COMP496/901: Academic Presentation and Writing Skills Using LaTeX

Robert Dale
Robert.Dale@mq.edu.au

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  - Jan-Philipp Söhn
  - David Squire
  - Tobias Oetiker

Agenda

- The Principles of Declarative Formatting
- The Basics of Formatting in LaTeX
- Some Highlights
- LaTeX You Need To Know

Starting Points

- LaTeX is a typesetting system, not a word processor
- It is most suited to producing scientific and mathematical documents of high typographical quality
- The focus is on specifying what your text is, now how it should look: that's someone else's job

Author, Book Designer, and Typesetter: The Traditional Model

- The author gives manuscript to a publishing company.
- A book designer from the publishing company decides the layout of the document (column width, fonts, and so on).
- The book designer writes her instructions into the manuscript and gives it to a typesetter.
- The typesetter typesets the book according to these instructions.

Author, Book Designer, and Typesetter: Intelligent Design

- A human book designer tries to find out what the author had in mind when he or she wrote the text.
- She decides on the formatting of chapter headings, citations, examples, formulae, and so on based on her professional knowledge and the contents of the manuscript.

Author, Book Designer, and Typesetter: Using Technology

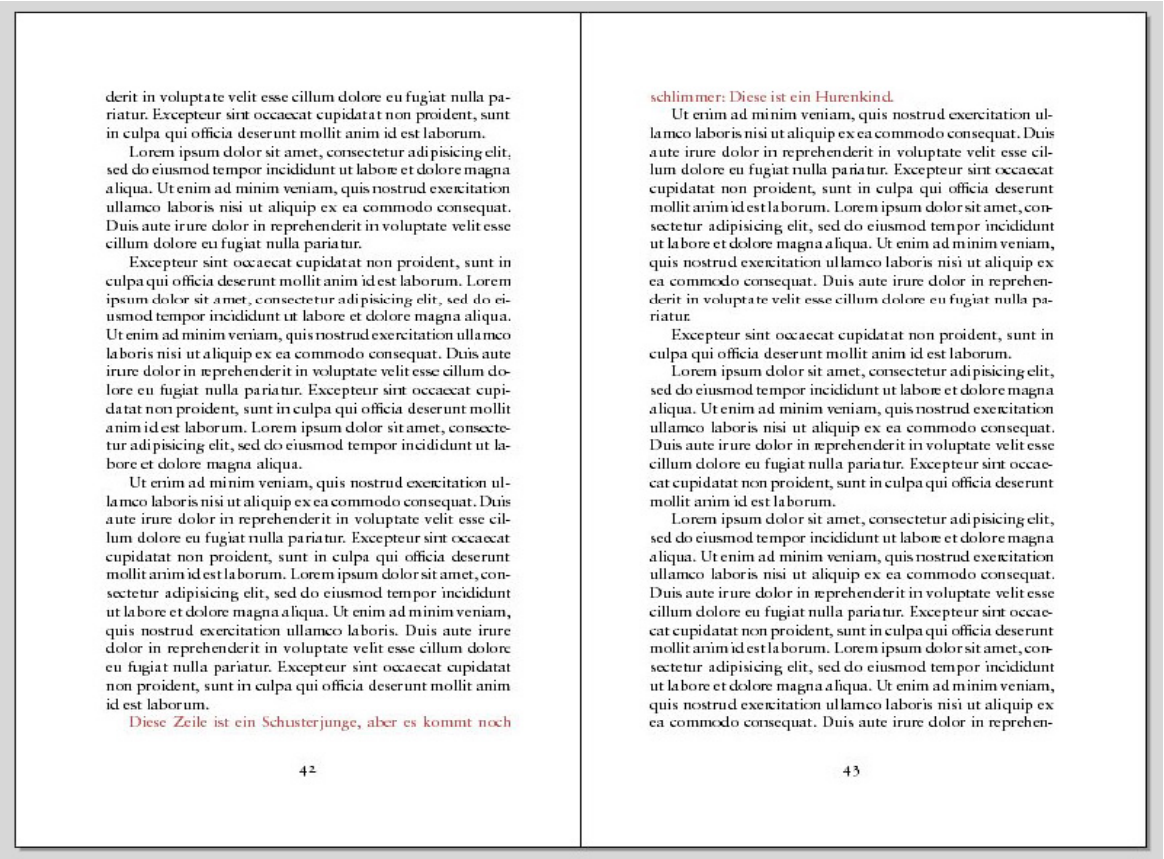
- LaTeX takes the role of the book designer and uses TeX as its typesetter.
- But LaTeX is only a relatively dumb program, so it needs more guidance.
- The author has to provide additional information which describes the logical structure of her work.
- This information is written into the text in the form of LaTeX commands.
- This is very different from the popular WYSIWYG approach you find in Word and other word processors.

The Pitfalls of Layout Design

- With WYSIWYG systems, authors often generate aesthetically pleasing documents with very little, or inconsistent, structure.
- LaTeX prevents such formatting errors by forcing the author to declare the logical structure of the document.
- LaTeX uses the logical structure to choose the most suitable layout.
- Logical mark-up also improves the portability of documents: journals can use stylesheets to translate the logical mark-up into their in-house layout style.

Some Typographic Issues

- Justification
- Orphans (have a future but no past)
- Widows (have a past but no future)



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Diese Zeile ist ein Schusterjunge, aber es kommt noch

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Advantages of LaTeX over WYSIWYG

- Professionally crafted layouts are available
- The typesetting of mathematical formulae is supported in a convenient way
- Users need only to learn a few simple commands, which specify the logical structure of a document; they almost never need to tinker with the physical layout of the document

Advantages of LaTeX over WYSIWYG

- Complex structures such as footnotes, references, table of contents, and bibliographies can be generated easily
- For many typographical tasks not directly supported by basic LaTeX, there are free add-on packages
- LaTeX encourages authors to write well-structured texts
- LaTeX is highly portable and free

Disadvantages of LaTeX over WYSIWYG

- What you see is not what you get.
- But is this really a disadvantage? Why are you thinking about layout instead of content?

Agenda

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A Minimal LaTeX File

```
\documentclass{article}
\begin{document}
Hello world!
\end{document}
```

LaTeX Input Files

- The input for LaTeX is a plain ASCII text file
- You can create it with any text editor
- It contains
  - the text of the document
  - commands which tell LaTeX how to typeset the text:
    - Spaces
    - Special characters
    - LaTeX commands
    - Comments

Spaces

- Whitespace characters (e.g. blank, tab, a single linebreak) are treated uniformly as space by LaTeX
- Several consecutive whitespace characters are treated as one space
- An empty line between two lines of text defines the end of a paragraph
- Several empty lines are treated in the same way as one empty line

It does not matter whether you enter one of several spaces after a word.
An empty line starts a new paragraph.

```
It does not matter      whether you enter one
or    several spaces after a word.

An empty line starts a new paragraph.
```

Special Characters

- The following symbols are reserved characters: they either have a special meaning in LaTeX, or are not available in all the fonts

  $ & % # _ { } ~ ^ \

- Some of these characters can be used in your documents by adding a prefix backslash:

  `$ & % # _ { }` `\$ \& \% \# \_ \{ \}`

- The other symbols (and many more!) can be printed with special commands in mathematical formulae or as accents

LaTeX Commands: Format

LaTeX commands are case sensitive and take one of two formats:

- They start with a backslash \ and have a name consisting only of letters; command names are terminated by a space, a number or any other ‘non-letter’.
- They consist of a backslash and exactly one special character.

LaTeX Commands: Whitespace

LaTeX ignores whitespace after commands.

- If you want to get a space after a command, you have to put either {} and a blank or a special spacing command after the command name.

I read that Knuth divides people working with TeX into TeXnicians and TeXperts. Today is March 25th, 2004.

```
I read that Knuth divides people
working with \TeX{} into \TeX{}nicians
and \TeX perts. Today is \today.
```

LaTeX Commands: Specifying Arguments

- Some commands take a parameter which has to be given between curly braces { } after the command name
- Some commands support optional parameters which are added after the command name in square brackets [ ]

This is *italicized* text.

```
This is \textit{italicized}
text.
```

Comments

- When LaTeX encounters a % character while processing an input file, it ignores the rest of the present line
- This is useful for adding notes to the input file, which will not show up in the printed version

This text is processed.

```
This text is processed. % A comment isn't
```

Input File Structure: The Preamble

- When LaTeX2e processes an input file it expects it to follow a certain structure. Every input file starts with the command:

```
\documentclass{...}
```

  - This specifies what sort of document you intend to write (article, letter, book and so on)
- After that, you can include global style commands or you can load packages which add new features to the LaTeX system. To load a package you use the command:

```
\usepackage{...}
```

Input File Structure: The Body

- When all the setup work is done, you start the body of the text with the command:

```
\begin{document}
```

- Now you enter the text mixed with some useful LaTeX commands
- At the end of the document you use the

```
\end{document}
```

  command, which tells LaTeX to finish.
- Anything which follows this command will be ignored by LaTeX

A Simple Example

```
\documentclass[a4paper,11pt]{article}
\usepackage{latexsym}
\author{H.~Partl}
\title{minimalism}
\begin{document}
\maketitle
\tableofcontents
\section{Start}
Here begins my lovely article \ldots
\section{End}
\ldots{} and here it ends.
\end{document}
```

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Typesetting Mathematics

- LaTeX has a special mode for typesetting mathematics, called math mode.
- Within a paragraph, math mode is entered between `$` characters, or by using the `\begin{math}` and `\end{math}` commands

To find the square of the hypotenuse, add a squared to b squared to find c squared, e.g. $a^2 + b^2 = c^2$. It's as easy as that!

```
To find the square of the
hypotenuse, add a squared to
b squared to find c squared,
e.g. $a^2 + b^2 = c^2$. It's
as easy as that!
```

Typesetting Maths: Referring to Equations

- In a scholarly article or thesis, you will often want to number equations and refer to them in the text
- This is done using the **`equation`** environment, and the commands **`\label`** and **`\ref:`**

… it is clear that

$$\varepsilon > 0. \qquad (1)$$

From Equation 1 it follows that ...

```
\ldots it is clear that
\begin{equation}
\epsilon > 0.
\label{eq:eps}
\end{equation}
From Equation~\ref{eq:eps} it
follows that \ldots
```

Including Graphics

- LaTeX2e includes a standard package for including *PostScript* graphics in your document. Load it using

```
\usepackage{graphics}
```

- An example that shows a figure being included:

```
\begin{figure}[ht]
\begin{center}
\includegraphics[width=140mm]{mypic.ps}
\end{center}
\caption{An example of a figure}
\label{fig:example}
\end{figure}
```

Bibliographies: Citations

- Articles can be cited in the text using the \cite command:

By far the most commonly used feature is colour (e.g. [1,2,3]), usually computed in a colour space thought to be “perceptually accurate” (e.g. HSV [3] or CIE [4].

```
By far the most commonly used feature
is colour (e.g.\
\cite{NBE1993,JaV1996,SmC1996a}),
usually computed in a colour space
thought to be ``perceptually
accurate'' (e.g.\ HSV \cite{SmC1996a}
or CIE \cite{STL1997}).
```

- The details of the cited articles are stored in BibTeX format, in a .bib file
- BibTeX resolves the citations in the LaTeX file and generates the required bibliography

Bibliographies: BibTeX Entries

```
@book{AhR1975,
   author = {N. Ahmed and K. Rao},
   title = {Orthogonal transforms for digital signal processing},
   publisher = {Springer-Verlag},
   year = {1975},
   address = {New York},
}
@inproceedings{Aus1989,
   author = {James Austin and A. Phantom and Also Phantom},
   title = {High Speed Invariant Recognition Using Adaptive Neural Networks},
   booktitle = {IEE 3rd International Conference on Image Processing and its
Applications},
   year = {1989},
   pages = {28--32},
   abstract = {A method is described which...},
}
```

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Running LaTeX on the Command Line

```
>latex test.tex
```

This will create several files:

File	Contents
`test.aux`	the auxiliary file that LaTeX will use in subsequent passes to resolve references to figures, tables, citations etc.
`test.log`	a log file that contains information about the LaTeX run
`test.dvi`	the DeVice Independent output file: this is the typeset document, ready for conversion to postscript or other printable formats

Structuring Your Document

- \chapter{...}
- \section{...}
- \subsection{...}
- \subsubsection{...}
- Using \label and \ref to refer to sections by number
- Unnumbered versions of the above environments
- Switching to appendices

List Environments

```
\begin{itemize}
\item ...
\end{itemize}
```

Also:

- enumerate
- description

Tables and the Tabular Environment

Floats

- Figures
- Tables
- Referring to figures and tables

More Information

Check out the following links:

- For using LaTeX and setting up a LaTeX environment:
  - http://www.ics.mq.edu.au/~rdale/resources/latex/index.html
- For general info on using LaTeX and other related material:
  - http://www.ics.mq.edu.au/~rdale/resources/writingnotes/index.html