LaTeX Course 2011

Part 2: Logical commands

Arho Virkki

VTT Technical Research Centre of Finland

Logical commands

The document is described in abstract level. Logical command define, for example,

- sections (`\section{foo}`),
- environments (`\begin{frame}`),
- emphasis (`\emph{observe}`),
- ...

and the interpretation of these commands is controlled by the style sheet (.sty) and it depends, of course, also on the media (.pdf document, .pdf slides or .html page).

Observe that LaTeX was first introduces in 1985 as an extension for TeX (first released in 1978), and HTML5/CSS3, copying the same idea, is called the "future of the web" (as of 2011).

What this means?

Setting the style by hand is not a good idea[1].

Avoid:

```
\textbf{Backround}\\[3mm]
In the future, one of the most striking
challenges will be...
```

Instead, use:

```
\section{Backround}
In the future, one of the most striking
challenges will be...
```

[1] Compare this with doing . . . in an html document instead of using <emph> and defining that environment properly in the cascading style sheet (css)!

What this also means?

- LaTeX is a sophisticated, and thus also a bit involved environment.
- You should be writing scratch files in plain text (or with paper and pencil – and then feed the papers into scanner to archive them).
- Nevertheless, I use LaTeX to write down the potential ideas still being immature for publication just to make them clean.

Headings

The levels of headings are

-1	`\part{}`
0	`\chapter{}`
1	`\section{}`
2	`\subsection{}`
3	`\subsubsection{}`
4	`\paragraph{}`
5	`\subparagraph{}`

Headings...

- The levels `\part{}` and `\chapter{}` are not used with all document types. These command are used mostly in books.
- Ending command (analog to ending tag) is not needed[2].
- Command `\setcounter{secnumdepth}{n}` $n \in 0, \ldots, 5$ defines the extent of explicit numbering (in front of the headings).

[2] This is in contrast to XML, where the elements always consist of the starting and ending tag and the content between them. For example, `<tag>` must be ended with `<\tag>`.

Environments

The most common environments are `equation`, `displaymath` and `itemize`. Suppose that `end1` and `env2` are two environments. Then

```
\begin{env1}
   ...
   \begin{env2}
   ...
   \end{env2}
\end{env1}
```

is legal. Observe that the environments need to be nested: `env1` can not end before `env2`.

Environments: Lists

```
\begin{enumerate}
\item one
\item two
\end{enumerate}
\begin{itemize}
\item[+] pros
\item[--] cons
\end{itemize}
```

yields

1. one
2. two

+ pros
– cons

Environments: Plain text

```
\begin{verbatim}
  o o
   *
  \_/
\end{verbatim}
```

produces

```
  o o
   *
  \_/
```

Environments: Plain text...

Source code listings are convenient to include with `\verbatiminput{myprog.f90}`.

For algorithm, one should use an environment that can emphasize the keywords.[3]

[3] This is a good example of an exercise for this course: Find a package for this and describe how it is used.

Environments: Text alignment

`center`:

$$\sum$$

`flushright`:

$$\sum$$

`flushleft`:

$$\sum$$

Environments: Text alignment...

```
\begin{center}
KYNTTILÄT SYTTYVÄT VARHAIN\bigskip

Kiertävät unettavat auringonnousut\\
Kaikkialle harsona niin\\
Aattoni vähiin käynyt\\
Kun kevät uutena nousee\\
\dots
\end{center}
\begin{flushright}
\emph{-- Kuusumun profeetta}
\end{flushright}
```

Environments: Text alignment...

KYNTTILÄT SYTTYVÄT VARHAIN

Kiertävät unettavat auringonnousut
Kaikkialle harsona niin
Aattoni vähiin käynyt
Kun kevät uutena nousee
...

– Kuusumun profeetta

Environments: Text alignment...

The 'quote' environment is rather basic – but it works.

```
\begin{quote}
He has a profound respect for old age.
Especially when it's bottled.
--- Gene Fowler
\end{quote}
```

> *He has a profound respect for old age. Especially when it's bottled. — Gene Fowler*

The command `quotation` works better for longer quotations.

Environments: Table

```
\begin{tabular}{|l|c|c|}
\hline
Name & J. Foo & G. Bar \\
\hline
\hline
A-score & 1 & 3 \\
B-score & -2 & 0 \\
\hline
```

Environments: Table...

Name	J. Foo	G. Bar
A-score	1	3
B-score	-2	0

Somehow this looks shomehow crowded... Let's change the title into

```
\rule[-4pt]{0pt}{16pt}Nimi & J. Foo & G. Bar \\
```

Environments: tabular...

Name	J. Foo	G. Bar
A-score	1	3
B-score	-2	0

We extended the borders of the table with a line of with zero.

The LaTeX tables are, to be honest, rather clumsy. This is not a problem if we can generate them automatically (e.g. from the R language using the xtable package).

Environments: Custom definitions

Let us define an environment than adds automatically a box at the end of a proof, and writes the title 'New Proof.' in the beginning:

```
\newenvironment{newproof}
{\makebox[2cm][l]{\textbf{New Proof.\ }}}
{\hfill $\Box$}
```

Environments...

```
\begin{newproof}
Suppose that $\epsilon > 0$ is already
chosen,\dots
\end{newproof}
```

New Proof. Suppose that $\epsilon > 0$ is already chosen, ... □

Environments...

The general form of the environment definition:

```
\newenvironment{name}[args]{begdef}{enddef}
```

or

```
\renewenvironment{name}[args]{begdef}{enddef}
```

if we wish to re-define an existing environment.

Environments...

These exists a command for stating lemmas:

```
\newtheorem{command name}{theorem name}[counter]
```

For example,

```
\newtheorem{newlemma}{Lemma}[page]

\begin{newlemma}[The Professors' Remainder
Theorem]
If we use half of the time left for each
exercise, we can deal with an infine number
of exercises.
\end{newlemma}
```

Environments...

Lemma (The Professors' Remainder Theorem)

If we use half of the time left for each exercise, we can deal with an infine number of exercises.

Let us further inspect the command:

```
\newtheorem{newlemma}{Lemma}[page]
```

where the numbering was set to follow the `page` counter. Thus, (if this was an article and not a slideshow) all formulas are numbered as

(page,lemma)

Environments...

```
\newtheorem{mynote}{Note!}
\begin{mynote}
Huom\dots
\end{mynote}
```

Note!

Notes lose their meaning if there are too many of them, or the notes are self-evident.

Environments...

Note!

LaTeX has lots of counters that can be cited with the command `\the<counter_name>`*:*

```
We are on slide \thepage.
```

We are on slide 24.

Environments: Summary

Remember the commands

- `\newcommand` and
- `\newtheorem`.

Details can be found from books or on-line help systems.

You can inspect e.g. http://en.wikibooks.org/wiki/LaTeX,
or by typing the command name into Google — which seems to be a reasonable default procedure for anything nowadays.

Commands

If we need a simple command, e.g. `\warning{text}`, one can define

```
\newcommand{\warning}[1]{%
\begin{center}
\Large
\shadowbox{
\textbf{#1}}
\end{center}
}
```

Commands...

Now, the command

```
\warning{orthogonal vectors $\neq$
orthonormal vectors}
```

produces

orthogonal vectors $\neq$ orthonormal vectors

Observations

- `\shadowbox{}` is from the package `fancybox`. There are tons of similar useful and less useful packages available at the Comprehensive TeX Archive Network (CTAN).
- To define new high level logical commands, one of course needs to know something about the low level LaTeX "programming".