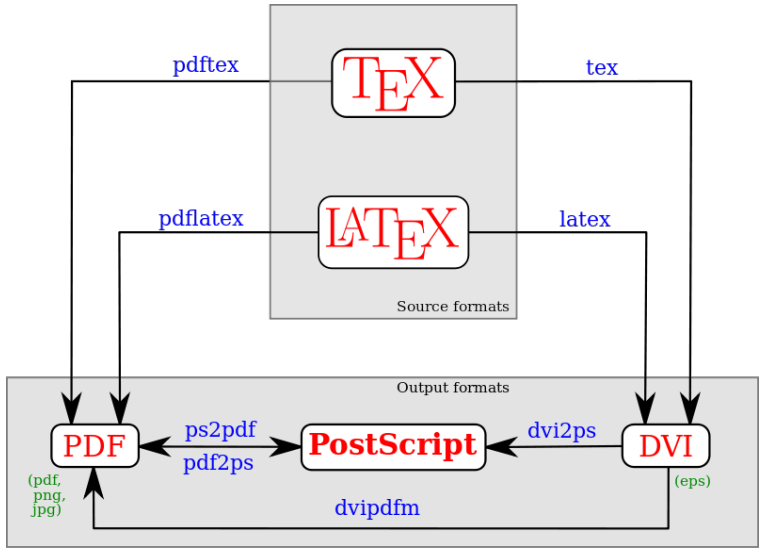
... text ...

1.1.1 Title of the First Subsubsection

... text ...

Title of the Second Subsubsection

Compiling LaTeX



Warning!

The only important file types are .tex, .cls and .sty, .bib and .bst. They are not temporary and should not be deleted.

Layout

Page Style

`\pagestyle{'style'}` and `\thispagestyle{'style'}`

- **empty:** Header and footer are cleared
- **plain:** Header is clear, but the footer contains the page number in the center
- **headings:** Footer is blank, header displays information according to document class and page number top right
- **myheadings:** Page number is top right, and it is possible to control the rest of the header
- **fancy:** For better control over the headers and footers
  `\usepackage{fancyhdr}`

Formatting

Page Size and Structure

- LaTeX comes with predefined page and margin sizes for every style and document class
- For manipulation: `\usepackage[options]{geometry}`
- The landscape format is an option of the geometry package
- Text in multiple columns:
  `\begin{multicols}{#}...lots of text...\end{multicols}`

Warning!

As LaTeX is a globally recognized set of typesetting defaults, additional page formatting should be done not without reason and always with great care.

Formatting

Colors

`\usepackage{color}` and `\usepackage[options]{xcolor}`

- Define colors: `\definecolor{'name'}{'model'}{'color-spec'}`
- Coloring text: `\textcolor{declared-color}{text}`
- Coloring the background: `\colorbox{declared-color}{text}`

Formatting

Fonts

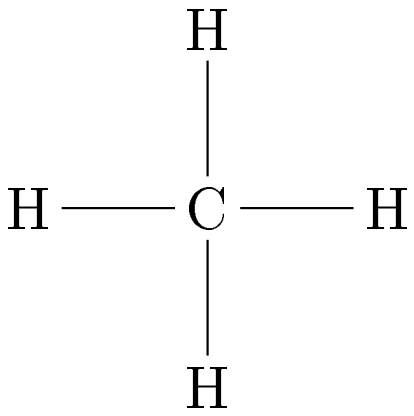
Various font styles, shapes and sizes are available.

Font encoding can be modified with
`\usepackage['encoding']{fontenc}`

Warning!

For the sake of consistent typography playing a lot with fonts is highly discouraged. This is the work of font and class designers, not end users.

Common Elements



7C0	hexadecimal
3700	octal
11111000000	binary
1984	decimal

$$CO_2 + C \longrightarrow 2\,CO$$

$$\exp(x) = \sum_{n=0}^{\infty} \frac{x^n}{n!} = \lim_{n\to\infty} \left(1 + \frac{x}{n}\right)^n$$

1. first item
2. second item

Lists

Sorted and Unsorted

sorted lists: `\begin{enumerate} \item[] \end{enumerate}`

1. first item
2. second item

unsorted lists: `\begin{itemize} \item[] \end{itemize}`

- first item
- second item

Floats

Concept and Problem-Solving

Floats are containers for things in a document that cannot be broken over a page → they float (graphs, tables)

- Placement specifiers `\begin{float}[h!,t,b]`
- `\usepackage{float}` provides the placement specifier `[H]`
- `\usepackage{placeins}` use with `\FloatBarrier`

Hint:

If many floats occur in rapid succession, LaTeX stacks them all up and prints them together or leaves them to the end in protest.

Floats

Formatting Tables

- Tabular environment:
  `\begin{tabular}[pos]{table spec}...\end{tabular}`
- Tabular commands: For more control over tables:
  `\usepackage{tabularx}`, `\usepackage{booktabs}`,
  `\usepackage{tabu}`,
- Introducing tables in float environment:
  `\begin{table}...tabular...\end{table}`

```
\begin{tabular}{ l | c | r }
   1 & 2 & 3 \\ \hline
   4 & 5 & 6 \\ \hline
\end\{tabular\}}
```

1	2	3
4	5	6

Floats

Graphics: Import and Placement

- `\usepackage{graphicx}`
  `\graphicspath{{'path'}}`
- Insert files in text: `\includegraphics*[parameters]{mypicture}`
- Introducing graphics in float environment:
  `\begin{figure}...graphics...\end{figure}`

Hint:

You should always prefer vector graphics if possible (EPS, PDF).

Floats

Including Pictures

```
\begin{figure}[htb]
\centering
\includegraphics[width=0.8\textwidth]{image.png}
\caption{Awesome Image}
\label{fig:awesome_image}
\end{figure}
```

Mathematical Symbols

Symbols and Equations

```
\usepackage{amsmath}
```

- Math environment:
  `\begin{equation}...equation...\end{equation}`
- Inline math environment: `$...equation...$`

```
\frac{\alpha^2}{\beta^2}
```

$$\frac{\alpha^2}{\beta^2}$$

Manage correct spacing for units `\usepackage{siunitx}` is used with `\SI{'number'}{'unit'}`

Constitutional Formulas and Equations

`\usepackage{chemfig}` and `\usepackage[version=3]{mchem}`

- Chemical Graphics:
  `\chemfig{<atom1><bond type>[parameters]<atom2>}}`

  `\chemfig{A=B}` $\mathrm{A}=\!=\mathrm{B}$

- Chemical Equations: `\ce{...equation...}`

  `\ce{CO2+C- >2CO2}` $\mathrm{CO_2 + C \longrightarrow 2\,CO}$

Citing Literature

BibTeX

BibTeX provides for the storage of all references in an external, flat-file database.

- **Environment:** `\bibliography{bibfile}`
- **Two options:**
  - Type every entry manually
  - Use a database that produces BibTeX code (strongly recommended!)

Literature Databases

- JabRef
- EndNote (does not import BibTeX)
- Citavi
- Mendeley
- CiteULike
- RefWorks (web based)

Check out also http://en.wikipedia.org/wiki/Comparison_of_reference_management_software for the complete list.

Hint:

Google scholar and most paper-search websites (like SciVerse) can export BibTeX entries.

Citing

Basics and Styles

```
\bibliographystyle{style}
\bibliography{mybibliography1,mybibliography2}
```

Various styles available: plain, abstract, named ...

Standard LaTeX bibliography: numeric style of citations

For alternative options (journal or research specific) use the package:
`\usepackage[options]{natbib}`

Citing

BibTeX Entries

```
\cite{citation_key1}
\cite{citation01,citation02,citation03}
```

BibTeX entry:

```
@article{greenwade93,
    author  = "George D. Greenwade",
    title   = "The {C}omprehensive {T}ex {A}rchive
    {N}etwork ({CTAN})",
    year    = "1993",
    journal = "TUGBoat",
    volume  = "14",
    number  = "3",
    pages   = "342--351"
}
```

Advanced Topics

What now?

Now the interesting part begins! 5 reasons to use LaTeX in a scientific environment.

- Special documents
  - Presentation
  - Poster
  - CV and cover letter
  - Teaching stuff
- Modular documents
- Version control
- Controlling external graphs
- Creating graphics

Special Documents

Presentation

`\documentclass{beamer}`

LaTeX provides various themes along with colors:
`\usetheme{'theme'}` and `\usecolortheme{'theme'}`

Additional to the traditional sections hierarchy, beamer class comes with "frames" corresponding to the individual slides.
`\begin{frame}...text...\end{frame}`

Hint:

At http://deic.uab.es/~iblanes/beamer_gallery/index.html all available basic themes can be looked up.

Special Documents

Poster

```
\usepackage[orientation,size,scale]{beamerposter}
```

- Flexibility of fonts and sizes
- Flexibility of orientation
- Beamer themes
- Textblocks: `textpos` package for positioning control

Hint:

http://tug.org/pracjourn/2012-1/shang/shang.pdf is a great introduction.

Introduction to LaTeX

Scientific Document Preparation System

- Learn to use a document preparation system for high quality typesetting.
- Create professional documents for all your nuclear related papers.
- Use it to create perfectly formatted laboratory reports and theses.

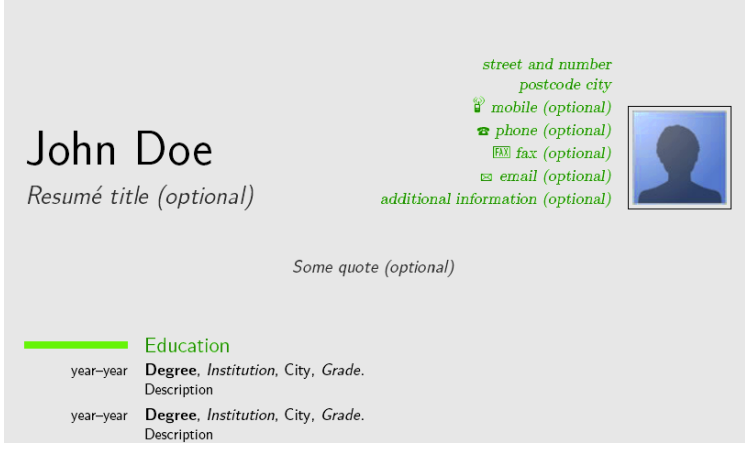
Date: *Friday, September 27th, 2013*
Time: *10:00 - 12:00 am*
Location: *UA 2140, UOIT North Campus, 2000 Simcoe Street North, Oshawa L1H 7K4*

CANADIAN NUCLEAR SOCIETY ®
SOCIÉTÉ NUCLÉAIRE CANADIENNE

Special Documents

Curriculum Vitae

```
\documentclass[options]{moderncv}
\moderncvstyle{"style"}
\moderncvcolor{"color"}
```



Modular Documents

Introducing Order

Very useful strategy for long LaTeX documents: split in several files.

Best practice:

- main document (main.tex)
- style document (style.sty)
- latex files folder
- pictures folder

include documents with `\include{filename}`

Hint:

To compile the child documents separate from the mother document use `\usepackage{subfiles}`.

More Options

... for more convenience!

- More Special Documents: letters, cover letters, exams, assignments
- Version control: backups, collaborative work, non-destructive editing
- External graphs typesetting: control gnuplot graphs
- Creating graphics: with the `tikz` package

Troubleshooting

What to do if it just doesn't work

1. Check the log file for a detailed error message or line number
2. Check for missing or surplus brackets
3. Check for problems in closing an environment
4. Delete all temporary files and compile again
5. Copy and paste the error message in your browser
6. For MikTEX related issues: Don't start installing packages manually unless you are sure you know what you are doing!
7. If MikTEX still doesn't work: Use TEXLive

Questions?

... and Answers

- The not so short introduction: http://tobi.oetiker.ch/lshort/lshort.pdf
- A great book: https://en.wikibooks.org/wiki/Latex
- Forum for any kind of problem and any kind of solution: http://tex.stackexchange.com/
- The TEX Archive Network http://www.ctan.org/
- The LATEX Community: http://www.latex-community.org/
- DeTEXify: http://detexify.kirelabs.org/classify.html