Making Friends with LaTeX

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What is LaTeX

- LaTeX is a system of "**typesetting**" documents
- It was developed by Donald Knuth. The original version is referred to as TeX [1980]
- Macro's were written to simplify the use of TeX by Leslie Lamport. This became famous as LaTeX [1985]
- LaTeX was further developed by a group of people - Frank Mittelbach, David Carlisle *et. al.* and was released as LaTeX 2_ε [1994]

Evils of Word Processing

- Writing a large document has four basic stages:
  - Writing the draft
  - Typesetting
  - Proof reading
  - Making the final copy
- Word Processors being WYSIWYG in nature force the user to do all the tasks simultaneously
- LaTeX minimises the distraction by taking away the task of typesetting

So why use LaTeX?

- Takes over the task of formatting
- Provides professional looking *camera ready* copy
- Compatible across various Operating Systems
- Highly extensible
- Produces DVI, PS and PDF format
- Easily portable to other desired formats
- Widely accepted for Journal publication and academia

And why not use LaTeX?

- Steep Learning Curve
- Huge installation - Small ($\approx$ 50 MB), Full ($\approx$ 700 MB)
- Requires some degree of logical ability
- Not WYSIWYG

A Typical LaTeX document


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

Let $D$ be a subset of $\bf R$ and let $f \colon
D \to \mathbf{R}$ be a real-valued function on $D$.
The function $f$ is said to be \emph{continuous}
on $D$ if, for all $\epsilon > 0$ and for all
$x \in D$, there exists some $\delta > 0$
(which may depend on $x$) such that if $y \in
D$ satisfies \[ |y - x| < \delta \] then
\[ |f(y) - f(x)| < \epsilon. \]

\end{document}
```

A Typical LaTeX output

Let D be a subset of $\mathbf{R}$ and let $f: D \to \mathbf{R}$ be a real-valued function on D. The function f is said to be *continuous* on D if, for all $\epsilon > 0$ and for all $x \in D$, there exists some $\delta > 0$ (which may depend on x) such that if $y \in D$ satisfies

$$|y - x| < \delta$$

then

$$|f(y) - f(x)| < \epsilon.$$

Document Structure

- A LaTeX document is divided in to two parts:
  - PREAMBLE : Contains all the formatting information, instructions about using special packages, Authorship etc.
  - DOCUMENT BODY : Contains the actual material that is to be typeset

Understanding Preamble

The Preamble contains the following commands:

```
\documentclass [option-list] {class-name}
\usepackage [option-list] {class-name}
\title{Name of the Article}
\author{Name of the Author(s)}
\date{17th November, 2005}
```

- There can be exactly one document class
- The [. . .] enclose the *optional* parameters and { . . . } enclose the **default** parameters
- Valid document classes are: article, report, letter, book and slides

Preamble Options

LaTeX provides lots of optional parameters for the preamble:

- Typeface Size : 10pt, 11pt, 12pt. Default **10pt**
- Paper Size: a4paper, letterpaper, legalpaper. Default **letter**
- Paper Orientation: landscape. Default **portrait**
- Title Page: titlepage, notitlepage. Default **titlepage**
- Equation Numbering: leqno. Default **Right Side**
- Equation Alignment: fleqn. Default **Centered**
- Output type: draft, final. Default **final**
- Layout Type: oneside, twoside. Default **oneside**
- Chapter Opening: openright, openany. Default **openright**
- Columns: onecolumn, twocolumn Defaults is **onecolumn**

The above options are NOT always valid for the slide class

Understanding Main Body

- Body is enclosed within the following command:

```
\begin{document}          %% Start of the Document
...                       %% Some Matter
\end{document}            %% End of the Document
```

- LaTeX works in three different modes within the body
  - PARAGRAPH MODE: Used for processing normal text
  - MATH MODE: Used for processing Mathematical Equations and Formulas. It has three different sub-modes viz. **Math**, **Displaymath** and **Equation**
  - LEFT-RIGHT MODE: A special kind of mode used for specific purposes

Paragraph Mode

- In paragraph mode, LaTeX works by defining environments
- It is a special area in the document which tells LaTeX to treat the matter present in a separate manner
- Any environment is within a `\begin{environment}` and `\end{environment}` command.
- LaTeX provides numerous prespecified environments
- Environments can be customised or user defined
- The special characters `# $ % _ ^ { }` need to be escaped with a `\` for use in paragraph mode
- The following characters need EXTRA care: `~` and `\`

Math Mode

- The “Math” mode is entered using `$ and $`. This produces inline equations such as follows: $\sigma^2 = \frac{\Sigma_{i=1}^{n}(X_i - \overline{X})}{N}$
- “Displaymath” mode is entered using `\begin{diaplaymath}` and `\end{displaymath}` and produces the following

$$\sigma^2 = \frac{\sum_{i=1}^{n}(X_i - \overline{X})}{N}$$

- The “Equation” mode is entered using `\begin{equation}` and `\end{equation}` and produces the following

$$\sigma^2 = \frac{\sum_{i=1}^{n}(X_i - \overline{X})}{N} \tag{1}$$

Notice the right aligned equation number in slide class

Creating Math-Magic

You want this	You type this
x^y	`$x^{y}$`
x_i	`$x_{i}$`
x_1^y	`$x^{y}+{1}$`
$\frac{ax}{b}$	`$\frac{ax}{b}$`
$\sqrt[n]{x+y}$	`$\sqrt[n]{x+y}$`
$\overline{\overline{x}^2+1}$	`$\overline{\overline{x}^{2}+1}$`
$\overbrace{a+\underbrace{b+c}+d}$	`$\overbrace{a+\underbrace{b+c}+d}$`
$\int_0^1 xdx$	`$\int_{0}^{1}xdx $`

LaTeX can typeset any formula a scientist can write

Structuring the Document

- `\part`
- `\chapter`
- `\section`
- `\subsection`
- `\subsubsection`
- `\paragraph`
- `\subparagraph`

- LaTeX provides for structuring the document by providing various sectioning commands
- These commands are used for numbering the sections and the “Table of Contents”
- `\part` and `\chapter` are not present in the article class
- `\appendix` command starts the Appendix and changes the chapter numbering to alpha-numeric

Creating Tables

City	Population
New Delhi	12,79,000
Kolkata	13,22,000

Table 1: A Tale of Two cities

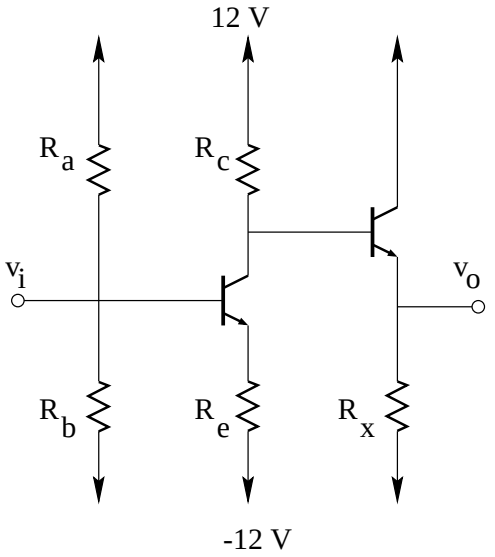
- No special package required for inserting tables
- The corrosponding code is as follows

```
\begin{table}[htbp]
\begin{tabular}{|l|r|}
\hline
City           & Population \\
\hline
New Delhi      & 12,79,000
\\
\hline
Kolkata        &
13,22,000  \\
\hline
\end{tabular}
\label{tab::Tale2}
\caption{A Tale of Two Cities}
\end{table}
```

Understanding Tables

- `\begin{table}` starts the table environment. A Table is treated as **float**ing object in LaTeX
- `[htbp]` indicate placement of float namely - **h**ere, **t**op of page, **b**ottom of page and **p**age of floats
- `\begin{tabular}` starts the tabular environment
- `{|l|r|}` indicates that there are two columns – left aligned and right aligned
- `&` is the tabbing character and `\\` is the newline separator
- `\hline` inserts horizontal lines and `|` inserts vertical lines
- `\label{...}` is used to refer to the table anywhere else in the document
- `\caption{...}` generates the table title and is used in the `\listoftables` command

Inserting Graphics



- Use the `graphics` or `graphicx` package in the preamble
- The commands would be as follows:

```
\documentclass{article}
\usepackage{graphicx}
...
\begin{document}
\includegraphics{transistor.eps}
\end{document}
```

- EPS files preferred for insertion of graphics
- Do not attempt without reading the documentation to the graphics package

Other useful commands

You want this	You type this
A Table of Contents	`\tableofcontents`
A List of Tables	`\listoftables`
A List of Figures	`\listoffigures`
Italics	`\textit{Italics}`
Bold Face	`\textbf{Bold Face}`
Sans Serif	`\textsf{Sans Serif}`
`Type writer style`	`\texttt{Type writer style}`
SMALL CAPS	`\textsc{Small Caps}`

Meet BIBTeX

- Article
- Book
- Booklet
- Conference
- Inbook
- Incollection
- Inproceedings
- Manual
- Mastersthesis
- Misc
- Other
- Phdthesis
- Proceedings
- Techreport
- Unpublished

- BIBTEX was written by Oren Patashnik for managing bibliographies
- An external file (bib) contains the bibliographic records

```
@ARTICLE{RVK,
author={Rohit Vishal Kumar},
title={{Making Friends with LaTeX}},
journal={Journal of University},
year={2005},
volume={I},
pages={1 - 20},
month={09},
}
```

Using BIBTeX


```
\documentclass{article} %% Writing an Article
...
\begin{document}
In a recent article \cite{RVK}  %% Citing the entry
it was found that
...
\bibliographystyle{plain} %% Default Bib Style
\bibliography{myref} %% My Bib file myref.bib
\end{document}
```

- The output would be as follows:

  In a recent article [1] it was found that

References

[1] Rohit Vishal Kumar. Making Friends with LaTeX *Journal of University*, I:1 – 20, 09 2005

More on BIBTeX

- BIBTEX is capable of producing almost any kind of bibliographical reference style
- **apacite** and **natbib** provide extension for (Author, Date) style of reference prevalent in Social Sciences
- BIBTEX is capable of cross referencing within the bibliography

Extending LaTeX

- LaTeX can be extended by using packages
- More than 150 packages exist for taking on any possible task
- It can be used to produce documents in almost any known language including Devnagri, Malayalam and Tamil
- Some common packages are given below

  AMSTeX American Mathematical Society's extension of TeX

  Makeindex Used to produce Index

  Prosper Used to produce slides. This presentation for instance

  Beamer Another powerful slide presentation package

  Memoir Useful in producing books
- Check out CTAN for a definitive set of packages

Setting up a LaTeX System

- On Widows
  - MikTeX for the LaTeX system
  - TeXnicCenter for the IDE
- On Linux
  - TeTeX already installed on most systems
  - Kile for the IDE
- WARNING These are personal recommendations

In the end

- "Remember practise makes perfect"
- Contact your local guru to know more about LaTeX
- Some Recommended Books on LaTeX
  - LaTeX user guide and reference manual, Leslie Lamport, Pearson Education Asia, First Indian Reprint, 2000
  - The not so Short Introduction to LaTeX , Tobias Oetiker, Available online

THANK YOU