Short introduction to PSTricks

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Sources

- `http://www.tug.org/applications/PSTricks/`
  Many, many examples. (Learning by doing.)

- `http://www.pstricks.de/`
  Ditto.

- `http://www.pstricks.de/docs.phtml`
  PSTricks user guide: as one PDF,   PSTricks quick reference card

- Elke & Michael Niedermair, LaTeX Praxisbuch, 2004, Franzis-Verlag,
  (Studienausgabe für 20€)

First example

```
\documentclass{article}
\usepackage{pstricks}
\begin{document}
\begin{figure}
  \begin{pspicture}(4,5)
    \psframe(0.7,2)(3.3,3)
    \rput(2,2.5){First Example}
  \end{pspicture}
\end{figure}
\end{document}
```
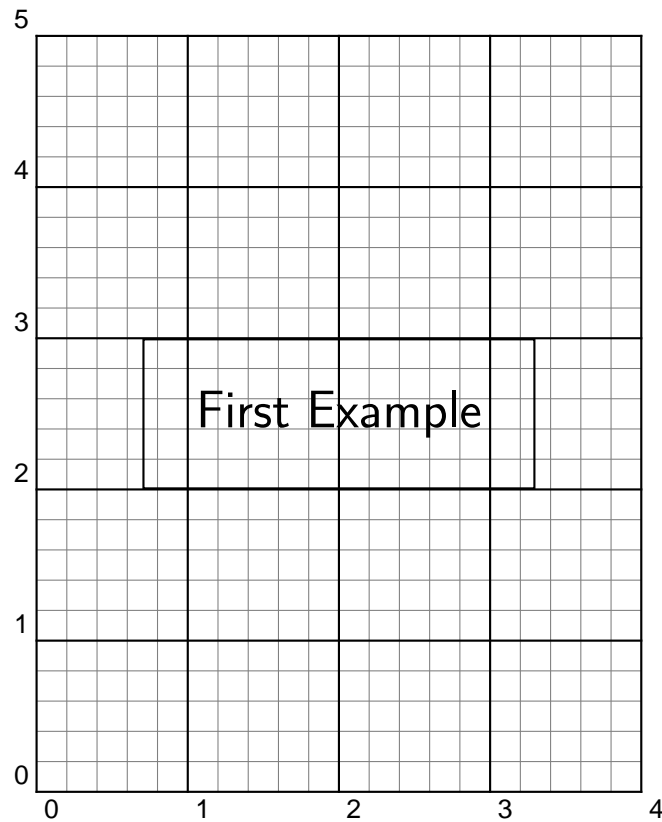
pspictures can replace simple eps-figures.

First Example

Important tool: The grid

`\begin{pspicture}(4,5)`
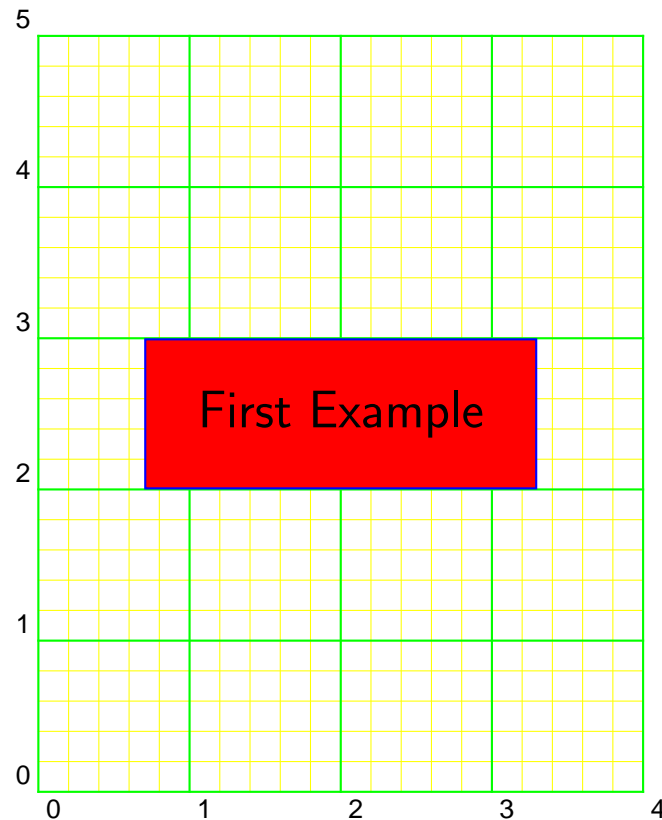
  `\psgrid`

  `...`

`\end{pspicture}`

Globally deactivated via

`\let\psgrid\relax`

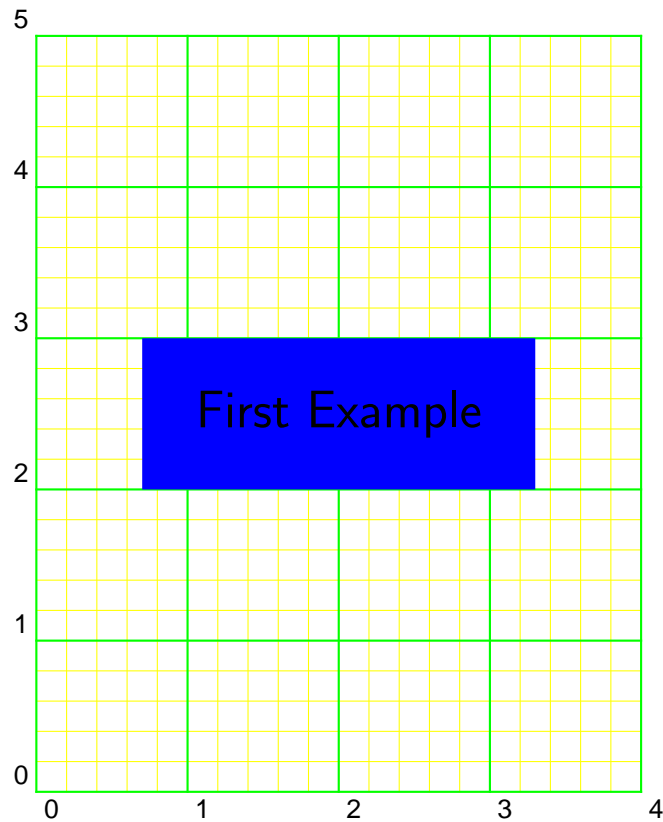in the final version.

Setting options

```
\psset{gridcolor=green,
        subgridcolor=yellow}
\begin{pspicture}(4,5)
 ...
  \psframe[linecolor=blue,
          fillcolor=red,
          fillstyle=solid]
          (0.7,2)(3.3,3)
 ...
\end{pspicture}
```
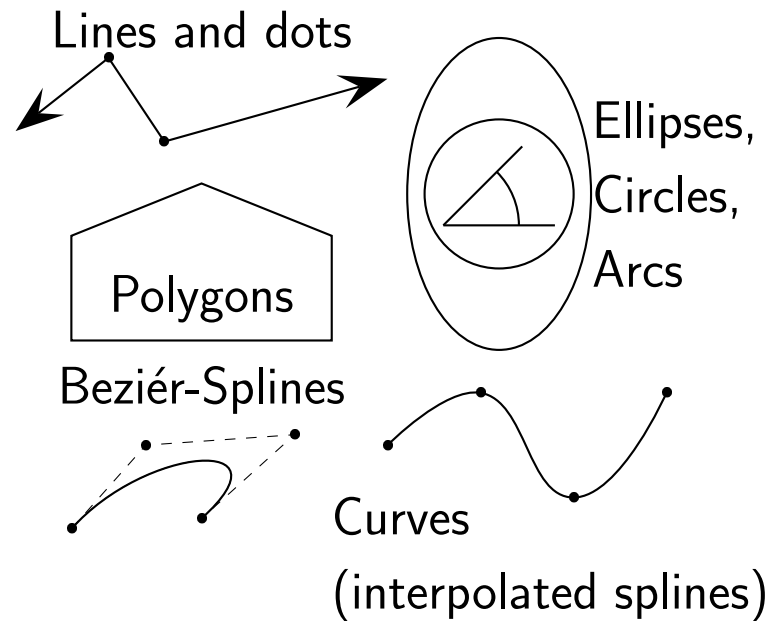
First Example

Star versions of objects

```
\begin{pspicture}(4,5)
  ...
    \psframe*[linecolor=blue,
            fillcolor=red]
          (0.7,2)(3.3,3)
  ...
\end{pspicture}
```
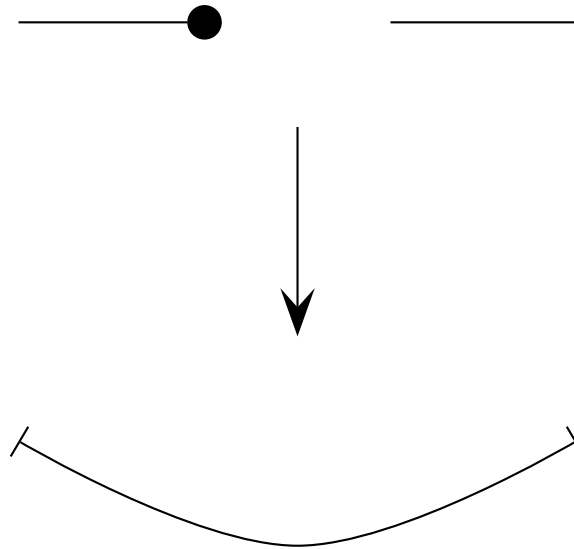
Further basic geometric objects

\psline

\psdots

\pspolygon

\pscircle

\psellipse

\psarc

\pscurve

\psbezier

Lines and dots

Ellipses,

Circles,

Arcs

Polygons

Beziér-Splines

Curves
(interpolated splines)

Exact syntax: `pst-usr.pdf`/`pst-quik.ps`

Line ends 'Arrows'

\psline{-*}(1,6)(2,6)

\psline{-}(3,6)(4,6)

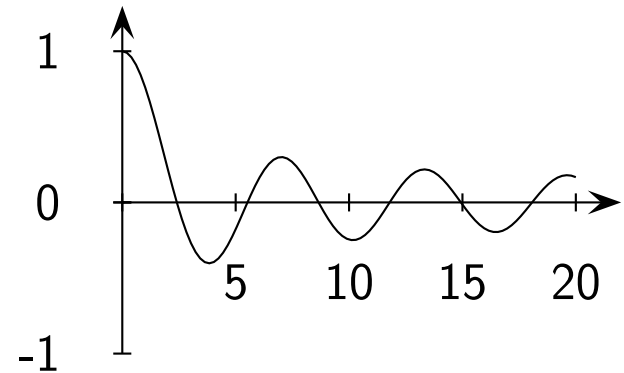\psline{->}(2.5,5)(2.5,3)

\pscurve{|-|}(1,2)(2.5,1)(4,2)

File plots

\usepackage{pst-plot.sty}

...

\psaxes[Dx=5]{->}(0,0)(0,-1)(22,1.3)
\fileplot{bessel.dat}

Contents of the file bessel.dat:

```
 0   1
 0.20202   0.989823
 0.40404   0.959602
        ⋮
```
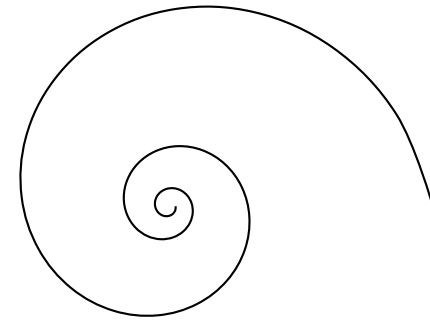
Function plots (parametric)

```
\def\Euler{2.718 }
\parametricplot[plotstyle=curve]{0}{360}{
  3 t mul cos \Euler -0.01 t mul exp mul
  3 t mul sin \Euler -0.01 t mul exp mul }
```

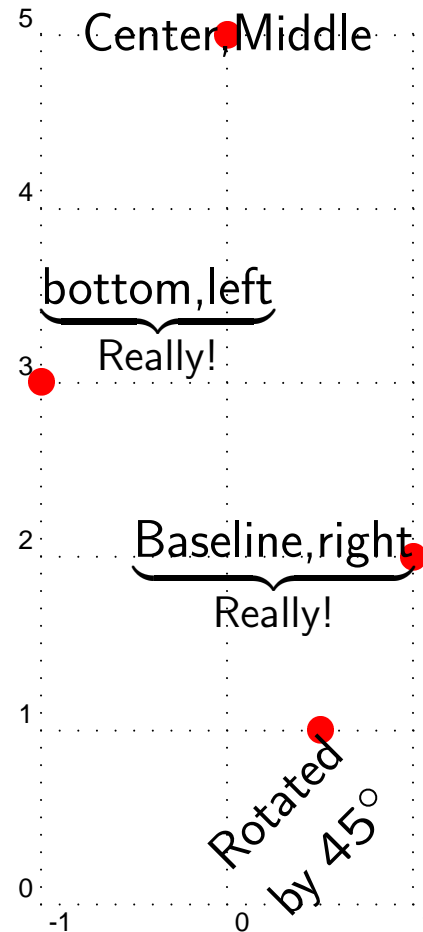$$(x(t), y(t)) = \exp(-0.01t) \cdot (\cos(3t), \sin(3t))$$

with $t \in [0, 360°]$

Postscript: Chapter 'Operators' in `RedBook.pdf` by Adobe Inc.
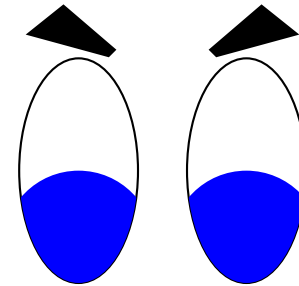
Placing whatever, wherever

```
\psdots[linecolor=red,dotsize=10pt]
(0,5)(-1,3)(1,2)(0.5,1)
\rput(0,5){Center,Middle}
\rput[bl](-1,3){$\underbrace{
    \text{bottom,left}
  }_{\text{Really!}}$}
\rput[Br](1,2){$\underbrace{
    \text{Baseline,right}
  }_{\text{Really!}}$}
\rput[tr]{45}(0.5,1)
  {\parbox{5cm}{\flushright Rotated\\
              by $45^{\circ}$}}
```
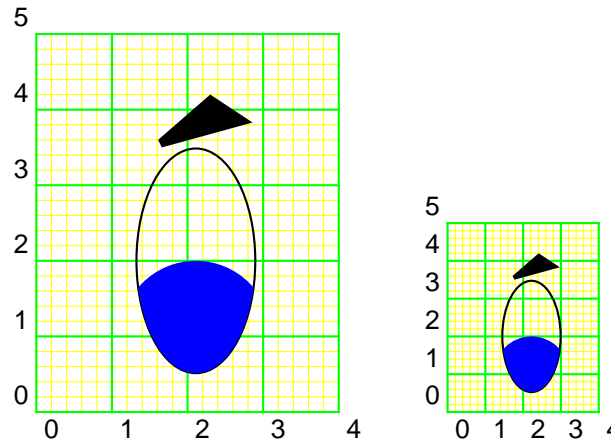
Clipping and scaling

```
\def\myEye{
  \begin{psclip}{\psellipse(0,0)(0.8,1.5)}
      \pscircle*[linecolor=blue](0,-1){1}
  \end{psclip}
  \pspolygon*(-0.4,1.5)(0.7,1.8)
             (0.2,2.2)(-0.5,1.6)
}
\rput(8,2){\myEye}
\rput(6,2){\scalebox{-1 1}{\myEye}}
```
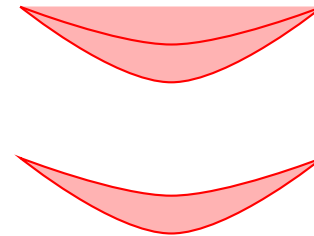
Easy way to scale everything

```
\begin{pspicture}(4,5)
  \rput(2,2)\myeye
\end{pspicture}
\hspace{1cm}
\psset{unit=0.5cm}
\begin{pspicture}(4,5)
  \rput(2,2)\myeye
\end{pspicture}
```
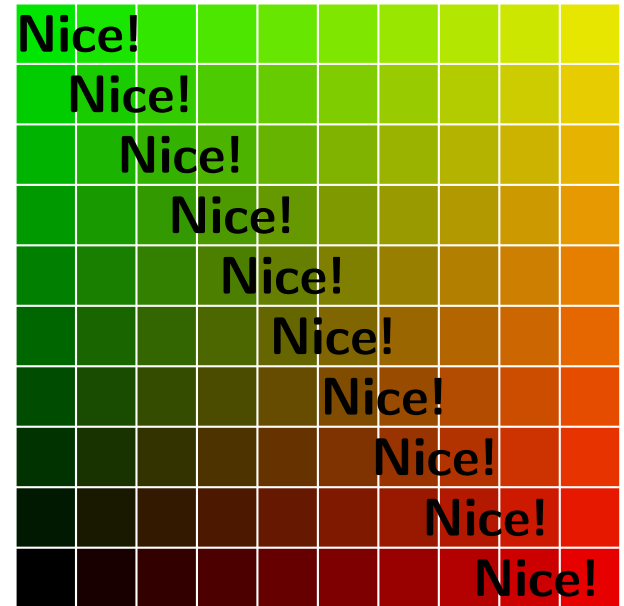
Enrolling one's own path

```
\psset{linecolor=red,fillcolor=pink,fillstyle=solid}
\rput(0,2){
    \pscurve(1,0)(0,-1.0)(-1,0)
    \pscurve(-1,0)(0,-0.5)(1,0)
}
\pscustom{
    \pscurve(1,0)(0,-1.0)(-1,0)
    \pscurve[liftpen=1](-1,0)(0,-0.5)(1,0)
}
```
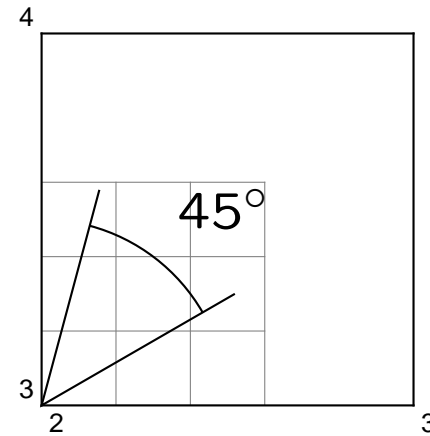
Repetition (and rgbcolors)

```
\usepackage{pstcol,multido}

...

\psset{fillstyle=solid,linestyle=none}
\multido{\nx=0.0+0.1}{10}{%
    \multido{\ny=0.0+0.1}{10}{%
        \newrgbcolor{c}{{\nx} {\ny} 0}%
        \rput(\nx,\ny){%
            \psframe[fillcolor=c](0,0)(0.1,0.1)%
}}}
\multirput[Bl](0,0.92)(0.084,-0.1){10}{Nice!}
```

Special coordinates (e.g. polar coordinates)

```
\SpecialCoor
\rput(2,3){
  \psline(0.6;30)(0,0)(0.6;75)
  \psarc(0,0){0.5}{30}{75}
  \rput[bl](0.6;52.5){$45^{\circ}$}
}
```

Special coordinates (postscript)


```
\Pt A(-1,0)\Pt B(-2,1)\Pt C(3,1)
% \Pt A(-1,0) -> \A=-1,0 \AX=-1 \AY=0
\pspolygon[fillstyle=solid,fillcolor=yellow](\B)(\A)(\C)
(!
  \BX\space \CX\space add \AX\space sub
  \BY\space \CY\space add \AY\space sub
)
```
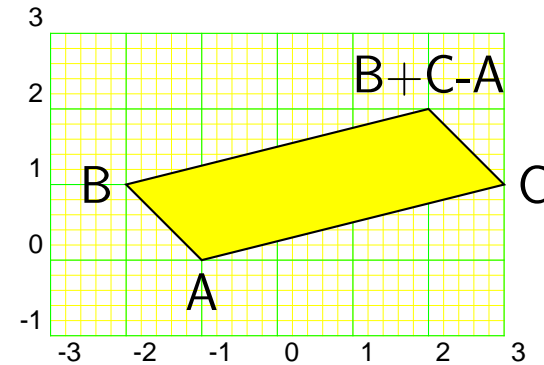
Example for the usage of (L^A)T_EX-commands

```
\newcommand\myPairs{(0.3,0.2)(0.7,1.0)%
                (1.5,1.1)(1,0.3)}
{\psset{linestyle=dotted,
        linewidth=1.5\pslinewidth}
  \expandafter\psline\myPairs
  \expandafter\psbezier\myPairs
}
```
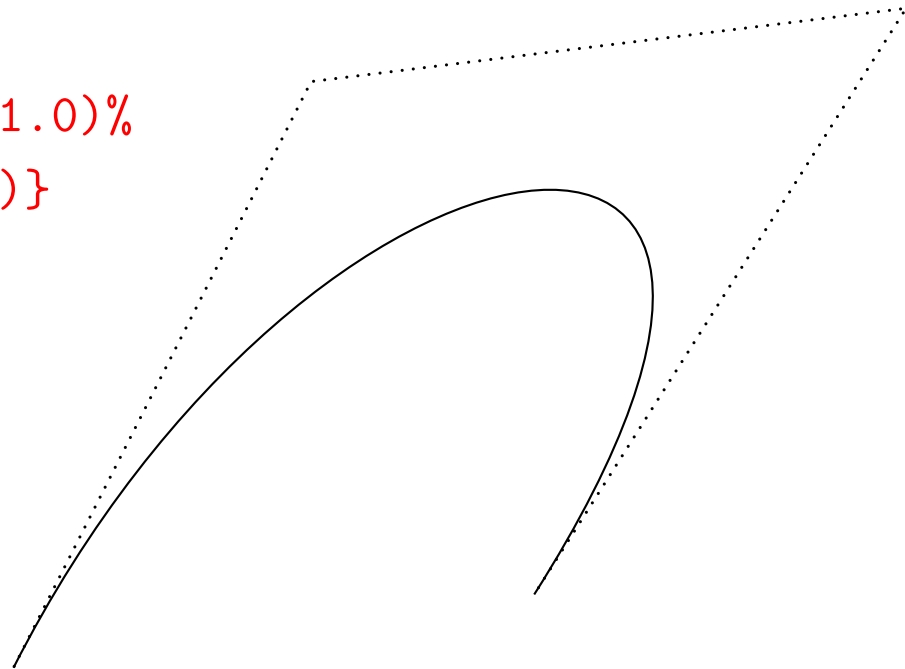
Importing eps-files

```
\begin{pspicture}
  (-0.5\linewidth,-0.4\textheight)
  (0.5\linewidth,0.4\textheight)
  \rput[cm](0,0){%
    \includegraphics
    [width=1\linewidth]
    {graph1.eps}%
  }
\end{pspicture}
```
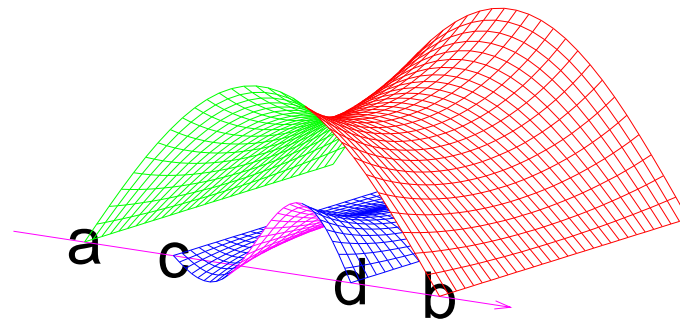
Nodes and node connections

```
\usepackage{psfrag,pst-node}
...
\psfrag{a}[cm][cm]{\pnode{KnotenA}}
\psfrag{b}[cm][cm]{\pnode{KnotenB}}
\includegraphics ..
\ncdiag[angle=-130,
        arm=2cm,
        linearc=0.25cm]
   {KnotenA}{KnotenB}
\mput*{$\Omega$}
```

PSfrag replacements

G_ε

Ω
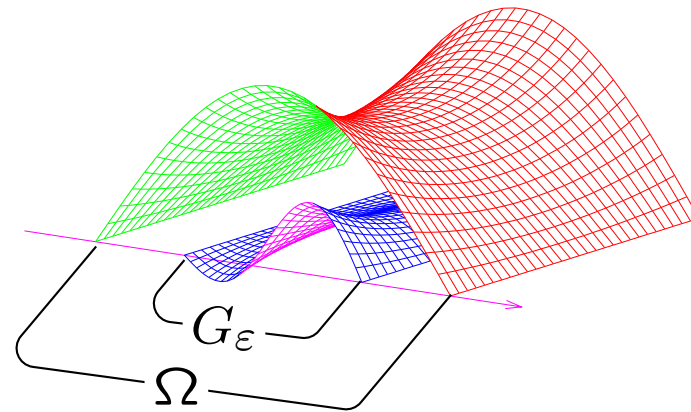
'Labeling' node connections

```
\usepackage{pstricks-add}
...
\cnodeput(2,1){cnA}{Cond. A}
\cnodeput(2.5,4){cnB}{Cond. B}
\nccurve[ArrowInside=->,ArrowInsidePos=0.25,
  angleA=40,angleB=-50]{cnA}{cnB}
\lput{:U}{
  \psline{->}(0,0)(1,0)
  \uput[0]{*0}(1,0){$\mathbf{t}$}
  \psline{->}(0,0)(0,-1)
  \uput[90]{*0}(0,-1){$\mathbf{n}$}}
\aput(0.25){$W_{12}$}
```
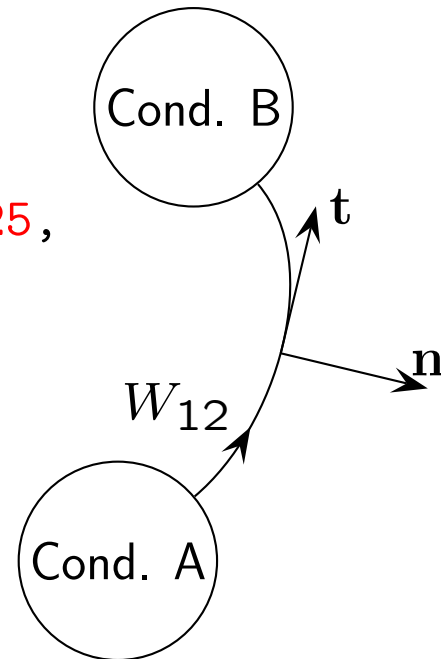
. . . more nodes and node connections

```
\begin{array}{c@{\hspace{3cm}}c}
  \Rnode{N1}{X}
  &\Rnode{N2}{
       \bigtimes\limits_{i\in I} Y_{i}
     }\\[3cm]
  &\Rnode{N3}{Y_{j}}
\end{array}
\psset{nodesep=0.3cm}
\everypsbox{\scriptstyle}
\ncLine{->}{N1}{N2}\Aput{f}
\ncLine{->}{N1}{N3}\Bput{f_{j}=\pi_{j}\circ f}
\ncLine{->}{N2}{N3}\Aput{\pi_{j}}
```

$$
\begin{array}{ccc}
X & \xrightarrow{\ f\ } & \bigtimes_{i\in I} Y_i \\
 & {\scriptstyle f_j=\pi_j\circ f}\searrow & \big\downarrow {\scriptstyle \pi_j} \\
 & & Y_j
\end{array}
$$
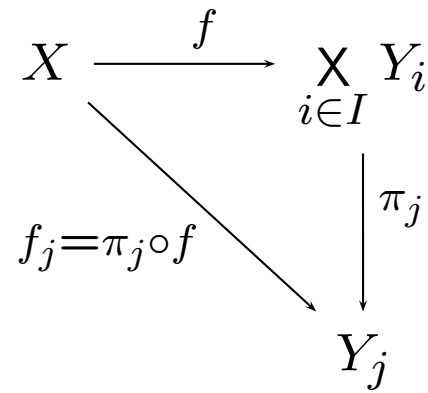
...alternative node placement: psmatrix

```
\begin{psmatrix}[mnode=R,colsep=3cm,rowsep=3cm]
  X & \bigtimes\limits_{i\in I} Y_{i}\\
    &Y_{j}
\end{psmatrix}
\psset{nodesep=0.3cm}
\everypsbox{\scriptstyle}
\ncLine{->}{1,1}{1,2}\Aput{f}
\ncLine{->}{1,1}{2,2}\Bput{f_{j}=\pi_{j}\circ f}
\ncLine{->}{1,2}{2,2}\Aput{\pi_{j}}
```
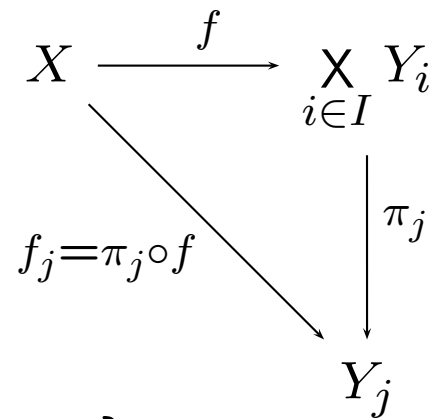
$$X \xrightarrow{\ f\ } \bigtimes_{i\in I} Y_i$$

$$f_j = \pi_j \circ f \qquad \Big\downarrow \pi_j$$

$$Y_j$$

Including postscript code in \pscustom

```
\pnode(0.0,-0.6){AA}
...
\pnode(1,4.1){DC}
\pscurve(AD)(AC)(AB)(AA)
...
\pscustom[fillcolor=yellow,fillstyle=solid]{
  \psline(BC)(BB)(CB)
  \coor(BC)(CB)
  \code{\AddPairs} % x1 y1 x2 y2 -> (x1+x2) (y1+y2)
  \coor(BB)
  \code{\SubPairs lineto}
  \closepath}
```
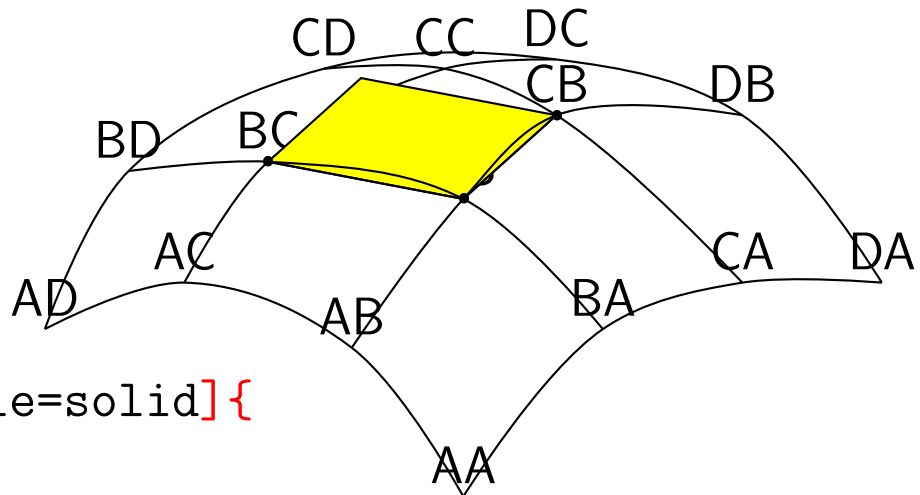
The corresponding postscript codes

```
%% x1 y1 x2 y2 -> (x1+x2) (y1+y2)
\def\AddPairs{ exch 4 1 roll add 3 1 roll add exch }


%% x1 y1 x2 y2 -> (x1-x2) (y1-y2)
\def\SubPairs{ exch 4 1 roll sub 3 1 roll exch sub exch }
```

ps4pdf: Preparing the LATEX-file

```
\documentclass{article}
\usepackage{hyperref,graphicx,ps4pdf}
\PSforPDF{\usepackage{pstricks,pst-plot}}
\begin{document}
\title{Example for the usage of ps4pdf}\maketitle\centering
\PSforPDF{
  \begin{pspicture}(-5,-5)(5,5)
    \rput(0,0){\psovalbox{That would be some complicated graphic.}}
  \end{pspicture}
}%% End of PSforPDF.
\par\hypertarget{Target}{That's the target.}
\newpage
\hyperlink{Target}{That's the link.}
\end{document}
```

ps4pdf: Pstricks & pdflatex

CTAN: /tex-archive/macros/latex/contrib/ps4pdf/ps4pdf.sty
(needs graphicx, preview, ifpdf, and ifvtex)
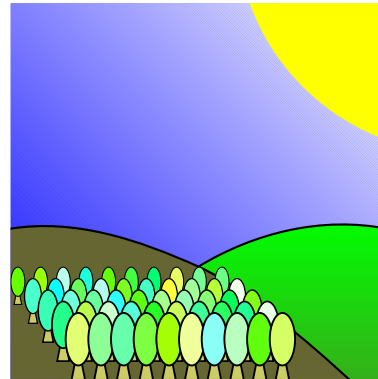
```
                            dvips              ps2pdf
                 ┌─────────┐         ┌────────┐          ┌──────────────┐
                 │ foo.dvi │────────▶│ foo.ps │─────────▶│ foo-pics.pdf │
                 └─────────┘         └────────┘          └──────────────┘
            latex  ▲                                              │
                  ╱                                               │
        ┌─────────┐              pdflatex                    ┌─────────┐
        │ foo.tex │─────────────────────────────────────────▶│ foo.pdf │
        └─────────┘                                          └─────────┘
```
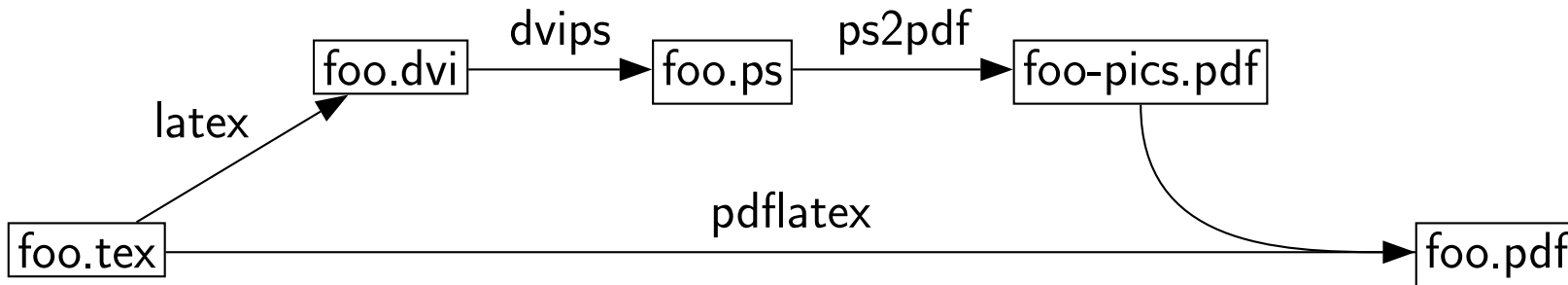
Other nice stuff – fillstyle=gradient

```
\usepackage{pst-grad}
...
\begin{psclip}{
  \psframe[linestyle=none,
    fillstyle=gradient,
    gradbegin=white,gradend=blue,
    gradmidpoint=1,
    gradangle=-45](0,0)(5,5)
  }
  ... other stuff ...
\end{psclip}
```

Other nice stuff – Playing with Text


```
\usepackage{pst-text,pst-char,ae}
...
\pstextpath(0,-3ex){\psellipse(0,0)(3,2)}{
   \multido{\i=1+1}{19}{ PS\LaTeX{}}}
\psset{fillstyle=gradient,gradbegin=red,gradend=blue}
\rput(0,0){\pscharpath{\fontsize{1.3cm}{1.3cm}\selectfont\LaTeX}}
```