Strategies for including graphics in LaTeX documents

Klaus Höppner

GuIT meeting 2005

Overview of graphics formats

Classification of graphics formats:

Vector graphics set up by geometrical elements like lines, curves, polygons, circles, . . .

Bitmap graphics store image information as a set of colored pixels with a given resolution and color depth. Different compression methods exist:

- bitmaps with data compression only
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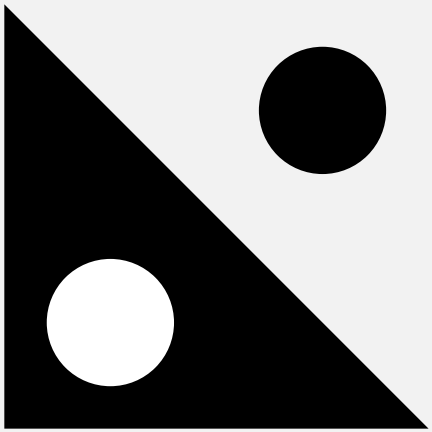
Example: vector drawing



a vector drawing

- Vector drawings are fine for geometrical drawings
- Advantage: Easily scaleable
- Advantage: Optimal quality independent of resolution of output device

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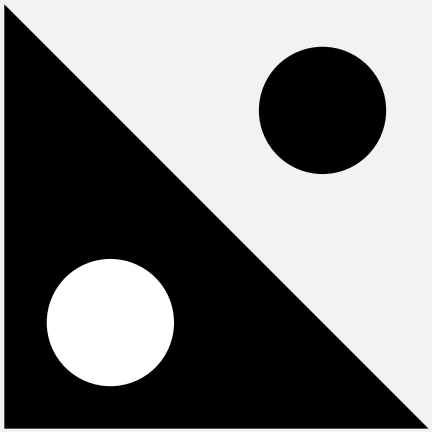

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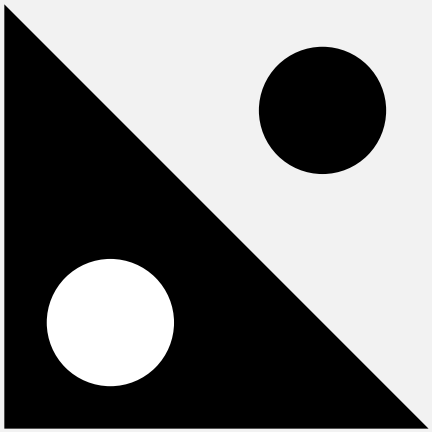

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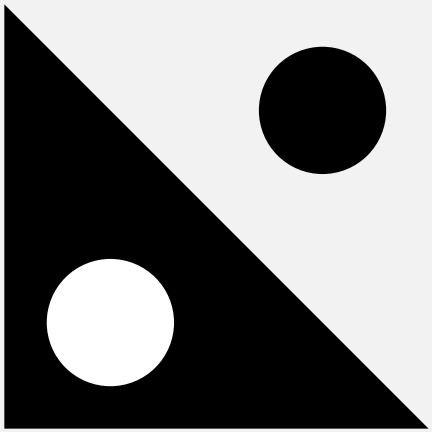

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a bitmap with few colors and sharp borders

- Sometimes you have to use bitmaps when you don’t have a mathematical representation of your drawing (e. g. no data set for land and political borders in shown example)
- Disadvantage: Loss of quality when scaling or zooming
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a photograph

- A photograph has many colors (typically 16 mio) and smooth transitions
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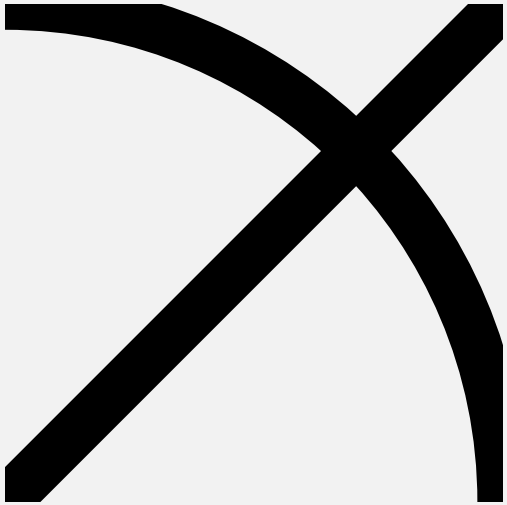
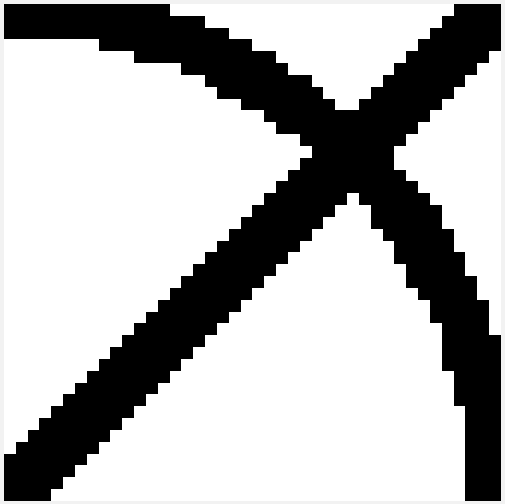
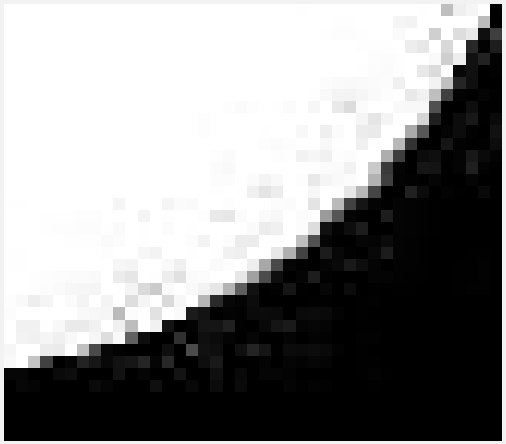


vector drawing



low resolution bitmap (pixels visible)



artifacts in a bitmap with lossy compression

Graphic formats in detail

EPS encapsulated postcript can contain vector drawings and bitmaps

PNG bitmapped portable network graphics format is a successor of GIF, supporting both compression with and without lossy compression

JPG bitmap format with lossy compression, often used for photographs (e. g. digital cameras)

TIFF a bitmap format often used for high quality DTP, supports CMYK color space

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- `graphicx` is an extension of `graphics` supporting key-value-options for e. g. scaling and rotating
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Including a graphics file

- You can include an image in its natural size with `\includegraphics{sample}`
- Use options as key-value-pairs (`graphicx`): `\includegraphics[key1=opt1,key2=opt2,...]{sample}`
- Common options are:

scale	to scale the image by a factor
width	to scale the image to fit a width
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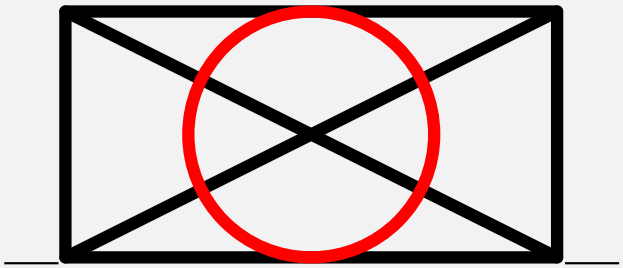
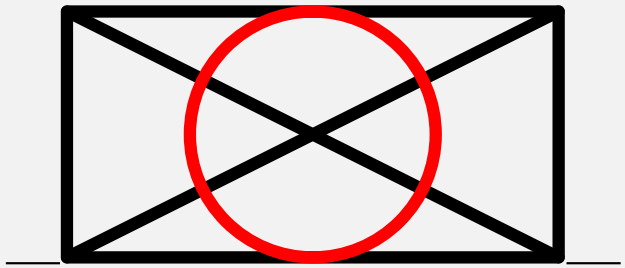
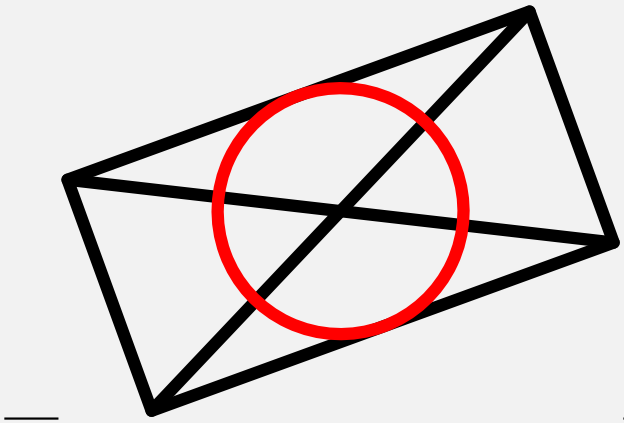
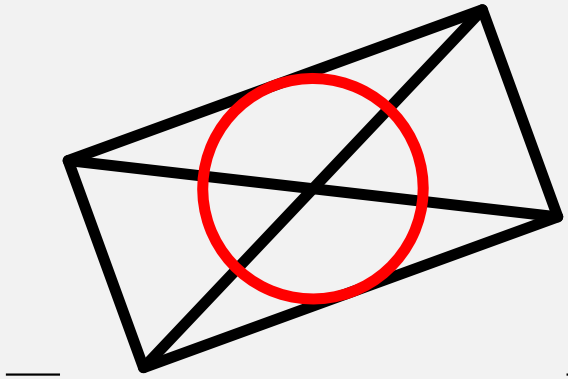
Examples





```
\includegraphics[width=.3\linewidth]{sample}
```





```
\includegraphics[width=.3\linewidth,angle=20]{sample}
```

$\neq$

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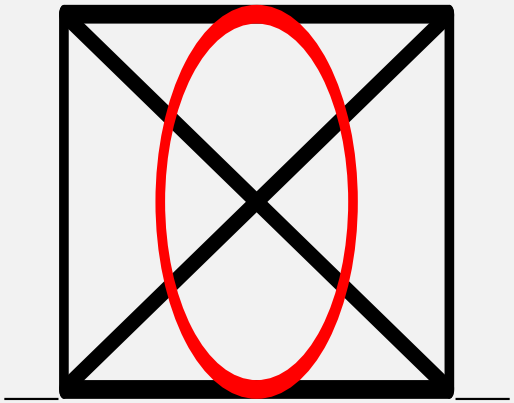
More examples



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\includegraphics[width=1in,height=1in]{sample}
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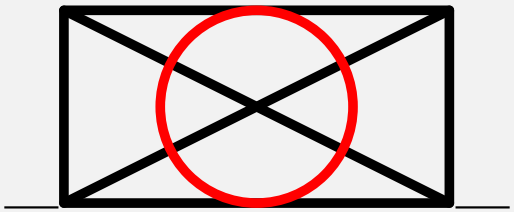

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Supported graphics formats

- Support for graphics file formats and support for features like scaling and rotating depend on the used backend
- Both `dvips` and `pdftex` support scaling and rotating
- `dvips` supports EPS
- `pdftex` supports
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Converting to a supported format

	latex+dvips		pdflatex	
Source	Target	Tool	Target	Tool
EPS	✔	–	PDF	epstopdf
PDF	EPS	gs	✔	–
PNG	EPS	ImageMagick	✔	–
JPEG	EPS	ImageMagick	✔	–
TIFF	EPS	ImageMagick	PNG	ImageMagick
		or tif2eps	PDF	tif2eps+epstopdf

Tools for graphics conversion

ImageMagick command line tool for graphics conversion and manipulation (changing size, gamma correction, . . .), available for Unix and Windows

netpbm command line conversion tools, mainly on Unix but Windows binaries exist

gs Ghostscript is a PostScript interpreter available for various OS

epstopdf is a Perl script to convert EPS to PDF using gs

tif2eps by Bogusław Jackowski et al. uses gs to convert TIFF to EPS. Nice tool, also supporting CMYK color space.

GUI tools like Gimp, Adobe Photoshop, Corel Draw, . . .

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Additional tools: potrace

- potrace is a tool to trace a pure black and white bitmap and produce a vector drawing
- potrace is a command line tool, binaries available for Unix, Mac OSX and Windows
- input formats are PBM, PGM, PPM
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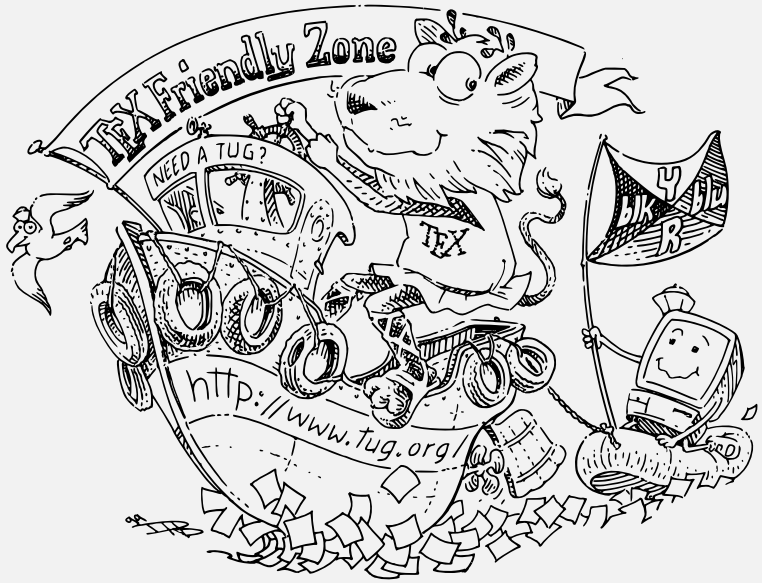
Example

original bitmap



traced vector drawing

Additional tool: package overpic

- LaTeX package written by Rolf Niepraschk
- overlays an image with a LaTeX picture environment
- you can add new elemements to the picture (text, symbols, . . .)
- Example:

```
\begin{overpic}[grid,tics=5]{map}
\put(32,74){\includegraphics[scale=.3]
    {busstop.mps}}
\put(32,77){\llap{\scriptsize%
    \colorbox{back}{Windm\"uhle}}}
\put(28,63){\small\textcolor{red}{\ding{55}}}
...
\put(6.3,13){\colorbox{back}{{\Pisymbol{ftsy}{68}}}}
\put(29.8,61.4){\color{blue}\vector(-1,-3){2}}
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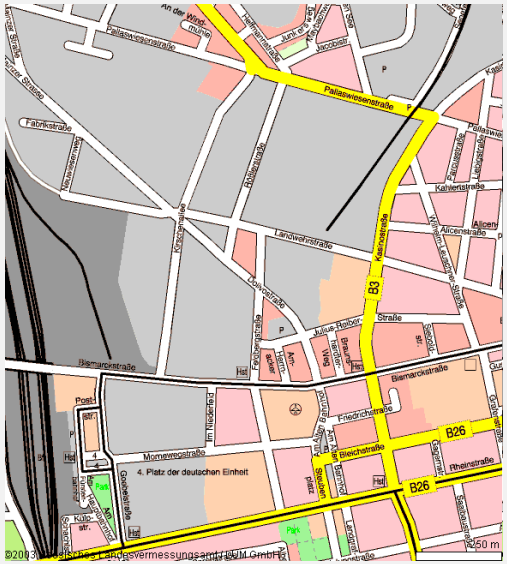
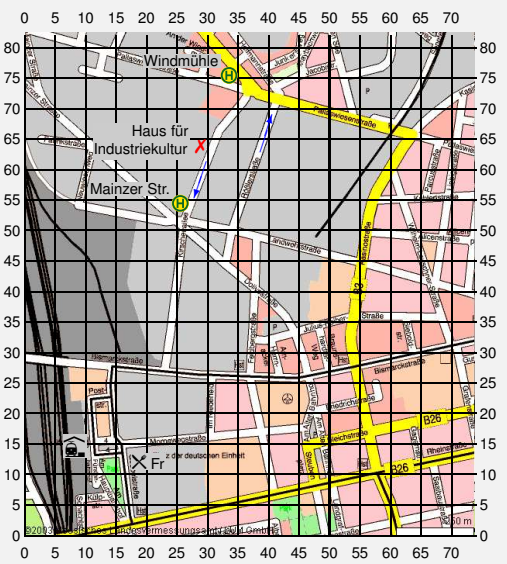
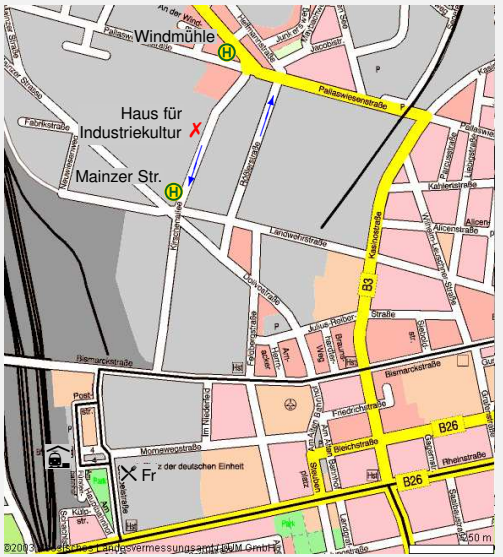


original



with grid



final