Introduction to LaTeX

Lecture 4: Use Graphics and Tables in LaTeX

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Measuring units in LaTeX

- pt - The smallest unit in LaTeX, 1/72.27 inch
- bp - 1/72 inch
- in - inch
- cm - centimeter
- mm - millimeter
- em - the width of letter M of the current font (commonly used in width measuring)
- ex - the height of letter x of the current font (commonly used in height measuring)
- \linewidth - the width of current line in the container
- \pagewidth - the width of the page
- \pageheight - the height of the page
- \textwidth - the normal width of text on the page
- \textheight - the normal height of text on the page

Include graphs

It's very useful to include graphs in LaTeX, especially in report and paper writing. Here is a common template of including a single floating graph.

Command

```
\usepackage{graphicx}
\begin{figure}[position]
    \centering
    \includegraphics[options]{file}
    \caption{caption}
    \label{label}
\end{figure}
```

- position - we usually use htbp here
- options - the width, height and other options about the graph
- caption - the caption displayed above/under the graph
- label - used for references in a document (will be introduced later)

Usually you need to optimize the size and some other properties of the graph, most of them can be set in options. (Only some useful options are listed here)

- height - use any LaTeX measuring unit.
- width - use any LaTeX measuring unit.
- scale - scale the graph to this proportion
- angle - rotate the graph in anti-clockwise by this angle

Example

```
\usepackage{graphicx}
\begin{figure}[htbp]
    \centering
    \includegraphics[width=0.8
\linewidth,angle=180]{sample.jpg}
    \caption{3 greatest people in
JI}
    \label{fig-sample}
\end{figure}
```

Figure: 3 greatest people in JI

Include multiple graphs

Sometimes you need to include a series of graphs, then the subfigure package can be used.

Example

```
\usepackage{graphicx}
\usepackage{subfigure}
\begin{figure}[htbp]
    \centering
    \subfigure[God Gan]{
    \includegraphics[width=0.4
\linewidth]{sample-1.jpg}
        \label{fig-sample-1}

    ...(with Master Fu, Professor and
God Hang)
\end{figure}
```

Draw tables

Table is another common element in LaTeX, for example, there is a simple table like this:

Example

```
\begin{tabular}{—l—c—r—}
    \hline
    Title 1 & Title 2 & Title 3 \\
    \hline
    1 & 2 & 3 \\
    \hline
\end{tabular}
```

Title 1	Title 2	Title 3
1	2	3

Command

```
\begin{tabular}{format}
    ...
\end{tabular}
```

format can be set as follow

- | - represents a vertical separate symbol
- l - align left in this column
- c - align center in this column
- r - align right in this column

Example

—|—c—r—

Title 1	Title 2	Title 3
1	2	3

———c—cc———

Title 1	Title 2	Title 3
1	2	3

How to arrange cells in tabular environment is very similar to the align environment. However, we usually need horizontal lines in tables.

Command

```
\hline = \cline{1-max_col}
\cline{start-end}
```

Example

```
\begin{tabular}{c|l|c|r}
    \hline\hline
    & Title 1 & Title 2 & Title
3 \\
    \cline{2-4}
    Table 1 & 2 & 3 \\
    \cline{2-4}
    & 4 & 5 & 6 \\
    \hline\hline
\end{tabular}
```

	Title 1	Title 2	Title 3
Table	1	2	3
	4	5	6

Here we draw a table with a multirow, but it only works with multirows of odd row number. A more convenient method of drawing multirows will be introduced.

Multicolumn and Multirow

Command

\multicolumn{ncols}{format}{text}

- ncols - the number of columns to be merged
- format - the format of the merged column, excluding the left — (eg. c—)
- text - the text in the merged column

\usepackage{multirow}
\multirow{nrows}{width}[fixup]{text}

- nrows - the number of rows to be merged
- width - the width of the merged rows (use * for auto)
- fixup - the vertical position of the text (optional, default in the center)
- text - the text in the merged row

Example

```
\begin{tabular}{—c—c—c—c—c—}
    \hline
    \multirow{4}{*}{Table} & Title 1 & Title 2 & Title 3 & Title 4 \\
    \cline{2-5}
    & \multicolumn{2}{c—}{Text 1} &
\multicolumn{2}{c—}{\multirow{3}{*}{Text 3}} \\
    \cline{2-3}
    & \multicolumn{2}{c—}{Text 2} & \multicolumn{2}{c—}{} \\
    \cline{2-3}
    & Text 4 & Text 5 & \multicolumn{2}{c—}{} \\
    \hline
\end{tabular}
```

Table	Title 1	Title 2	Title 3	Title 4
	Text 1		Text 3	
	Text 2			
	Text 4	Text 5		

Table environment

A table environment is used to arrange the place of a tabular, similar to the figure environment

Command

```
\begin{table(*)}[position]
    \centering
    \begin{tabular}{format}
        ...
    \end{tabular}
    \caption{caption}
    \label{label}
\end{table(*)}
```

The position, caption, label are same as those in figure environment.

About htbp

The htbp order is an official order of displaying graphs and tables.

- h - insert to the current place
- t - insert to the top of the page
- b - insert to the bottom of the page
- p - insert to a new page, which is common in dealing with big graphs and tables.

LaTeX compiler will try these methods from left to right as you defined. Usually, we use htbp so that it will try to put the graph or table in the current place. If fails, then it will try the top, the bottom, and the next page until success.

The array environment

When you use tabular in maths environment, the text format in the tabular won't be italic. However, there is a replacement of tabular, which is array environment.

Command

```
\begin{array}{format}
    ...
\end{array}
```

The properties and usages of these two environment are exactly the same.

Note that there is also a package called array, which is an enhancement of both tabular and array, you may use texdoc array to learn about it.

Draw graphs with TikZ and PGF

In your VE203, if you write your homework in LaTeX (with a 10% bonus), you will need this package to draw graphs. There is a document of more than one thousand pages about it (texdoc tikz or texdoc pgf)

Example

Example

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