Introduction to (LA)TEX
Workshop

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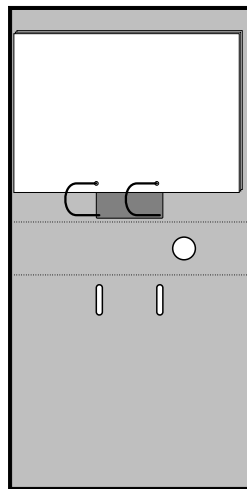
Background

- 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 T$_E$X, 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
  - X∃TEX
- 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 2ε.

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

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

$$E_0 = mc^2$$

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

1

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
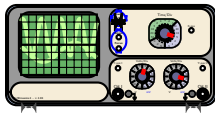 - macOS can use MacTeX
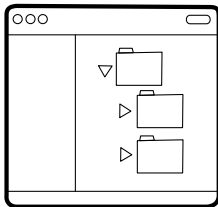
Collaborative editing

- Web-based editors (a la Google Docs) available
    - Overleaf, Papeeria, Authorea, ...
    - Most require payment for private repositories
    - University-wide Overleaf Pro license being discussed right now, expressions of interest/use cases would help it materialise
- Git (thanks to plain text)
    - GitHub, GitLab, own server, ...
    - Beware of merge conflicts: split chapters into separate files
    - Useful even when writing alone: no more problems with backups and multiple versions
- Both combined!

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/2HJbyUm

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 X∃LATEX, 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)
- 5678 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!