LaTeX

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Don Knuth

- Donald Erwin Knuth (1938), Computing Guru and Professor Emeritus at Stanford University
- *The art of computer programming* (5 vol.) (1. vol. 1968, 1–3 published, 4 in progress, 5 estimated in 2015...)
- Software for typography: TeX
- Software for designing fonts: MetaFont
- Language for implementing and documenting these tools: web
- Result in addition to *The art of computer programming*:
  - TeX
  - MetaFont
  - *Computers and typesetting* (5 vol. about digital typography)++
- Price for finding typos: $2.56

TeX: High quality typography

- The name of the game: $\tau\epsilon\chi$
- A kind of page description language language; higher level than PostScript
- Translated to dvi – device independent
- Macro language
- Primitive TeX (ca. 200 low level macros written in web)
- Plain TeX (ca. 800 macros written in primitive TeX)
- Development of TeX is frozen; bug fixing only.
- Version numbers converging towards π (now: 3.14159)
- State-of-the-art algorithms for
  - Line and page breaking
  - Hyphenation
  - Automatic kerning
  - Automatic ligatures
  - Mathematics

Leslie Lamport ca. 1985: LaTeX v. 2.09

- Huge macro package over plain TeX
- Structured documents: structure rather than detail typography
- Cross references, figures, tables, bibliographies etc.
- Masterpiece of macro programming, not so good book
- Huge amount of additional macro files appeared

Frank Mittelbach: The LaTeX3 project

- Total revision of LaTeX
- Result: LaTeX2ε (based directly on primitive TeX (LaTeX2.09 was based on plain TeX)
- Uniform interface for additional packages
- NFSS: New Font Selection Scheme
- PSNFSS: PostScript NFSS (support for PostScript fonts)
- A multitude of additional packages

File format for a .tex file for LaTeX2ε

```
\documentclass{...}
% LaTeX Preamble: use of packages etc.
\begin{document}
% The document itself, structured
\end{document}
```

Example .tex file for LaTeX2ε

```
\documentclass{article}
\begin{document}
This is an \emph{extremely} small \LaTeX{} document.
\end{document}
```

Tools for running LaTeX

- Command line tools:
  - `latex`: runs the LaTeX program, creates dvi file
  - `dvips`: converts dvi to ps
  - `ps2pdf`: converts ps to pdf
  - `xdvi` or `yap`: dvi previewers
  - `gs` or `gsview`: ps previewers
  - `acroread`: pdf previewer
- GUI tools:
  - TeXnicCenter
  - Emacs with AUCtex
  - LyX
  - Scientific Workplace
  - TeXmacs

Important packages and options

```
\documentclass[a4paper,11pt,dvips]{article}
\usepackage[T1]{fontenc}          % new fonts
\usepackage[latin1]{inputenc}     % Norwegian characters
\usepackage[norsk]{babel}         % Norwegian hyphenation++
\usepackage{graphicx}             % including graphics
\usepackage{charter}              % or times, helvetica etc.
\usepackage{amsmath}              % advanced mathematics
\usepackage{amssymb}              % advanced symbols
...
\begin{document}
...
\end{document}
```

Sectioning commands

- For article:
  - `\section{...}` is the highest level
  - `\subsection{...}`
  - `\subsubsection{...}`
  - `\paragraph{...}`
- For report:
  - `\chapter{...}` is the highest level
  - `\section{...}` is the second highest level
  - etc.
- Starred version produced unnumbered section:
  - `\section*{...}`
  - etc.

Equations

- The command `$$f(x) = \int_1^x 1/\tau \, d\tau$$` produces the following output:

$$f(x) = \int_1^x 1/\tau \, d\tau$$

- If surrounded by `\begin{equation}...\end{equation}`, the equation is numbered:

$$f(x) = \int_1^x 1/\tau \, d\tau \tag{1}$$

Floats: figures

- Tables and figures are treated as floating objects that appear virtually anywhere in the document
- Basic syntax for figure:

```
\begin{figure}
  \centering
  \includegraphics{figure_file.eps}
  \caption{Figure caption goes here.}
\end{figure}
```

Floats: tables

- Basic syntax for table:

```
\begin{table}
  \caption{Table caption goes here}
  \centering
  \begin{tabular}{c|c}
    Centered & Table \\ \hline
    0 & 1 \\
    1 & 2 \\
    2 & 4 \\
    3 & 8 \\
  \end{tabular}
\end{table}
```

Cross references

- `\label{...}` can be put anywhere and is context sensitive.
- Labels can be referred to by `\ref{...}`
- Example:

```
\begin{equation}
  \label{eq:function}
  f(x) = \int_1^x 1/\tau \, d\tau
\end{equation}
Equation~(\ref{eq:function}) shows \dots
```

gives

$$f(x) = \int_1^x 1/\tau \, d\tau \tag{2}$$

Equation (2) shows ...

- Remember to run LaTeX twice (why?)

Bibliography

- Two ways: manual or BibTeX; choose BibTeX
- Put all references in a .bib file with items like this:

```
@BOOK{Lamport:86,
      author    = {Lamport, Leslie},
      title     = {{\LaTeX}: A Document Preparation System},
      year      = {1986},
      publisher = {Addison-Wesley Publishing Company, Inc.}
}
```

- Cite them like this `\cite{Lamport:86}`
- Include bibliography:

```
\bibliographystyle{unsrt}
\bibliography{mybib.bib}
```

- Run `latex`, `bibtex`, `latex`, `latex` (why?)

GUC master thesis

- Download the `gucmasterthesis` from the HiG web page, `http://www.hig.no/imt/index.php?id=570`
- Use `\documentclass{gucmasterthesis}`
- Follow the example file (`example.tex`)

Other nice stuff

- `\tableofcontents`
- `\maketitle`
- `\listoffigures`
- `\listoftables`
- `makeindex`

Help me! Where do I start?

- CTAN: Comprehensive TeX Archive Network

  `http://www.ctan.org`
- Install a suitable LaTeX distribution:
  - Unix/linux: teTeX
  - Windoze: MikTeX
- "LaTeX for nybegynnere" (in Norwegian only):

  `http://heim.ifi.uio.no/~ifidrift/doc/LaTeX-for-nybegynnere.pdf`
- The not so short introduction to LaTeX(see HiG web page, `http://www.hig.no/imt/index.php?id=570`)
- Lamport's book?
- The LaTeX companion
- `no.it.programvare.tex` and `comp.text.tex`
- Hack `.sty` and (subsequently) `.cls` files
- Ask Monica...