
Typesetting with $\text{T}_{\text{E}}\text{X}$ / $\text{L}_{\text{A}}\text{T}_{\text{E}}\text{X}$

Part III: Figures and Tables

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Overview

- Part I: basic components and essential \LaTeX
- Part II: formatting and layout
- **Part III**: figures and tables
- Part IV: basic mathematics and $\text{AMS}\text{\LaTeX}$
- Part V: $\text{PDF}\text{\LaTeX}$ and slides
- Part VI: $\text{BIB}\text{\TeX}$ and MakeIndex
- Part VII: useful things...

Graphics



Graphics in L^AT_EX

- `graphics` and `graphicx` packages provide commands to include images
 - In principle any image format (`eps`, `png`, `jpeg`, ...) can be used
 - Which formats can be handled mainly depends on dvi processor
 - PS output: `eps`, (`jpeg`); PDF output: `png`, `jpeg`
- We only discuss the `graphicx` package, `graphics` provides less options
- Create graphics using XFig, GIMP, ImageMagick, ...
- Images behave quite similar to characters, just in larger boxes

Including Graphics

➤ **Include graphics** file (as box):

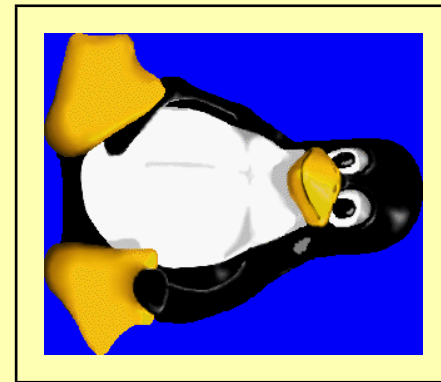
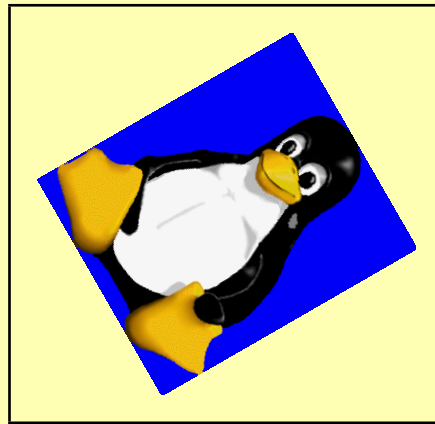
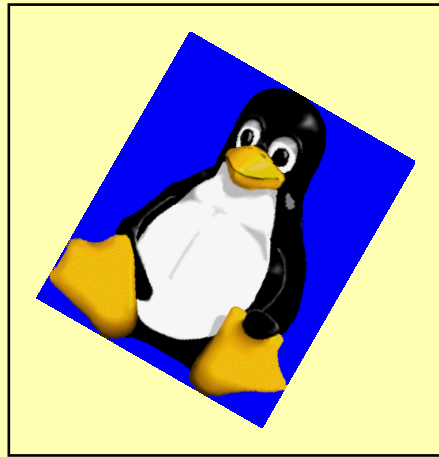
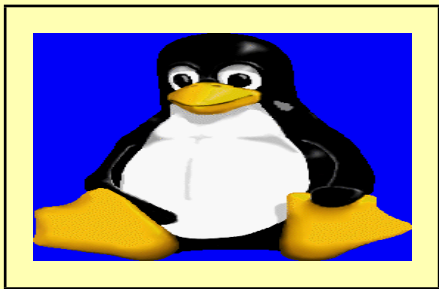
```
\includegraphics[options]{filename}
```

where **options** is a comma separated list of:

<code>angle=x</code>	rotate picture by x°
<code>width=len</code>	scale picture to width <code>len</code>
<code>height=len</code>	scale picture to height <code>len</code>
<code>scale=x</code>	scale picture
<code>bb=lx by rx ty</code>	set bound box
<code>clip</code>	clip picture
<code>draft</code>	don't display image, just draw bounding box with filename inside (also: class option)

Graphics Example

```
\includegraphics [height=3cm,width=5cm] {logo.png}  
\includegraphics [angle=-30,width=5cm] {logo.png}  
\includegraphics [angle=-60,width=5cm] {logo.png}  
\includegraphics [angle=-90,width=5cm] {logo.png}
```



➤ Notice the vertical alignment and the box sizes (drawn with `\fbox`)

Tabulars

Including Tabulars

- ▶ **Tabulated material** can be aligned in rows and columns using the tabular environment:

```
\begin{tabular}[vert. pos]{columns}  
... \end{tabular}
```

- ▶ **columns** is a string describing column types containing the characters:

l left justified column

r right justified column

c centred column

p{l} paragraph column of length **l**

@{**text**} column with fixed content **text** over all rows
(e.g. horizontal space)

*{**n**}{**cols**} **n** copies of **cols** columns

Row Format

- A row of a tabular is **separated into columns by &** (alignment character)
- A **row end** is indicated by `\\`
- Rows may contain less, but not more columns than specified by tabular argument

```
\begin{tabular}[t]{p{3cm}lr@{.}l}  
More text in row 1 &  
Left & 1 & 05\\  
Row 2 & & 341 & 05\\  
& last  
\end{tabular}
```

More	Left	1.05
text in		
row 1		
Row 2		341.05
	last	

Horizontal and Vertical Lines

- **Vertical lines** are marked by | in column specification
- **Horizontal lines** are inserted with `\hline`

```
\begin{tabular}{|l|c|}  
\hline  
Item & Cost\  
\hline\  
CD & 10.95\  
Video & 13.20\  
\hline  
\end{tabular}
```

Item	Cost
CD	10.95
Video	13.20

- A horizontal line from column **x** to **y**:

```
\cline{x-y}
```

- For more complicated lines use `hhline` package

Multicolumns, etc.

- **Combine several columns** to a single column in a single row:

```
\multicolumn{cols}{pos}{text}
```

- Combines the next **cols** to single column with alignment **pos** and contents **text**
 - Must be at the beginning of a row or directly after &
- For more complicated tabulars, the `tabular` environment may be nested
 - To **set width** of a tabular (usually determined automatically):

```
\begin{tabular*}{width}[pos]{columns}  
...  
\end{tabular*}
```

Tabular Example

```
\begin{tabular*}{.65\textwidth}{%
  { | l | c @ { \extracolsep { \fill } } c | } \hline
& \multicolumn{2}{c|}{Cost} \\
Item & ex VAT & inc VAT \\ \hline
CD & 10.00 & 11.75 \\
Video & 10.00 & 14.10 \\ \hline
\multicolumn{1}{l|}{Total} & 22.00 &
25.85 \\ \cline{2-3}
\end{tabular*}
```

Item	Cost	
	ex VAT	inc VAT
CD	10.00	11.75
Video	10.00	14.10
Total	22.00	25.85

Floats

Figures and Tables

- Figures and Tables are **floats**
 - They are **float**ed to the nearest convenient location according to some typographical rules
- \LaTeX handles numbering automatically
 - Cross-references can be done using labels
- Figures are created using `figure` environment
- Tables are created using `table` environment
(tables work like figures, but usually have a `tabular` environment instead of `\includegraphics`)
- These environments cannot have a page break in them

Captions

- A figure or table has a caption and an associated number:

```
\caption[short caption]{caption}
```

- **short caption**, if present, is used in list of figures/tables

```
\begin{figure}  
\centerline{\includegraphics[height=4cm]{logo.png}}  
\caption[Tux]{Tux, the Linux Penguin}  
\end{figure}
```

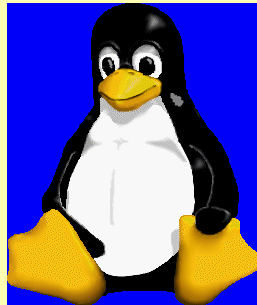


Figure 1.1: Tux, the Linux Penguin

Float Positions

- Positions of floats on page can be influenced by optional argument:

```
\begin{figure/table} [pos] ... \end{figure/table}
```

h here – at the position of the environment in the text

t at the top of a text page

b at the bottom of a text page

p Page of floats – on a separate float page which only contains floats

- **pos** position characters are tried in sequence

- Default is `tbp`

- Use `figure*` or `table*` environment in two-column mode for float over all columns

Adjacent Figures

➤ To create **two adjacent figures** with two captions

```
\begin{figure} [tbh]
\begin{minipage}{.4\textwidth}
\centerline{\includegraphics{logo.png}}
\caption{Tux}\end{minipage}
\begin{minipage}{.4\textwidth}
\centerline{\includegraphics{logo2.png}}
\caption{Tux BW}\end{minipage}
\end{figure}
```



Figure 1: Tux

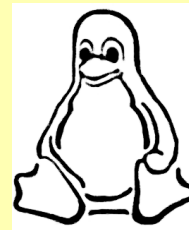


Figure 2: Tux BW

Sub-Figures

- subfigure package provides commands for sub-figures:

```
\subfigure [entry] [subcaption] {figure}
```

- and sub-tables:

```
\subtable [entry] [subcaption] {figure}
```

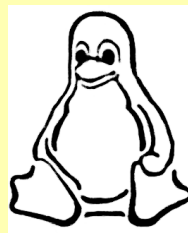
- 1 opt. arg.: determine list entry and sub-caption
- 2 opt. arg.: separate list entry and sub-caption
- 1 empty opt. arg.: no list entry, but sub-figure gets default caption
- 0 opt. arg: no list entry and no caption

Sub-Figures Example

```
\begin{figure}\centering  
\subfigure [Tux] {\includegraphics{logo.png}}  
\hspace{6cm}  
\subfigure [] {\includegraphics{logo2.png}}  
\hspace{6cm}  
\subfigure{\includegraphics{logo3.png}}  
\caption{Tux, the Linux Penguin}  
\end{figure}
```



(a) Tux



(b)



Figure 1: Tux, the Linux Penguin

Cross-Referencing

- Assign a **textual label** to last “object”:

```
\label{string}
```

- **Objects** are caption, section, subsection, subfigure, ...
(roughly everything that is numbered automatically)

- Refer to the referenced object:

```
\ref{string}
```

- Refer to page that object is on:

```
\pageref{string}
```

- Cross-referencing requires two T_EX compiler passes
(1st pass detects location and writes it to auxiliary file, 2nd pass inserts it from auxiliary file)

Cross-Referencing Example

```
\section{Introduction}
\label{sec:intro}
\begin{figure} ...
  \caption{Tux} \label{fig:tux}
\end{figure}
```

See Section~\ref{sec:intro}, Fig.~\ref{fig:tux} on page~\pageref{fig:tux}.

1 Introduction

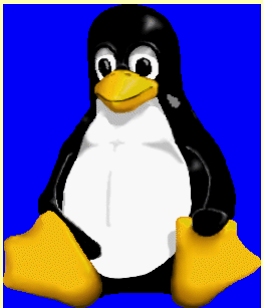


Figure 1.1: Tux

See Section 1, Fig. 1.1 on page 20.