Creating Tables

Petra Harwin

November 12, 2012

Contents

1 Constructing tables

The `tabular` environment is the basic tool by which tables are produced. Its syntax is
`\begin{tabular}[pos]{cols} rows \end{tabular}`
The meaning of the arguments are as follows:

`pos` Vertical positioning argument. It can take values

- `t` the top line of the table is aligned with the baseline of the external text;
- `b` the bottom line of the table is aligned with the external baseline;

with no positioning argument given, the table is centred on the external baseline.

`cols` The column formatting argument. There must be an entry for each column but extra entries may be added for the left and right borders of the table or for the intercolumn spacings.

l, r, c These column formatting symbols make the contents left justified, right justified and centred respectively.

p{width} This column formatting symbol produces a column of the specified width in which paragraphs may be typed. (Wrap-around is automatic.)

| || Draw one and two vertical lines respectively and are used to create the left and right borders to columns.

`*{num}{cols}` The column format contained in `cols` is reproduced `num` times, so that `*{5}{|c}|` produces `|c|c|c|c|c|`.

For example, the code

```
\begin{tabular}{r|c|l}
rows
\end{tabular}
```

produces a table with three columns separated by vertical lines. The contents of the columns are right justified, centred and left justified respectively.

The rows contain the entries in the table, each horizontal row being terminated with \\. These rows consist of entries separated from each other by `&` symbols. Each row in the table must contain the same number of entries as are specified in the column formatting argument `cols`.

To separate rows with horizontal lines the `\hline` command is used. It may only appear before the first row or immediately after a row termination \\. `\hline` draws a horizontal line the full width of the table directly below the row it follows. Two `\hline` commands one after another will draw two horizontal lines with a little space between them.

1.1 Some simple tables

Bifurcation branch	Value at which $\|V\|_\infty = 1$	Turning point
p_0	$p = 28.832$	$p = 71.572$
p_1	$p = 10.587$	$p = 25.501$
p_2	$p = 3.795$	$p = 7.051$

The code used to generate this was

```
\begin{tabular}{|c|c|c|}
\hline
Bifurcation branch & Value at which
```

```
$\|V\|_\infty=1$ & Turning point\\ \hline
$p_0$ & $p=28.832$ & $p=71.572$\\ \hline
$p_1$ & $p=10.587$ & $p=25.501$\\ \hline
$p_2$ & $p=3.795$ & $p=7.051$\\ \hline
\end{tabular}
```

Bifurcation branch	Value at which $\|V\|_\infty = 1$	Turning point
p_0	$p = 28.832$	$p = 71.572$
p_1	$p = 10.587$	$p = 25.501$
p_2	$p = 3.795$	$p = 7.051$

The code used to generate this was

```
\begin{tabular}{||c|c|c||}
\hline\hline Bifurcation branch & Value at which
$\|V\|_\infty=1$ & Turning point\\
\hline $p_0$ & $p=28.832$ & $p=71.572$\\
\hline $p_1$ & $p=10.587$ & $p=25.501$\\
\hline $p_2$ & $p=3.795$ & $p=7.051$\\
\hline\hline
\end{tabular}
```

1.2 Positioning

The two tables we've just seen were typeset in their own paragraph with no positioning argument specified. If we specify `pos` we get the following results.

With `pos` set to `t` for top we get

A table
with two rows

With `pos` set to `b` for bottom we get

A table
with two rows

With `pos` not given we get

A table
with two rows

1.3 Repeated entries

If you have a table where all the entries in one column are the same then you can take advantage of the `@{text}` command. This command is placed instead of a column formatting symbol and inserts `text` in every row of the specified column. Note that the format of the row entries will now change - LaTeX will need one less `&` character in each row since it will automatically deal with the column of `@{text}`. For example, the table

1	Maths Postgrads	33	19	13	1	66:31	51:15
2	Team Bath	33	18	9	6	65:37	45:21

was produced using the code

```
\begin{tabular}
{|r|l|@{\hspace{0.2cm}33\hspace{0.2cm}}|rrr|c|c|}
\hline
1&Maths Postgrads&19&13&1&66:31&51:15\\ \hline
2&Team Bath&18&9&6&65:37&45:21\\ \hline
\end{tabular}
```

Note that the `@{text}` creates a column with no extra spacing around the text. If extra spacing is required then the horizontal spacing command `\hspace` must be used.

1.4 Unequal columns

Sometimes you may require one entry in a table to occupy multiple columns. This can be achieved by using the `\multicolumn` command. Its syntax is

`\multicolumn{num}{col}{text}`

This command combines the following `num` cells into a single cell. The argument `col` contains exactly one of the positioning symbols `l`, `r` or `c` and may contain vertical lines `|`. The `multicolumn` command may only be used at the start of a row or immediately after a column separation symbol `&`.

1.4.1 Examples

5-a-side football results						
	Club	W	T	L	Goals	Points
1	Maths Postgrads	19	13	1	66:31	51:15
2	Team Bath	18	9	6	65:37	45:21

This was produced using the code

```
\begin{tabular}{|r|l|rrr|r@{:}l|r@{:}l|}\hline
\multicolumn{9}{|c|}{\bfseries 5-a-side football results}
\\ \hline
&Club&W&T&L&\multicolumn{2}{c|}{Goals}
&\multicolumn{2}{c|}{Points}\\ \hline\hline
1&Maths Postgrads &19&13&1&66&31&51&15\\ \hline
2&Team Bath &18&9&6&65&37&45&21\\ \hline
\end{tabular}
```

Note that multicolumn doesn't count columns created by the `@{text}` command in its argument `num`. Thus to combine a single entry with a following `@{text}` entry use `\multicolumn{1}{col}{text}` *before* the entry you wish to combine with the `@{text}` entry.

5-a-side football results							
	Club	W	T	L	test	Goals	Points
1	Maths Postgrads	19	13	1	66:31		51:15
2	Team Bath	18	9	6	65:37		45:21

This was produced using the code

```
\begin{tabular}{|r|l|rrr|r@{:}l|r@{:}l|}\hline
\multicolumn{9}{|c|}{\bfseries 5-a-side football results}\\ \hline
&Club&W&T&L&\multicolumn{1}{c|}{test}&Goals
&\multicolumn{2}{c|}{Points}\\ \hline\hline
1&Maths Postgrads &19&13&1&66&31&51&15\\\hline
2&Team Bath &18&9&6&65&37&45&21\\\hline
\end{tabular}
```

(There is no way to combine an `@{text}` entry with a cell following it. This is because `@{text}` is treated as being appended to the column it follows.)

`@{text}` expressions are particularly useful if you want numerical values to line up about the decimal point. Simply use `r@{.}l` in the appropriate column.

The table

x_n	y_n
1	1.10
2	7.792
3	12.19

was produced using the code

```
\begin{tabular}{c|r@{.}l}
$x_n$&\multicolumn{2}{c}{$y_n$}\\\hline
1&1&10\\
2&7&792\\
3&12&19\\
\end{tabular}
```

1.5 `\vline`, `\cline` and `\raisebox`

- The `\vline` command draws a vertical line with the height of the row at the point at which it appears. In this way, vertical lines that do not extend the whole height of the table may be inserted.

- `\cline{n-m}` draws a horizontal line from the left side of column `n` to the right side of column `m`. Like `\hline` it may only be given just after a row termination and they may be combined. For example, `\cline{1-3} \cline{5-7}` draws two horizontal lines, one from column 1 to column 3 and one from column 5 to column 7.

- `\raisebox{lift}[height][depth]{text}` produces a box with the contents text, raised above the current baseline by an amount `lift` (in the units `ex`). If `lift` is negative then the box is lowered. The optional arguments tell LaTeX to treat the box as though its extension above the baseline were `height` and that below were `depth` (if they are not given then the contents of the box determine its dimensions).

1.5.1 An example

Now we can produce tables that look like this:

Day	6.15pm-7.15pm		7.20pm-8.20pm		8.30pm-9.30pm	
	Subj.	Teacher	Subj.	Teacher	Subj.	Teacher
		Room		Room		Room
Mon	UNIX	Dr. Smith	Fortran	Ms. Clark	Math.	Mr. Mill
		Hall B		Hall A		Hall A
Tue	LaTeX	Ms. Baker	Fortran	Ms. Clark	Math.	Mr. Mill
		Hall B		Hall A		Hall A

This was generated using the following code.

```
\begin{tabular}{|l||c|l|c|l|c|l|}\hline
&\multicolumn{2}{c|}{6.15pm-7.15pm}
&\multicolumn{2}{c|}{7.20pm-8.20pm}
&\multicolumn{2}{c|}{8.30pm-9.30pm}\\ \cline{2-7}
&&Teacher&&Teacher&&Teacher\\ \cline{3-3}\cline{5-5}\cline{7-7}
\raisebox{1.5ex}[0pt]{Day}&\raisebox{1.5ex}[0pt]{Subj.}&Room
&\raisebox{1.5ex}[0pt]{Subj.}&Room
&\raisebox{1.5ex}[0pt]{Subj.}&Room\\\hline\hline
&&Dr. Smith&&Ms. Clark&&Mr. Mill\\
\cline{3-3}\cline{5-5}\cline{7-7}
\raisebox{1.5ex}[0pt]{Mon}&\raisebox{1.5ex}[0pt]{UNIX}
&Hall B&\raisebox{1.5ex}[0pt]{Fortran}&Hall A
&\raisebox{1.5ex}[0pt]{Math.}&Hall A\\\hline
&&Ms. Baker&&Ms. Clark&&Mr. Mill\\
\cline{3-3}\cline{5-5}\cline{7-7}
\raisebox{1.5ex}[0pt]{Tue}&\raisebox{1.5ex}[0pt]{\LaTeX}
&Hall B&\raisebox{1.5ex}[0pt]{Fortran}&Hall A
&\raisebox{1.5ex}[0pt]{Math.}&Hall A\\\hline
```

```
\end{tabular}
```

2 A drawback of the tabular environment and a solution

One drawback of the tabular environment is that it produces a table at the place in the text where it appears. This is frequently exactly what you want. However, if the table is so long that it doesn't fit on the current page, the page is ended and the next page begins with the table followed by any subsequent text. This can lead to far too much blank space on one page. It would be better if the table were only inserted into the immediate text if there was enough room for it on the current page, else the text should continue and the table should be inserted at the top of the next page (or in some other appropriate place).

2.1 The table environment

The solution to this is to use the `table` environment. Its syntax is
`\begin{table}[where] head_text table foot_text \caption{text}\label{label}\end{table}`
where `table` is the contents of the `tabular` environment, `head_text` is the header of the table, `foot_text` is the footer the table (these may be left blank), `where` is the optional positioning argument, `\caption{text}` puts `text` as a caption for the table and `\label{label}` allows us to refer to the table using the command `\ref{label}`.

The positioning argument `pos` can be given as one of `h`,`t`,`b` or `p` (here, top, bottom or page). `h` tries to put the table where it appears, `t` puts it at the top of this page or at the top of the next available page, `b` works like `t` but for bottom and `p` puts the table on its own page.

2.1.1 An example without a caption

This example with no caption was produced using the code following it.

```
\begin{table}[h]
{\bfseries Primary Energy Consumption}\\
\begin{tabular}{ll|r@{.}lr@{.}lr@{.}l}\hline
\multicolumn{2}{l|}{Energy Source}&\multicolumn{2}{c}{1975}
&\multicolumn{2}{c}{1980}&\multicolumn{2}{c}{1986}\\ \hline
\multicolumn{2}{l|}{Total Consumption}\\
\multicolumn{2}{l|}{In millions of tons BCU}
&347&7&390&2&385&0\\
\multicolumn{2}{l|}{of which (percentages)}\\
&petroleum &52&1&47&6&43&2\\
&bituminous coal &19&1&19&8&20&0\\
```

Primary Energy Consumption

Energy Source	1975	1980	1986
Total Consumption			
In millions of tons BCU	347.7	390.2	385.0
of which (percentages)			
petroleum	52.1	47.6	43.2
bituminous coal	19.1	19.8	20.0
brown coal	9.9	10.0	8.6
natural gas	14.2	16.5	15.1
nuclear energy	2.0	3.7	10.1
other	2.7	2.3	3.0

Source: Energy Balance study group, Essen 1987.

```
&brown coal &9&9&10&0&8&6\\
&natural gas &14&2&16&5&15&1\\
&nuclear energy &2&0&3&7&10&1\\
&other &2&7&2&3&3&0\\\hline
\end{tabular}\\
\emph{Source:} Energy Balance study group, Essen 1987.
\end{table}
```

2.1.2 An example with a caption

Energy Source	1975	1980	1986
Total Consumption			
In millions of tons BCU	347.7	390.2	385.0
of which (percentages)			
petroleum	52.1	47.6	43.2
bituminous coal	19.1	19.8	20.0
brown coal	9.9	10.0	8.6
natural gas	14.2	16.5	15.1
nuclear energy	2.0	3.7	10.1
other	2.7	2.3	3.0

Source: Energy Balance study group, Essen 1987.

Table 1: **Primary Energy Consumption**

Table 1 was produced using the following code. The `\centering` command centers the table.

```
\begin{table}[h]
\centering
\begin{tabular}{ll|r@{.}lr@{.}lr@{.}l}\hline
\multicolumn{2}{l|}{Energy Source}&\multicolumn{2}{c}{1975}
&\multicolumn{2}{c}{1980}&\multicolumn{2}{c}{1986}\\ \hline
\multicolumn{2}{l|}{Total Consumption}\\
\multicolumn{2}{l|}{In millions of tons BCU}
&347&7&390&2&385&0\\
\multicolumn{2}{l|}{of which (percentages)}\\
&petroleum &52&1&47&6&43&2\\
&bituminous coal &19&1&19&8&20&0\\
&brown coal &9&9&10&0&8&6\\
&natural gas &14&2&16&5&15&1\\
&nuclear energy &2&0&3&7&10&1\\
&other &2&7&2&3&3&0\\\hline
\end{tabular}\\
\emph{Source:} Energy Balance study group, Essen 1987.
\caption{{\bfseries Primary Energy Consumption}}
\label{OurTable}
\end{table}
```

"The information is contained in Table 1" is then produced by ``The information is contained in Table \ref{OurTable}''.

3 The `longtable` environment

If you have a table that is too long to fit onto one page then using the `longtable` environment allows page breaks to occur. This environment also differs from the normal tabular environment in that headers and footers for each page can be specified. To use it you must include the line `\usepackage{longtable}` in the preamble. The basic syntax for the longtable environment is very similar to that of the tabular environment and is as follows.

```
\begin{longtable}[align]{cols} rows \end{longtable}
```

The difference is that this time the optional argument `align` specifies the *horizontal* alignment of the table. The argument may have the value `l`, `r` or `c` for left, right and centre alignment of the table respectively.

The `longtable` environment allows you to specify header and footer rows for each page as well as a different header row for the first page and a different footer row for the last page. This is done using the commands `\endfirsthead`, `\endhead`, `\endfoot` and `\endlastfoot`. They are used as follows

```
\begin{longtable}{cols}
Column headers on the first page\\
\endfirsthead
Column headers on each page except the first\\
\endhead
Column footers on each page except the last\\
\endfoot
Column footers on the last page\\
\endlastfoot
normal row entries...
\end{longtable}
```

If \endfirsthead and \endlastfoot are not specified then their contents are set equal to \endhead and \endfoot respectively.

3.1 An example

The table that follows was produced using the following code. (Note where the caption and label are placed.)

```
\begin{longtable}{|l|l|l|}
\caption{Feasible triples for
highly variable Grid, MLMMH.} \label{grid_mlmmh} \\

\hline \multicolumn{1}{|c|}{\textbf{Time (s)}} &
\multicolumn{1}{c|}{\textbf{Triple chosen}} &
\multicolumn{1}{c|}{\textbf{Other feasible triples}} \\ \hline
\endfirsthead

\multicolumn{3}{c}{{\bfseries \tablename\
\thetable{} -- continued from previous page}} \\
\hline \multicolumn{1}{|c|}{\textbf{Time (s)}} &
\multicolumn{1}{c|}{\textbf{Triple chosen}} &
\multicolumn{1}{c|}{\textbf{Other feasible triples}} \\ \hline
\endhead

\hline \multicolumn{3}{|r|}{{Continued on next page}} \\ \hline
\endfoot

\hline \hline
\endlastfoot
```

```
0 & (1, 11, 13725) & (1, 12, 10980), (1, 13, 8235), (2, 2, 0), (3, 1, 0) \\
lots of row data...
164700 & (1, 13, 13725) & (2, 2, 2745), (2, 3, 0), (3, 1, 0) \\
\end{longtable}
```

Table 2: Feasible triples for highly variable Grid, MLMMH.

Time (s)	**Triple chosen**	**Other feasible triples**
0	(1, 11, 13725)	(1, 12, 10980), (1, 13, 8235), (2, 2, 0), (3, 1, 0)
2745	(1, 12, 10980)	(1, 13, 8235), (2, 2, 0), (2, 3, 0), (3, 1, 0)
5490	(1, 12, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
8235	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
10980	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
13725	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
16470	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
19215	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
21960	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
24705	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
27450	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
30195	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
32940	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
35685	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
38430	(1, 13, 10980)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
41175	(1, 12, 13725)	(1, 13, 10980), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
43920	(1, 13, 10980)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
46665	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
49410	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
52155	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
54900	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
57645	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
60390	(1, 12, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
63135	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
65880	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
68625	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
71370	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
74115	(1, 12, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
76860	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
79605	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
82350	(1, 12, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)

Continued on next page

Table 2 – continued from previous page

Time (s)	Triple chosen	Other feasible triples
85095	(1, 12, 13725)	(1, 13, 10980), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
87840	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
90585	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
93330	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
96075	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
98820	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
101565	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
104310	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
107055	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
109800	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
112545	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
115290	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
118035	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
120780	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
123525	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
126270	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
129015	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
131760	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
134505	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
137250	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
139995	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
142740	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
145485	(1, 12, 16470)	(1, 13, 13725), (2, 2, 2745), (2, 3, 0), (3, 1, 0)
148230	(2, 2, 2745)	(2, 3, 0), (3, 1, 0)
150975	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
153720	(1, 12, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
156465	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
159210	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
161955	(1, 13, 16470)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)
164700	(1, 13, 13725)	(2, 2, 2745), (2, 3, 0), (3, 1, 0)