Scientific Computing 372

LaTeX: Section 5

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Last updated: 12 February 2015

Admin

Schedule

1. Introduction and setting text
2. Setting mathematics
3. Standard environments
4. Tables and figures
5. Boxes and new environments
6. $\mathcal{AMS}$-LaTeX
7. Beamer and PGF

Little boxes

L–R boxes

- L–R means left-to-right, won't break into paragraphs
- Use \makebox[⟨width⟩][⟨alignment⟩]{⟨contents⟩}

Example

```
A \makebox[3cm]{centre} aligned box. \\
A \makebox[3cm][l]{left} aligned box. \\
A \makebox[3cm][r]{right} aligned box. \\
```

A   centre   aligned box.
A left   aligned box.
A   right aligned box.

Little boxes

Example (Keeping it together)

- Use \mbox{⟨contents⟩}

```
Compare $|x - erff|/2$,
for example, with $|x -
\mbox{erff}|/2$.
```

Compare $|x - erff|/2$, for example, with $|x - \mathrm{erff}|/2$.

Example (Raising or lowering it)

- Use \raisebox{⟨distance⟩}{⟨contents⟩}

```
It is very easy to slightly
\raisebox{2mm}{\em raise
text} (a split infinitive!)
or \raisebox{-2mm}{lower
text}, really.
```

It is very easy to slightly *raise text* (a split infinitive!) or *lower text*, really.

Framing it

Framed boxes

- Use \framebox[⟨width⟩][⟨alignment⟩]{⟨contents⟩}

Example

```
A \framebox[3cm]{centre} framed box. \\
A \framebox[3cm][l]{left} framed box. \\
A \framebox[3cm][r]{right} framed box. \\
```

A | centre | framed box.
A | left | framed box.
A | right | framed box.

Drawing rules

Rules

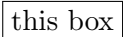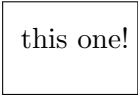- Use \rule[⟨distance⟩]{⟨x dimension⟩}{⟨y dimension⟩}

Example

```
Rule 1: \rule{1mm}{5mm} Rule 2: \rule[4mm]{20mm}{3mm}
Rule 3: \rule[-4mm]{30mm}{5mm}
```

Rule 1: ▮ Rule 2: ▬▬▬▬ Rule 3: ▬▬▬▬▬▬▬

Example (Rules with zero height or width)

Compare ⎢this box⎥ with ⎢ this one! ⎥

The trick: \framebox{\rule[-0.5mm]{0cm}{1cm} this one!}

Paragraph boxes

Paragraph boxes

- Use \parbox[⟨alignment⟩]{⟨width⟩}{⟨contents⟩}
- Allows normal text flow, unlike LR boxes

Example

```
\parbox[b]{4cm}{This paragraph box is aligned by its
bottom line,} \hfill while \hfill
\framebox{\parbox[t]{5cm}{this framed one is aligned
by its top line.}}
```

This paragraph box is
aligned by its bottom
line,   while | this framed one is aligned by
                                        | its top line.

Saving it for later

Saved boxes

- Declare the box with `\newsavebox{\`⟨box name⟩`}`
- Save contents with `\savebox{\`⟨box name⟩`}[\verb`⟨width⟩`{`⟨contents⟩`}`
- Place with `\usebox{\`⟨box name⟩`}`
- Note the slash \ before the box name

Example

```
\newsavebox{\bugs}
\savebox{\bugs}[4cm]{flies and mosquitoes}
Bugs like \usebox{\bugs} are everywhere
in Mpumalanga.
```

Bugs like   flies and mosquitoes   are everywhere in Mpumalanga.

Citing works

Bibliographies and Citations

- Two ways of handling bibliographies
  1. Employ BibTeX, an external program
     - Use `\bibliography{`⟨bib file⟩`}`
     - ⟨bib file⟩ is a specially-formatted file with the `.bib` extension
  2. Use `thebibliography` environment
     - Has a mandatory argument for the width of the key: LaTeX computes the boxed width of this argument, so use 0 for up to 9 references, 00 for up to 99, etc.
     - Use `\bibitem{`⟨key⟩`}` ⟨reference⟩ to list works
- Both methods declare a *citation key* for each reference
- Use `\cite[`⟨note⟩`]{`⟨key list⟩`}` to cite works, where
  - ⟨note⟩ is a note, e.g., page numbers
  - ⟨key list⟩ is a comma-separated subset of the available reference keys

Citing works

Example (Doing it youself)

```
Two of my favourite text books \cite{cohn,griffiths} agree that
\ldots.
\begin{thebibliography}{0}
\bibitem{cohn}  P. M. Cohn.  2003.  \emph{Basic Algebra: Groups,
Rings and Fields}.  Berlin: Springer-Verlag.
\bibitem{griffiths}  David J. Griffiths.  1999.
\emph{Introduction to Electrodynamics}.  Third Edition.  Upper
Saddle River, NJ: Prentice Hall.
\end{thebibliography}
```

Two of my favourite text books [1, 2] agree that . . . .

[1] P. M. Cohn. 2003. *Basic Algebra: Groups, Rings and Fields.* Berlin: Springer-Verlag.

[2] David J. Griffiths. 1999. *Introduction to Electrodynamics.* Third Edition. Upper Saddle River, NJ: Prentice Hall.

Citing works

Example (BIBTEX file format)

```
@ARTICLE{bachA,
   author = {A {Bachem} and W {Hochstattler} and M {Mallich}},
   title = {The simulated trading heuristic for vehicle routing
   problems},
   journal = {Discrete Applied Mathematics},
   volume = {65(1--3)},
   pages = {47--72},
   month = {March},
   year = {1993} }
@INBOOK{antTSP,
   author = {Marco {Dorigo} and Thomas {Stutzle}},
   chapter = {\textit{Chapter 9: The Ant Colony Optimization
   Metaheuristics: Algorithms, Applications, and Advances}},
   title = {Handbook of Metaheuristics},
   pages = {250--285},
   year = {2003},
   publisher = {Springer New York} }
```

New commands

Defining new commands

- Use `\newcommand{`⟨name⟩`}[`⟨number of arguments⟩`]{`⟨text⟩`}`
- ⟨name⟩ must start with \
- To "place" arguments in ⟨text⟩, use #⟨number⟩
- In general, use `\newcommand` only in the preamble

Example

```
\newcommand{\vlong}{very long, silly piece of text}
\newcommand{\der}[2]{$\frac{d#1}{d#2}$}
A \vlong\ sometimes precedes a derivative, where the
latter might be \der{x}{y} or \der{\phi}{t}.
```

A very long, silly piece of text sometimes precedes a derivative, where the latter might be $\frac{dx}{dy}$ or $\frac{d\phi}{dt}$.

New environments

Defining new environments

- \newenvironment{⟨name⟩}{⟨begin text⟩}{⟨end text⟩}
- ⟨name⟩ has *no* \
- Use like any other environment
- In general, use \newenvironment only in the preamble

Example

```
\newenvironment{emitemize}{\begin{itemize} \em}
{\end{itemize}}
\begin{emitemize}
\item First emphasised item
\item Second emphasised item
\end{emitemize}
```

- *First emphasised item*
- *Second emphasised item*

New theorems

New (numbered) theorem-like environments

- `\newtheorem{`⟨name⟩`}{`⟨caption⟩`}[`⟨numbered within⟩`]`
- `\newtheorem{`⟨name⟩`}[`⟨numbered like⟩`]{`⟨caption⟩`}`
- In general, use `\newtheorem` only in the preamble

Example

```
\newtheorem{theorem}{Theorem}
\newtheorem{guess}[theorem]
{Conjecture}
\begin{guess}[Wiles, 1985]
There do exist integers
$n>2$, $x$, $y$, and $z$ such
that $x^{n} + y^{n} = z^{n}$.
\end{guess}
\begin{theorem}[FLT]
There are no integers $n>2$,
$x$, $y$, and $z$ such that
$x^{n} + y^{n} = z^{n}$.
\end{theorem}
```

Conjecture 1 (Wiles, 1985)
There do exist integers $n > 2$, x, y, and z such that $x^n + y^n = z^n$.

Theorem 2 (FLT)   *There are no integers $n > 2$, x, y, and z such that $x^n + y^n = z^n$.*

Conjecture 3   *Don't count your chickens before they hatch.*

Setting counters

Counters

- \newcounter{⟨counter⟩}[⟨within⟩]
- \setcounter{⟨counter⟩}{⟨number⟩}
- \addtocounter{⟨counter⟩}{⟨number⟩}
- Use \the⟨counter⟩ to print the counter value
- Format with \arabic, \roman, \Roman, \alph, and \Alph

Example

```
\newcounter{bean} \setcounter{bean}{13}
\renewcommand{\thebean}{\Roman{bean}-\arabic{bean}}
This is bean \thebean.  \addtocounter{bean}{4}
This is bean \thebean\ now.
```

This is bean XIII-13.   This is bean XVII-17 now.

Setting lengths

Lengths

- \newlength{⟨command⟩}
- \setlength{⟨command⟩}{⟨length⟩}
- \settowidth{⟨command⟩}{⟨text⟩}

Example

```
\newlength{\play} \setlength{\play}{3cm}
Here is some \hspace{\play} space. \\
\settowidth{\play}{Pythagoras}
We use the theorem of \hspace{\play} to calculate\ldots. \\
\settowidth{\play}{We use the theorem of}
\hspace*{\play} Pythagoras
```

Here is some   space.
We use the theorem of   to calculate. . . .
                         Pythagoras