LaTeX Training Course

Using LaTeX to write a thesis

Nicola Talbot and Joseph Wright

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1 What is LaTeX, and what is TeX?

What are TeX and LaTeX?

- TeX is a typesetting application.
- It uses *primitives* to determine how to put text on a page.
- Very complicated!
- *Formats* are provided that translate easy to use commands into the low level primitives required by TeX.
  - Plain TeX
  - LaTeX
  - ConTeXt
  - ...
- Think of LaTeX as an interpreter between you and TeX.

What Else is There?

XeTeX/XeLaTeX: based on a merger of TeX and modern font technologies.

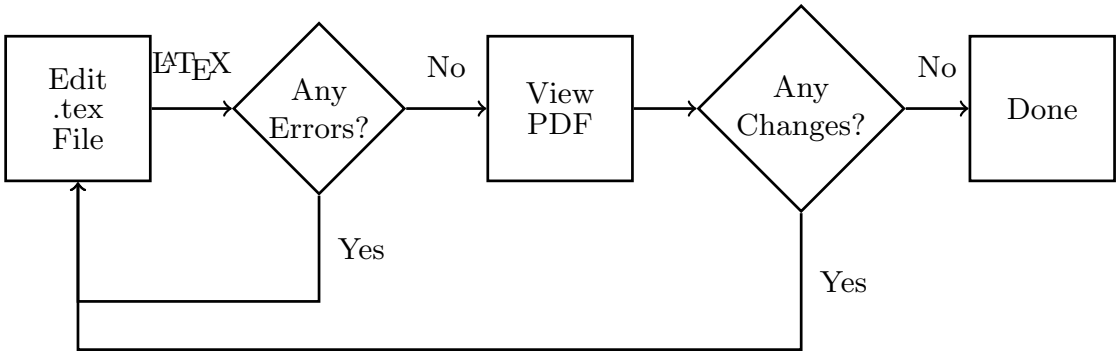
- Supports Unicode character sets.
- Supports bidirectional typesetting.

LuaTeX: TeX-like engine with a lua interpreter built in.

What do we need to use LaTeX?

- A text editor (e.g. vi, emacs, gedit, kwrite).
- A PDF viewer (e.g. Adobe Reader).
- A TeX distribution (e.g MiKTeX or TeX Live).
- Some editors are designed specifically for writing LaTeX files.
  - Coloured syntax
  - Buttons or menus to run LaTeX and view the resulting PDF file.
  - Most include an integrated spell checker

Workflow



Warning!

- Word processors can instill bad typographical habits. Examples:
  - Fully justifying text without hyphenation — this can produce large areas of white space between words.
  - No paragraph indentation and blank lines between paragraphs. (This is becoming more accepted, especially for HTML documents, but it's still considered amateurish by some, especially for fiction.)
- TeX follows many typesetting rules.
- People changing from word processors to TeX often get frustrated because TeX makes it difficult (but not impossible) to implement these bad habits.

Special Characters

- With a word processor, you can type any symbol on your keyboard.
- TeX has *special characters*. These are symbols that have a special meaning and should be used with care!

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

- If you actually want to produce one of those symbols, you need to use a command:

```
\textbackslash \{ \} \% \textasciitilde \& \# \$ \textasciicircum \_
```

Spaces

- TeX treats multiple spaces as a single space.
- By default, the space between sentences is slightly larger than the space between words. This can be switched off using `\frenchspacing`.
- New line characters are treated as a space.
- Paragraph breaks should be indicated by a blank line. (By default, there won't be a blank line in the PDF file.)
- LaTeX automatically indents paragraphs, except for the first paragraph after a section heading.

2 Getting Started

A Simple Document

Example 1.

```
\documentclass[a4paper,12pt]{article}

Preamble
\begin{document}
% This is a comment
This is   a simple
document\footnote{with a footnote}.

This is a new paragraph.
\end{document}
```

The class name.

Class options

The document.

Exercise 1. *Use the editor of your choice to create the above document. If you want to use an editor like vi or emacs, save the document with a .tex extension, for example* `exercise1.tex`*, and go to a terminal/command prompt and type:*

```
pdflatex exercise1
```

You can then view the resulting PDF file using a PDF viewer such as evince, kpdf or acroread.

3 Document Classes

Document Classes

- The *document class* sets up the general layout of the document. For example:
  - the format of the headings;
  - if the document should have chapters;
  - if the title should be on a separate page or above the text on the first page.
- The class is specified using

  `\documentclass[`*`options`*`]{`*`class-name`*`}`

Available Classes

- There are many classes available for different types of documents.
- Some journal and universities provide their own class.
- Basic classes:

  `article` for short documents without chapters;

  `report` for longer documents with chapters, typically single-sided with an abstract;

  `book` for books, typically double-sided with front matter and back matter;

  `letter` for correspondence;

  `slides` for presentations.
- The basic classes aren't very flexible.

Modern Classes

- The KOMA-Script classes:
  - `scrartcl` replaces `article`
  - `scrreprt` replaces `report`
  - `scrbook` replaces `book`
  - `scrlttr2` replaces `letter`
- `memoir` replaces `book` and `report`
- `octavo` replaces `book`
- Presentations (replacing `slides`):
  - `beamer` (used to create the accompanying slides)
  - `prosper`
  - `foils`

Documentation

- Each class should come with its own documentation.
- Use the `texdoc` application:
  1. Go to a terminal or command prompt or (Windows users) go to the Start menu and then select Run...
  2. Type `texdoc` followed by a space and then the name of the class. For example: `texdoc beamer`
- Or try the web address `http://www.ctan.org/pkg/`*name* where *name* is the name of the class. For example: `http://www.ctan.org/pkg/beamer`

Example

```
\documentclass{scrreprt}
\usepackage{lipsum}% Provides \lipsum for dummy text

\title{A Sample Document}
\author{Ann Author}

\begin{document}
\maketitle
\tableofcontents

\chapter{Introduction}
```

```
This is a sample document with some dummy
text\footnote{and a footnote}. \lipsum
\end{document}
```

Exercise 2. *Try creating the above document. The KOMA-Script classes have various options that affect the document's appearance. Try experimenting with some of the following:* `chapterprefix`, `headings=small`, `headings=normal`, `headings=big`, `numbers=enddot`, `numbers=noenddot`. *For example:*

```
\documentclass[chapterprefix]{scrreprt}
```

4 Structure

Title Page

- Before you can display the title page, you must specify the title information.
- Available commands depend on the class file. For `scrbook` the following commands are available:

```
\title{Title}
\author{Author(s)}
\date{Date}
\titlehead{Titlehead}
\subject{Subject}
\subtitle{Subtitle}
\publishers{Publisher}
```

- Use `\maketitle` to display the title page.

Sectioning Commands

- Article-like classes provide the commands:

```
\part[short title]{title}
\section[short title]{title}
\subsection[short title]{title}
\subsubsection[short title]{title}
\paragraph[short title]{title}
\subparagraph[short title]{title}
```

- If the short title is present, it's used for the table of contents or the page header.

- Book and report-like classes also provide the command:

  \chapter[*short title*]{*title*}

Exercise 3. *Try producing the following document.*

```
\documentclass[oneside]{scrbook}

\usepackage{lipsum}% provides \lipsum to produce dummy text

\titlehead{University of East Anglia\\
Norwich\\
NR15 1AJ}
\subject{A thesis submitted for the degree of Doctor of Philosophy}
\title{My Thesis}
\author{Ann Author}
\date{July 2010}
\publishers{Prof.\ My Advisor}

\begin{document}
\maketitle

\frontmatter
\tableofcontents

\chapter{Foreword}

This is the foreword. It is in an unnumbered chapter.

\mainmatter
\chapter{Introduction}

This is a sample chapter with a reference to Chapter~\ref{ch:method}.

\section{Sample Section}

This is a sample section with some dummy text to pad it out. \lipsum

\chapter{Method}\label{ch:method}

This is another chapter with some more dummy text. \lipsum

\appendix % Switch to appendices
```

```
\chapter{A Sample Appendix}\label{apd:sample}

This is an appendix. \lipsum

\chapter{Another Appendix}

This is another appendix with a reference to Appendix~\ref{apd:sample}. \lipsum
\end{document}
```

Here are some more KOMA-Script class options to try: `appendixprefix`, `toc=flat`, `headsepline`, `footsepline`.

5 Graphics

Including External Images

- Need to use the `graphicx` package:

  ```
  \usepackage{graphicx}
  ```

- To create a figure:

  ```
  \begin{figure}[htbp]
  \centering
  \includegraphics{myimage}
  \caption{A Sample Figure}
  \end{figure}
  ```

- Image formats: pdf, png, jpg.
- File extension may be omitted.

Exercise 4. *Try producing the following document. (Use an image application, such as paint, to produce a simple picture and save it as* `shapes.png`*.)*

```
\documentclass[oneside,numbers=noenddot]{scrbook}

\usepackage{lipsum}% provides \lipsum to produce dummy text
\usepackage{graphicx}% provides \includegraphics

\titlehead{University of East Anglia\\
Norwich\\
NR15 1AJ}
\subject{A thesis submitted for the degree of Doctor of Philosophy}
```

```
\title{My Thesis}
\author{Ann Author}
\date{July 2010}
\publishers{Prof.\ My Advisor}

\begin{document}
\maketitle

\frontmatter
\tableofcontents
\listoffigures

\chapter{Foreword}

This is the foreword. It is in an unnumbered chapter.

\mainmatter
\chapter{Introduction}

This is a sample chapter with a figure and a reference to Chapter~\ref{ch:method}.

\begin{figure}[htbp]
\centering
\includegraphics{shapes}
\caption{Some Shapes}
\end{figure}

\section{Sample Section}

This is a sample section with some dummy text to pad it out. \lipsum

\chapter{Method}\label{ch:method}

This is another chapter with a reference to Figure~\ref{fig:shapes}
and some more dummy text.

\begin{figure}[htbp]
\centering
\includegraphics[scale=0.5,angle=45]{shapes}
\caption{A Sample Figure}\label{fig:shapes}
\end{figure}

\lipsum
```

```
\appendix % Switch to appendices

\chapter{A Sample Appendix}\label{apd:sample}

This is an appendix. \lipsum

\chapter{Another Appendix}

This is another appendix with a reference to Appendix~\ref{apd:sample}. \lipsum
\end{document}
```

Here are some more class options to try that will affect the list of figures: `chapteratlists`, `chapteratlists=0mm`.

6 BiBTeX

Creating a Bibliography Using BibTeX

- Entries are stored in one or more databases. You specify the database(s) using `\bibliography{`*`database list`*`}` where you want the bibliography to appear.
- You specify the bibliography style using `\bibliographystyle{`*`style`*`}` (This governs the sorting as well as the formatting).
- Use the `bibtex` application to select only those references you've cited in the document.

BibTeX

- Create a new file (with `.bib` extension).
- Enter the details of the reference using a special syntax.
- BibTeX converts title text to lower case (depending on the style) except for the first word. Enclose proper nouns in curly braces to prevent this.
- Each entry has a unique label. Choose a naming system you find easy to remember.

BibTeX Database

Example 2.

This reference is a book

label

Don't change to lower case!

```
@book{lamport94,
   author    = "Leslie Lamport",
   title     = "{\LaTeX} : a document preparation
                system",
   edition   = "2nd",
   publisher = "Addison-Wesley",
   year      = 1994
}
```

Plain numbers don't need quotes

You can also use curly braces instead of double quotes. For example:
`author = {Leslie Lamport},`

Multiple Authors

- Separate each author with `and`.

Example 3.

This reference is a conference article

```
@inproceedings{smith05,
  author    = "Smith, Jr, John and Jane Lucy Doe
               and Jo de Vere",
  title     = "An example article",
  booktitle = "Proceedings of the Imaginary Society",
  month     = JAN,
  year      = 2005
}
```

Use 3 letter abbreviation without quotes

(If you use the three letter month abbreviations, the month name will either be expanded or abbreviated, depending on the bibliography style.)

Citations

- By default, citations are numerical.
- For more flexibility use a bibliography package. Examples:
  - `natbib`
  - `newapa`

  - `biblatex` — new, very flexible.

- We will be using the `natbib` package with the `plainnat` bibliography style.
  - Can choose between numerical and author year formats.
  - Can have textual and parenthetical citations.

Other bibliography styles provided by the `natbib` package are `abbrvnat` and `unsrtnat`.

Citations (`natbib`)

- *Textual* citation: `\citet[`*note*`]{`*label*`}`

  Example 4.

  ```
  \citet{lamport94}          ⇒ Lamport (1994)
  \citet[p.~34]{lamport94}   ⇒ Lamport (1994, p. 34)
  ```

  (Recall the tilde `~` is a non-breakable space.)

- *Parenthetical* citation: `\citep[`*pre*`][`*post*`]{`*label*`}`

  Example 5.

  ```
  \citep{lamport94}          ⇒ (Lamport, 1994)
  \citep[p.~34]{lamport94}   ⇒ (Lamport, 1994, p. 34)
  \citep[see][]{lamport94}   ⇒ (see Lamport, 1994)
  ```

KOMA-Script

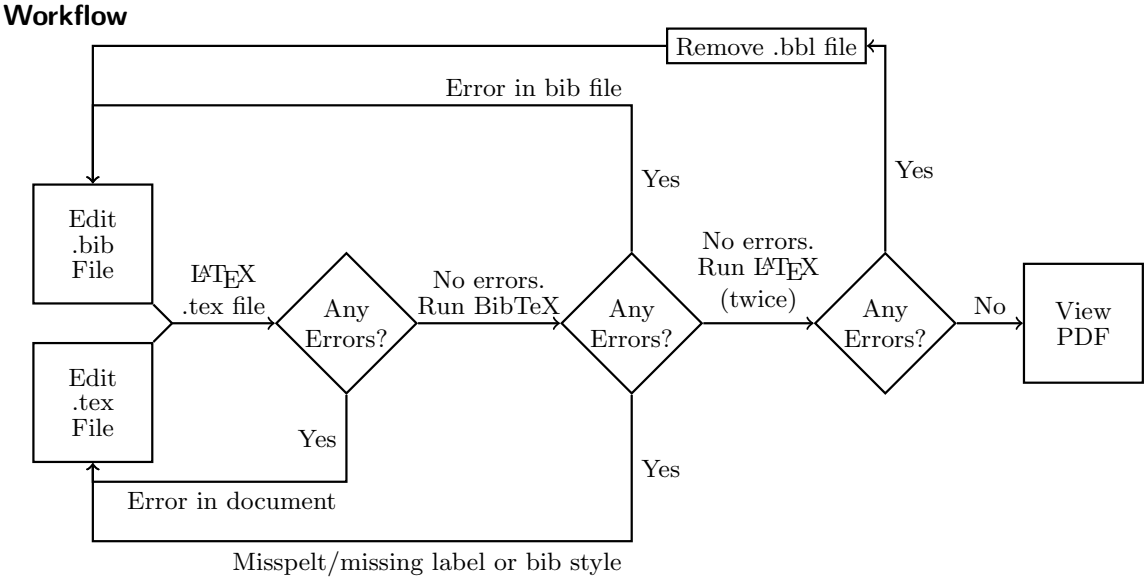
With the KOMA-Script classes you can:

- Add a preamble to the bibliography using

  `\setbibpreamble{`*preamble*`}`

- Add the bibliography to the table of contents using the class option `bibtotoc`
- Make the bibliography a numbered section/chapter using the class option `bibtotocnumbered`

Workflow



Example 6. *Assume the bibliography database is called* `myrefs.bib`*:*

```
\documentclass{scrartcl}
```
Load bibliography package
```
\usepackage{natbib}
\bibliographystyle{plainnat}
```
Specify bibliography style
```

\begin{document}
```
Citation
```
Main matter with citations such as \citet{lamport94}.

\bibliography{myrefs}
```
This is where the bibliography will go
```
\end{document}
```

Exercise 5. *Create a file called* `myrefs.bib` *that contains the following:*

```
@inproceedings{smith05,
  author = "Smith, Jr, John and Jane Lucy Doe and Jo de Vere",
  title = "An example article",
  booktitle = "Proceedings of the Imaginary Society",
  month = JAN,
  year = 2005
}

@book{lamport94,
  author = "Leslie Lamport",
  title = "{\LaTeX} : a document preparation system",
  edition = "2nd",
```

```
  publisher = "Addison-Wesley",
  year = 1994
}
```

Then create a file called, say, ***example5.tex*** *that contains the following:*

```
\documentclass{scrartcl}

\usepackage{natbib}
\bibliographystyle{plainnat}

\begin{document}
Main matter with citations such as \citet{lamport94}.

\bibliography{myrefs}
\end{document}
```

If you are using a terminal or command prompt, you will need to use the following commands:

```
pdflatex example5
bibtex example5
pdflatex example5
pdflatex example5
```

There are various options you can pass to the ***natbib*** *package that affects the formatting. For example:*

```
\usepackage[numbers,sort&compress]{natbib}
```

Try experimenting with some of these options: ***round****,* ***curly*** *and* ***numbers****. With the* ***numbers*** *option, you can also use:* ***super****,* ***sort*** *and* ***sort&compress****.*