CS-M00 Research Methodology
Lecture 27 Oct 2014: A Taster of \LaTeX

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http://www.cs.swan.ac.uk/~csetzer/lectures/researchmethodology/14/index.html

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Advantages/Disadvantages of WYSIWYG Systems

- WYSIWYG systems are relatively easy to use.
- In WYSIWYG systems typesetting to be done by the user.
  - Problem: most users are not professional type setters.
- In most systems (e.g. Word) you can see only the output, but not the formatting information.
  - Difficult to detect that one headline is in 11 pt and another in 12 pt, or one headline in one font, and another in a slightly different font.
  - Therefore output is usually inconsistent.
- Usually output not of printable quality.
- Programming is difficult, definition of macros restricted and difficult.

WYSIWYM

- WYSIWYM = “What You See Is What You Mean”.
- Instead of doing the typesetting directly the user says:
  - This is a headline.
  - This is a section title.
  - This text is normal text.
  - This is a mathematical formula
- Main examples: \TeX and \LaTeX.
Advantages/Disadvantages of WYSIWYM Systems

- Steeper learning curve.
- Separation of output from input, therefore what you write needs to be compiled into text.
- Can create text in print quality.
  - Many publishers print articles typeset in \LaTeX directly, or after adding their own generic macros.
- User sees all formatting information and can therefore produce very uniform text.
- Programmable using macros.
  - Development of macro packages for many purposes.
    - In \LaTeX macro packages e.g. for chess, for typesetting proofs, chemical formulas exist.
    - These slides are typeset in \LaTeX.

\LaTeX

- \TeX developed by Donald Knuth in order to typeset a new version of his books “The art of Computer Programming”.
- \LaTeX (for Lamport-\TeX) developed by Laslie Lamport in order to make a more user friendly version of \TeX.
  - \LaTeX is essentially a macro package on top of \TeX.

Use of \LaTeX for Reports and Dissertation

- Reports and dissertations can be written using any text processing system.
- Use of \LaTeX will in many cases give you an advantage because of the much higher quality of the output.
- Many lecturers (but not all) use \LaTeX, especially for scientific publishing.
  - They might help you with \LaTeX.

Example

- The following shows an example of \LaTeX code (split into 3 codes) plus the output.
- For ease of presentation after each code piece the final output (which is only produced after running latex on the whole code) is shown.
- The source for this file is available from the web page of CS-M00 or here: http://www.cs.swan.ac.uk/~csetzer/lectures/researchmethodology/11/exampleWikipedia.tex
\documentclass[12pt]{article}
\usepackage{amsmath}
\title{\LaTeX}
\author{Anton Setzer}
\thanks{Dept. of Computer Science, Swansea University, Singleton Park, Swansea SA1 4PZ, UK. Email: \{tt a.g.setzer@swan.ac.uk\}. This article is based on the example in Wikipedia, http://en.wikipedia.org/wiki/LaTeX}
\date{7 October 2011}
\newcommand{\role}{\{r\textsuperscript{o}le\}}
\begin{document}
\maketitle

Example (Continued)

\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. \LaTeX{} plays an important \role{} in publishing scientific articles in Science.

\% This is a comment; it will not be shown \% in the final output.

$E = mc^2$

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

\LaTeXOutput

\LaTeXOutput

\LaTeXOutput

\LaTeXOutput

\LaTeXOutput
Example (Continued)

\% The following shows a little of the typesetting power
\% of \LaTeX:

\begin{align}
E &= mc^2 \\
m &= \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \\
\end{align}
\end{document}

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*Dept. of Computer Science, Swansea University, Singleton Park, Swansea SA1 4PZ, UK. Email: a.g.setzer@swansea.ac.uk This article is based on the example in Wikipedia, http://en.wikipedia.org/wiki/LaTeX

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\LaTeX

Anton Setzer*
7 October 2011

\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 \LaTeX2e. \LaTeX is an important role in publishing scientific articles in Science.

\begin{align}
E &= mc^2 \\
m &= \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \\
\end{align}

---

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Running LaTeX

csetzer@csltas2:~> latex exampleWikipedia.tex
latex exampleWikipedia.tex
This is pdfTeX, Version 3.1415926-1.40.10
(TeX Live 2009/Debian)
entering extended mode
(./exampleWikipedia.tex
LaTeX2e <2009/09/24>
Babel <v3.8l> and hyphenation patterns for english,
usenglishmax, dumylang, nohyphenation, farsi,
arabic, croatian, bulgarian, ukrainian, russian, czech,
slovak, danish, dutch, finnish
... lots of more output ...
Output written on exampleWikipedia.dvi (1 page, 2364 bytes).
Transcript written on exampleWikipedia.log.
csetzer@csltas2:~> xdvi exampleWikipedia.dvi &

More Details

• \documentclass[12pt]{article}
  • Standard Header of a Latex file.
  • 12pt = font size
  • article = style
    (Article is suitable for reports.
    There are lots of other styles.
    Style "book" is the simplest style for dissertations.
    – There are many more fancy ones.)
• \usepackage{amsmath}
  • Loads package amstmath.
  • Rich package for mathematics, here used for command \frac.
  • Lots of packages are available.
• \title{LaTeX}
  • Defines the title.
  • \LaTeX{} is a macro typesetting \LaTeX.
• \author{Anton Setzer}
  • Starts defining the author (note { not closed yet)
• \thanks{Dept. of Computer Science,
Swansea University, Singleton Park,
Swansea SA1 4PZ, UK.
Email: {\tt a.g.setzer@swan.ac.uk}.
This article is based on the example in Wikipedia,
http://en.wikipedia.org/wiki/LaTeX})
  • Footnote added to author.
  • [{\tt ... }] type sets this part in type writer font.
  • Second "}" finishes definition of author.
• \date{7 October 2011}
  • Defines the date.
• \newcommand{\role}{r\hat{o}le}
  • Defines a macro.
  • From now on \role will expand to r\hat{o}le.
  • Curly brackets will be used to group text but will not be printed.
  • \hat{o} typesets \hat{o}
  • There are macros for defining lots and lots of special symbols.
  • http://www.tug.org/tex-archive/info/symbols/comprehensive/
  • Macros can have parameters as well.
\begin{document}

- \begin{document} 
  - Start of the content of the document.
- \maketitle 
  - Puts title, author, date at this position.
  - Without this command no title, author, date will occur in the document.

\end{document}

- \LaTeX{} is a document preparation system for the \TeX{} typesetting program. It offers ...
  - This is standard text to be typeset.
  - Aligning the text done by the system.
  - Line breaks in the text create only space between words.
  - Double line breaks creates a paragraph (Equivalently one can use the macro \par).
  - Several blanks, tabs, line breaks are the same as a single space (except for double line breaks).
  - \TeX{} typesets \TeX{}.

\LaTeX{} plays an important role in publishing
  - Here the user defined macro \role{} typeset as rôle is used.
  - {} here makes sure that there is a blank after \TeX{} and after rôle.
    Spaces after a macro are ignored.
  - \% This is a comment; it will not be shown
    - Everything in a a line after \% is a comment

\begin{align} 
\end{align}

- \begin{align} 
\end{align} is an example of an environment.
  - \begin{align} 
  \end{align} is an example of a environment.
  - There are many environments in \TeX{}.
Example (Continued)

- \begin{align}
  \cdots & \cdots \\
  \cdots & \cdots \\
\end{align}

- Environment align typesets several formulae, which are numbered as (1), (2) consecutively.
- Content of an align environment is mathematical text.
  - \text{l}a\text{T}e\text{X} and \text{T\TeX} have a text mode and a formula mode.
  - In formula mode different macros (usually for creating mathematical text) are used.
  - In mathematical text all blanks are ignored.
  - Mathematical text is where the full power of \text{l}a\text{T}e\text{X}/\text{T\TeX} is shown.
  - Seems to be the easiest system for typesetting formulae.
- \\ separates lines in mathematical text (can be used for ordinary text as well).
- Symbols & mark positions to be aligned.

- $c^2$
  - Typesets $c^2$ in mathematical text.
- $m_0$
  - Typesets $m_0$ in mathematical text.
- $\frac{\cdots}{\cdots}$
  - Typesets a fraction $\frac{\cdots}{\cdots}$.
  - Note that we can nest fractions.
- $\sqrt{\cdots}$
  - Typesets $\sqrt{\cdots}$.
- $\end{align}$
  - End of align environment.
- $\end{document}$
  - End of the document.
  - Text after this will be ignored.

\text{\LaTeX} under Windows

- Use any text editor. Recommended: Emacs or XEmacs.
- MikTeX is a \text{l}a\text{T}e\text{X} compiler for Windows.
- For viewing dvi files use the included YAP dvi-viewer.
- For postscript use GhostScript + GSView.
- See for instance \url{http://www.pinteric.com/miktex.html} on how to use \text{l}a\text{T}e\text{X} under Windows.

More Documentation

- Lots of documentation on \text{l}a\text{T}e\text{X} (tutorials, userguides etc) available online.
- Links available on the module home page at \url{http://www.cs.swan.ac.uk/~csetzer/lectures/researchmethodology/14/index.html}