CS-M00 Research Methodology
Lecture 4b: A Taster of \LaTeX

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http://www.cs.swan.ac.uk/~csetzer/lectures/researchmethodology/11/index.html

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WYSIWYG Systems

- What you type in can be seen directly on the screen.
- Microsoft Office Word is the main example of a WYSIWYG system.
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, no possibility for defining macros (or definition of macros restricted).
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{.}
- **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 userfriendly 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 a slight advantage because of the 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.
\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}{{\tt \textcircled{o}le}}

\begin{document}
\maketitle

\end{document}
\LaTeX

Anton Setzer*

7 October 2011

\LaTeX\ is a document preparation system for the T\TeX\ typesetting pro-
gram. It offers programmable desktop publishing features and extensive fa-
cilities 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 T\TeX; few people
write in plain T\TeX\ anymore. The current version is \LaTeX\ 2ε. \LaTeX\ plays an
important rôle in publishing scientific articles in Science.

\[ E = mc^2 \]

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

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\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.
\documentclass{article}
\begin{document}

\section*{\LaTeX}

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\begin{equation}
E = mc^2
\end{equation}

\begin{equation}
m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}
\end{equation}

\end{document}
important role in publishing scientific articles in Science.

\[ E = mc^2 \]  
\[ m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \]

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% 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}
\LaTeX

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7 October 2011

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\begin{align*}
E &= mc^2 \quad (1) \\
\frac{m}{m_0} &= \frac{\sqrt{1 - \frac{v^2}{c^2}}}{1 - \frac{v^2}{c^2}} \quad (2)
\end{align*}
Importance role in publishing scientific articles in Science.

\[ E = mc^2 \]  \hspace{1cm} (1)

\[ m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \]  \hspace{1cm} (2)

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1
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 \ldots \} type sets this part in type writer font.
- Second “\}” finishes definition of author.
\date{7 October 2011}

- Defines the date.
\begin{itemize}
\item \texttt{newcommand}\{\texttt{role}\}\{\texttt{r}^{\circ}e\}
  \begin{itemize}
  \item Defines a macro.
  \item From now on \texttt{role} will expand to \{\texttt{r}^{\circ}e\}.
  \item Curly brackets will be used to group text but will not be printed.
  \item \texttt{^\circ} typesets ô
  \item There are macros for defining lots and lots of special symbols.
  \item \url{http://www.tug.org/tex-archive/info/symbols/comprehensive/}
  \item Macros can have parameters as well.
  \end{itemize}
\end{itemize}
More Details

- \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.
\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 \LaTeX{} 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
Example (Continued)

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

- Example of an environment.
- There are many environments in $\LaTeX$. 
\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.
  ▶ \LaTeX{} and \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 \LaTeX{}/\TeX{} is shown.
  ▶ Seems to be the easiest system for typesetting formulae.
▶ \ \ \textbackslash{} separates lines in mathematical text (can be used for ordinary text as well).
▶ Symbols & mark positions to be aligned.
Example (Continued)

- $c^2$
  - Typesets $c^2$ in mathematical text.
- $m_0$.
  - Typesets $m_0$ in mathematical text.
- $\frac{\cdots}{\cdots}$
  - Type sets 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.
Use any texteditor. Recommended: Emacs or XEmacs.

MikTeX is a \LaTeX{} compiler for Windows.

For viewing dvi files use the included YAP dvi-viewer.

For postscript use GhostScript + GSView.

See for instance

http://www.pinteric.com/miktex.html

on how to use \LaTeX{} under Windows.
More to Come

- Lots of documentation on \LaTeX\ (tutorials, userguides etc) available online.
- Links will be made available on the module home page at
  http://www.cs.swan.ac.uk/\sim csetzer/lectures/
  researchmethodology/11/index.html