

Basic L^AT_EX

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Overview

- Introduction
- Platform Issues
- The Typesetting Process
- L^AT_EX Document Structure
- Typesetting Mathematics

History

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- $\text{L}^{\text{A}}\text{T}_{\text{E}}\text{X}$ is a collection of *macros* which uses the $\text{T}_{\text{E}}\text{X}$ formatter as its typesetting engine and produces high typographical quality in a predefined, professional layout.

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- L^AT_EX has available many predefined document layouts available. Note that many Mathematical Journals provide document styles to facilitate the submission of papers for publication.

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- L^AT_EX facilitates the writing of well-structured texts.
- The typesetting of mathematical formulae is supported in a convenient manner.

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- *WYSIWYG* created documents often have little or inconsistent structure.
- L^AT_EX (and T_EX) are considered *Markup Languages*, where one basically tags or indicates what special properties certain regions of text should have.

The L^AT_EX Advantage, contd.

- Other markup languages are SGML and HTML.
- L^AT_EX is excellent for preparing:
 - Quizzes and Exams.
 - Papers.
 - Theses.
 - Dissertations.
 - Books.
 - Project Grant Proposals for the University, NSF.

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- The most popular run under the UNIX, Windows, and Macintosh Operating Systems.
- We will be discussing working in the UNIX and Windows environments, as there exists \LaTeX implementations here that work in an almost identical fashion (and are free!)

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- Web2c is an implementation of T_EX and Friends which translates the original WEB sources into C, so they can be readily compiled on modern systems.
- MikTeX is an implementation of T_EX and Friends for Windows 95/98, Windows NT/2000, and Windows XP.

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- UNIX users can use vim or vi, emacs, pico, xedit, or other text editor.

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- Use the 8.3 file naming convention whenever possible.
- Windows systems should have the latest version of Ghostscript and Ghostview to deal efficiently with postscript output.
- Whatever platform you work on, make sure you are aware of where (what subdirectory) you are working in. This will make it easier to organize and plan your work.

The Typesetting Process

Assuming you have created a file called `sample.tex` in a subdirectory and you are in that subdirectory, you can typeset by:

- `latex sample`
- `latex sample`
- `dvips sample -o`
- `gv sample.ps` (to view the postscript file, UNIX only) or
- `lpr sample.ps` (to print the postscript file, UNIX only)
- To view and print the postscript file on Windows, start up ghostview and open the postscript file within ghostview.

Process, contd.

- The **latex** command reads the `sample.tex` file and converts it to a **.dvi** file called `sample.dvi`. A dvi file can be viewed with a dvi viewer (**xdvi** on UNIX and the dvi viewer supplied with MikTeX on Windows.)
- **latex** command is run twice to ensure that cross referencing obtains the correct references.
- The **dvips** command converts the file `sample.dvi` to the postscript file `sample.ps`. Note that if the **-o** option is not added, the postscript file is not saved and is sent directly to the printer.

Process, contd.

- One can view the postscript file using *ghostview* which is a postscript file viewer available on UNIX (with **gv**) and on Windows (through a Program Menu Item).
- Do not try and print the .dvi file directly (using **lpr**) as it will come out garbage and kill a lot of trees.
- One will find that one iterates on the process of editing, running latex on the file, viewing, and repeating the process quite often.

Document Structure

Every \LaTeX document file must have the following three commands:

```
\documentclass{...}  
\begin{document}  
\end{document}
```

A simple Example:

```
\documentclass{article}  
\begin{document}  
It's a small document!  
\end{document}
```

Document Classes

Note that \LaTeX commands are case sensitive. The `\documentclass` command is the first command in your document. There are three document classes that are used most often:

- **article** is used for articles in journals, short reports, etc.
- **report** is used for longer reports containing several chapters, small books, theses and dissertations, etc.
- **book** is used for real books!

Document Class Options

One can add options to the `\documentclass` command as seen in the following example:

```
\documentclass[10pt,leqno]{article}
```

where `10pt` will be the size of type in the document, `leqno` tells \LaTeX to place the numbering of equations on the left hand side instead of the right. Note that the only valid options for point size are `10pt`, `11pt`, and `12pt`.

Packages

There are often times where the basic L^AT_EX capabilities are not enough to meet your typesetting needs. This is where one extends the capability of L^AT_EX by including packages which provide extra capabilities. The `\usepackage[options]{package}` command does this, and must be put in between the `\documentclass` and `\begin{document}` commands. Here *package* is the name of the package and *options* is a list of keywords which trigger special features of the package.

Packages for Mathematics

To provide the full range of typesetting mathematics, one should always include the following packages as in the following example:

```
\usepackage{amsmath,amsfonts,amssymb}  
\usepackage{amsthm,latexsym}
```

The AMS packages provide just about every type of mathematical symbol one could want. Note that multiple `\usepackage` statements can be used, and multiple packages can be included in one `\usepackage` statement. No package options were used in the above statements.

AMS Document Classes

There does exist some AMS specific document classes, **amsart** and **amsbook** to name a few. I would discourage using these document classes unless the document you are writing is being submitted to AMS for publication. One does not need to include AMS math packages when using this document class, however modifying the layout to be different than that defined in the AMS document classes can be extremely challenging.

Paragraphs

Text can just be typed starting after the `\begin{document}` command. Note that \LaTeX interprets a blank line as a paragraph break. For example:

```
All good  
students  
study  
math.
```

is treated the same by \LaTeX as

```
All good students study math.
```

i.e., \LaTeX doesn't care how the text looks in the document, one uses a blank line to indicate a new paragraph. Note that one can force a line break by using `\\`.

Sectioning

For the **article** document class, one can insert the following sectioning commands: `\section{...}`, `\subsection{...}` to subdivide your text. Note that a title for the section or subsection is put between the brackets. For the **report** and **book** class one can use `\part{...}` and `\chapter{...}` also.

Environments

An *Environment* is a special feature in L^AT_EX that provides special capabilities. For example, the **enumerate** environment provides list numbering of items:

```
\begin{enumerate}
\item This is item 1.
\item This is item 2.
\end{enumerate}
```

Note that with environments, one must have a begin and an end, and the names must match within brackets. Other environments which are used quite often are **itemize** and **equation**.

Environments, contd.

The \LaTeX enumerate code from the previous slide would then look like:

1. This is item 1.
2. This is item 2.

Typesetting Mathematics

There are two modes in which one typeset's mathematics. One is the *inline* mode, for example $\int_0^1 f^2(x) dx < \infty$ and the other is *display* mode, i.e.,

$$\int_0^1 f^2(x) dx < \infty$$

To typeset in inline math mode, one encloses the mathematics inline with the other text by using a single dollar sign \$ to delimit the beginning and the end of the math content. To typeset in display math mode, one can use double dollar signs \$\$ to delimit the beginning and the end of the math content.

Typesetting Math, contd.

The inline mode mathematics from the previous slide was typeset with:

```
\int_0^1 f^2(x) \; dx < \infty
```

and the display mode mathematics was typeset with:

```
$$  
\int_0^1 f^2(x) \; dx < \infty  
$$
```

Note that the display math mode can be accessed by using the **equation** environment (if numbering required) or the **equation*** environment (no numbering required, identical to `$$... $$`).

Comments

- THE reference for \LaTeX is:
Michel Goossens, Frank Mittelbach and Alexander Samarin. The LaTeX Companion. Addison-Wesley, 1993.
- There is much information available on the web. Specifically one should browse this site:
`http://www.loria.fr/services/tex/english/index.html`
- Check out also `http://www.math.utk.edu/TeX` for links to sites with more information.
- A very good quick online help is located here:
`http://tex.loria.fr/general/latex2e.html`
- Do not be afraid of using \LaTeX . The more you use it, the more comfortable you will be.