AMTH250 Lecture 4

LaTeX – Special Topics

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4 Special Topics

4.1 Figures and Tables

4.1.1 Placement

Figures and tables generally cannot be broken up, so LaTeX has a problem whenever it starts a figure or table and reaches the end of a page before that figure or table is finished. In such a case, the figure or table will be held over until the page is finished. You might also actually prefer a figure or table to appear at either the top or bottom of a page. Figures and tables are referred to as **floats** in LaTeX.

The `figure` and `table` environments have an additional placement specifier, which indicates the allowable placements of the float. These are

1. `h` for *here*
2. `t` for *top* of a page
3. `b` for *bottom* of a page
4. `p` for a special *page* containing only floats
5. `!` for *try really hard* to follow my placement

A figure could be started, for example, by

```
\begin{figure}[!ht]
```

which tells LaTeX to try hard to place the figure here, or if that is not possible at the top of a page.

The placement of floats is a common problem with LaTeX, see NSSI §2.12 for more information on this.

4.1.2 Tables

The `table` environment is quite distinct form the `tabular` environment, although the latter is often used within the `table` environment. For small tables there is usually no problem with placement, but larger tables should always be enclosed in a `table` environment.

Example:

This example simply takes the table from Lecture 4 and encloses it in a `table` environment.

```
\begin{table}[!ht]
  \begin{center}
    \begin{tabular}{|l||cl|}
      \hline
      Name & Date & Formula \\
      \hline
      Newton   & 1687 & $F = m a$ \\
      Einstein & 1905 & $E = m c^2$ \\
      \hline
    \end{tabular}
  \end{center}
\end{table}
```

Name	Date	Formula
Newton	1687	$F = ma$
Einstein	1905	$E = mc^2$

4.1.3 Captions

Captions can be added to floats with the `\caption` command. The caption can be made to appear at either the top or bottom of the float by the placement of the `\caption` command. Figures and tables are numbered and can be referenced using `\label` and `\ref` as explained in §3.1.1.

Example:

```
\begin{table}[!ht]
  \caption{Physics Formulas} \label{tbl:physics}
  \begin{center}
    \begin{tabular}{|l||cl|}
      \hline
      Name & Date & Formula \\
      \hline
      Newton   & 1687 & $F = m a$ \\
      Einstein & 1905 & $E = m c^2$ \\
      \hline
    \end{tabular}
  \end{center}
\end{table}

Two famous formulas from physics are shown are shown in
Table \ref{tbl:physics}.
```

Table 1: Physics Formulas

Name	Date	Formula
Newton	1687	$F = ma$
Einstein	1905	$E = mc^2$

Two famous formulas from physics are shown are shown in Table 1.

4.2 Including Graphics

Figures typically contain graphics from other sources. The most common format for graphics is eps (encapsulated postscript) which can easily be incorporated into .ps documents. Scilab and most other programs producing graphs can save graphs in this format (as a `.eps` file).

Graphics in .pdf format can be easily incorporated into .pdf documents (using pdflatex).

There are a number of ways of including graphics in LaTeX, we will use the `graphicx` package, so you will need to include

```
\usepackage{graphicx}
```

in the preamble.

Example:

This example shows how to include an eps file from Scilab called `brown.eps`:

```
\begin{figure}[!ht]
  \begin{center}
    \includegraphics[angle=270, width=0.7\textwidth]{brown.eps}
    \caption{Brownian Motion}
  \end{center}
\end{figure}
```

The `\includegraphics` command has the following optional controls

`width`	scale to specified width
`height`	scale to specified height
`angle`	rotate counterclockwise
`scale`	scale

For `.eps` files from different sources, you usually need to experiment with these to get things right.

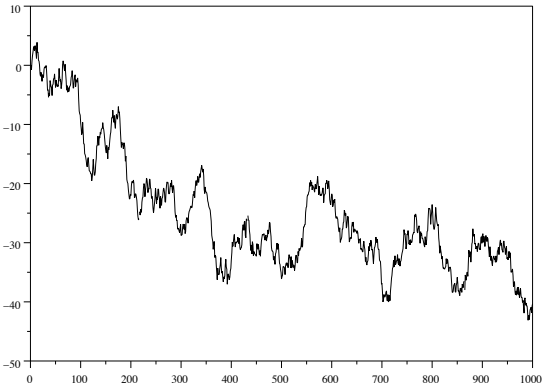

Figure 1: Brownian Motion

In the example above we used `angle=270` because Scilab graphs are presented in landscape form and `width=0.7\textwidth` to scale so that its width is 0.7 times the width of the text on the page.

When a graph won't appear where you want it to it is usually because the graph is too large to fit in the available space. Often scaling can be used to shrink the graph so that it fits into the available space.

4.3 Bibliographies

Bibliographies can be produced using the `thebibliography` environment. Items in the bibliography begin with the `\bibitem` command (similar to `\item` in list environments) followed by a marker which can then be used with the `\cite` command to refer to the bibliographic item. Bibliographies are placed at the end of documents (and headed References in the `article` document class). For large bibliographies it is worth learning about the `bibtex` package.

The bibliography at the end of this lecture was produced by:

```
\begin{thebibliography}{99}
  \bibitem{NSSI} Tobias Oetiker et. al. \emph{The Not So
     Short Introduction to \LaTeXe{}}.
  \bibitem{AMSM} American Mathematical Society,
    \emph{User's Guide for the \texttt{amsmath} Package}.
\end{thebibliography}
```

The `{99}` in this example tells LaTeX that no bibliographic item numbers will be *no wider* than the number 99.

The following shows how bibliographic items can be cited:

Example:

```
Equations can be aligned using either the \texttt{eqnarray}
environment, see \cite{NSSI} \S3.5, or the \texttt{align}
environment, see \cite{AMSM} \S3.6.
```

Equations can be aligned using either the `eqnarray` environment, see [1] §3.5, or the `align` environment, see [2] §3.6.

4.4 Macros

Macros are used to extend LaTeX. These include `\newcommand` for defining new commands, `\newenvironment` for defining new environments. The `amsmath` package has `\DeclareMathOperator` for defining new maths operators like `\cos`.

A typical use is when we need to repeat a LaTeX construction a number of times. Including such a construction as a macro has the advantages of (a) often saving typing, and (b) ensuring the construction is done exactly the same way every time.

It is good practice to collect all macros together, either at the beginning of the document or in a separate file included with an `\include` command. See NSSI §6.1 for more on macros.

Example:

Suppose we want to write "Schrödinger equation" many times in a document. We define a new command `\Seqn` do this:

```
\newcommand{\Seqn}{Schr\"{o}dinger equation}
```

Now we can use the `\Seqn` command, but we have to be careful to follow it immediately by `{}` to get spacing correct.

```
The \Seqn{} is the basis of quantum mechanics.
```

The Schrödinger equation is the basis of quantum mechanics.

References

[1] Tobias Oetiker et. al. *The Not So Short Introduction to LaTeX 2ε*.

[2] American Mathematical Society, *User's Guide for the amsmath Package*.