Introduction to (LA)TEX

Workshop

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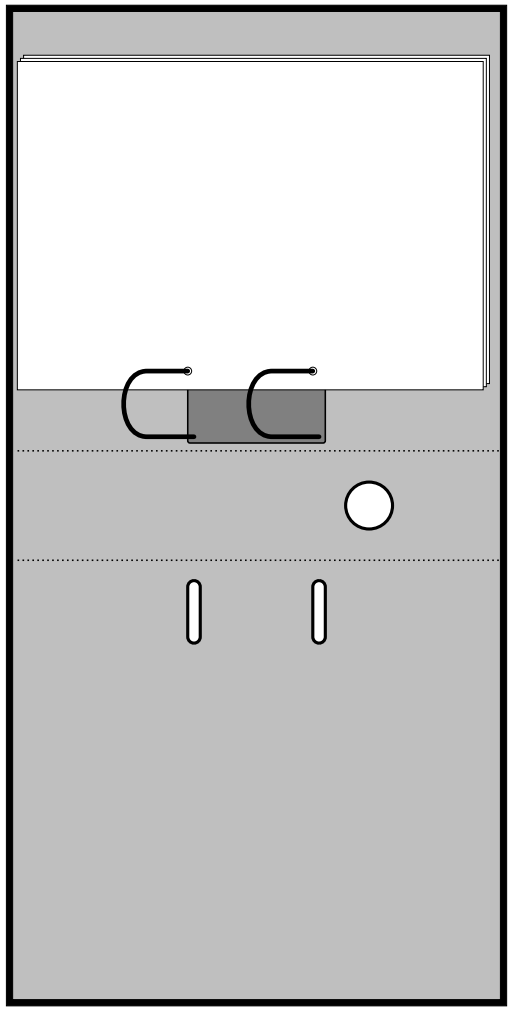
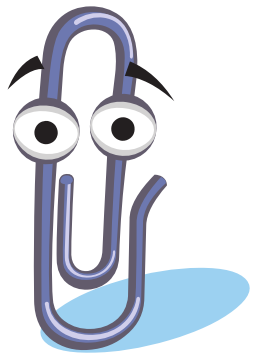
Background

- Writing reports, papers, theses, articles, ...
- Office text processors: Microsoft Office Word, LibreOffice Writer, WPS Office Words, Calligra Words etc.
- Seemingly good software?
- But has irritations...
- Professionals use TEX, a markup language for making documents
- Why?



Issues with Office

- Images: they never stay in place, go above text, outside of caption boxes, etc.
- Copy-pasting text (or worse, tables) leads to formatting problems
- Different office programs render the same files differently
- Bibliography management is a hassle, citation styles are too rigid
- Math formulas handled by another program altogether
- Reformatting (for publishing etc.) is tricky
- Large documents/images become very slow
- TEX solves that, and more: it's fun!



TEX

- A typesetting system made in 1978 (MS Word: 1990)
  - LATEX (1984): additions to base TEX for ease of use
  - ConTEXt (1996, Dutch): additions to TEX for more control
- Document files are plain text (`.tex`, source code, markup)
- An engine (compiler) is used to turn it into a standard read-only document (PDF, PS)
  - pdfLATEX
  - XƎTEX
- Highly extensible, heavily package-oriented: "there's a package for that"
- Available as a distribution: collection of engines and packages
- Free and open-source software, cross-platform

Example

```
\documentclass[12pt]{article}
\usepackage{amsmath}
\title{\LaTeX}
\date{}
\begin{document}
  \maketitle
  \LaTeX{} is a document preparation system for
  the \TeX{} typesetting program. It offers
  programmable desktop publishing features and
  extensive facilities for automating most
  aspects of typesetting and desktop publishing,
  including numbering and
cross-referencing,
  tables and figures, page layout,
  bibliographies, and much more.

  \LaTeX{} was
  originally written in 1984 by Leslie Lamport
  and has become the
dominant method for using
  \TeX; few people write in plain \TeX{} anymore.
  The current version is \LaTeXe.

  % This is a comment, not shown in final output.
  % The following shows typesetting
power of LaTeX:
  \begin{align}
    E_0 &= mc^2
\\
    E &= \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}}
  \end{align}

  % Same in built-in LaTeX math:
  $$ E_0 = mc^2 $$
  $$ E = \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}}$$
\end{document}
```

LaTeX

LaTeX is a document preparation system for the TeX typesetting program. It offers programmable desktop publishing features and extensive facilities for automating most aspects of typesetting and desktop publishing, including numbering and cross-referencing, tables and figures, page layout, bibliographies, and much more.

LaTeX was originally written in 1984 by Leslie Lamport and has become the dominant method for using TeX; few people write in plain TeX anymore. The current version is LaTeX 2_ε.

$$E_0 = mc^2 \tag{1}$$

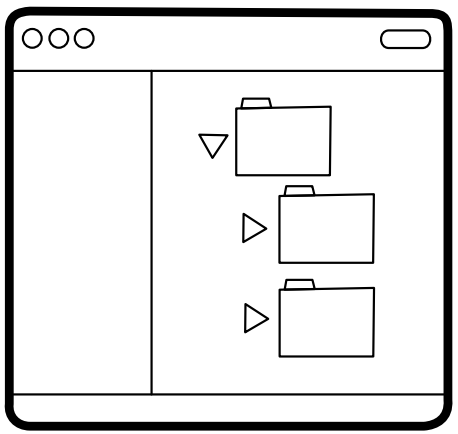
$$E = \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}} \tag{2}$$

$$E_0 = mc^2$$

$$E = \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}}$$

Graphical user interfaces

- Quick access to formatting, math, table creation macros, spell checking, word wrap, search, compiling, viewing the result
- Cross-platform GUIs, such as:
  - Texmaker and TeXstudio
  - Kile
  - LyX
- All depend on an already installed TeX distribution (i.e. TeX Live) to work!
  - Linux distributions provide TeX Live (and GUIs) out of the box via package managers
  - TeX Live installer for Windows available
  - macOS can use MacTeX

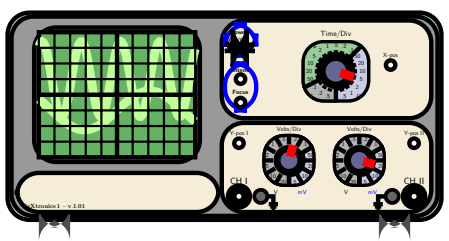


Collaborative editing

- Web-based editors (a la Google Docs)
  - Overleaf Pro:
    - Free until the end of the month, will have a university-wide license later!
    - Track changes, double-click to find etc.
  - Others: Papeeria, Authorea, etc. but much more limited than Overleaf right now
- Git (thanks to plain text)
  - GitHub, GitLab, own server, ...
  - Beware of merge conflicts: split chapters into separate files, one line per sentence
  - Useful even when writing alone: no more problems with backups and multiple versions
- Both combined! Natively on Overleaf!

Drawbacks

- Learning curve: pays off in the long run
- Confusing errors (if any!)
  - Auxiliary files in working directory may help: `.log` for engines, `.blg` for BibTeX
  - Overfull `\hboxes`: text interpreted as a character/box; if it cannot be broken up nicely, warns you
  - `File '<package>.sty' not found.` means you don't have the package installed
- Quirkiness:
  - pdfLaTeX doesn't support UTF-8 symbols
  - Need packages for handling image formats etc.
- People who are unwilling to learn to use collaborative LaTeX editors or PDF editors



Want to learn more?

- WikiBooks: https://en.wikibooks.org/wiki/LaTeX
- CTAN: http://ctan.org
- Stack Exchange: http://tex.stackexchange.com/
- This presentation and examples: https://github.com/GreatEmerald/tex-workshop
- Paper for Advanced Earth Observation course
- Master thesis and first PhD paper
- PhD thesis template: https://github.com/bbrede/Wageningen_PhD_thesis_template

Questions?

Practical

You can look at, compile and edit the examples given in the following slides on Overleaf.

1. Register and log into Overleaf: https://www.overleaf.com/
2. Follow the invitation link: https://bit.ly/3ggiMQf
3. Read-only; to make your own copy, click **“Menu”** at the top left, then **“Copy project”** (you must be **logged in**!)

Text and math (`example.tex`, `utf8.tex`)

- TEX is plain text: no formatting is preserved when pasting
- Whitespace is ignored, unless two new lines
- Inline maths capability with math-specific styles, syntax is fairly intuitive
- UTF-8 support is better in XELATEX, e.g. text in Chinese

Formatting (`ISPRSguidelines_authors.tex`)

- Formatting can be global or local
  - Global formatting is done in the file header: page margins, line spacing, font size, etc.; `geometry` package
  - Local formatting is done inline with special commands like `\texttt`, \textbf, \textit
  - Experts enjoy semantic styles by defining new commands: `\newcommand{\code}[1]{\texttt{#1}}`
- Journals often provide `.cls` style templates or template `.tex` files
  - `<filename>.cls`: use `\documenttype{<filename>}`
  - `<filename>.tex`: possibly use `\input{<filename>}`, edit or use as a reference
  - Example: ISPRS provides .cls files and an example .tex

Figures (`figures.tex`)

- LaTeX has a figure environment that makes it easy to include figures and refer to them
- The position of figures is determined automagically – no problem to add more text
- TeX is optimised for vector graphics (PDF, EPS, SVG), avoid rasters
- `hyperref` package allows following references within the PDF

BibTeX (`bibliography.tex`)

- A system that handles all things bibliography
- Database of bibliography is stored in plain text, `.bib` files, one may copy-paste entries from Google Scholar
- Reference managers (Zotero, Mendeley, EndNote etc.) can export to BibTeX format
- Cite entries by referring to their aliases
- The default citing package is rigid, use `natbib` or `biblatex` for customisability
- Integrates with `hyperref`
- Two-step process; might need two compilation rounds

More packages! (`acronyms.tex`, `changes.tex`, `gantt.tex`)

- CTAN: Comprehensive TEX Archive Network (http://ctan.org)
- 5836 packages at the moment of writing! (was 5199 in 2017)
  - `changes`: adding edit suggestions and comments!
  - `glossaries`: Acronym management!
  - `pgfgantt`: Gantt charts! Useful for writing proposals.
  - `tikz`: flowcharts and other vector graphics!
  - `textcomp`: symbols °, ©, ... for pdfLATEX
  - `qrcode`: QR code generation!
  - `knitr`: embed R code into TEX!
    - Allows putting the output of *R* commands into plain text, no more copy-pasting results
    - Exact same tool as for `.Rmd`, handles `.Rtex` too
    - Actually an *R* package implementing a TEX engine
  - `beamer`: Presentations! Like this one!