

dePSFrag, the final nail in the coffin

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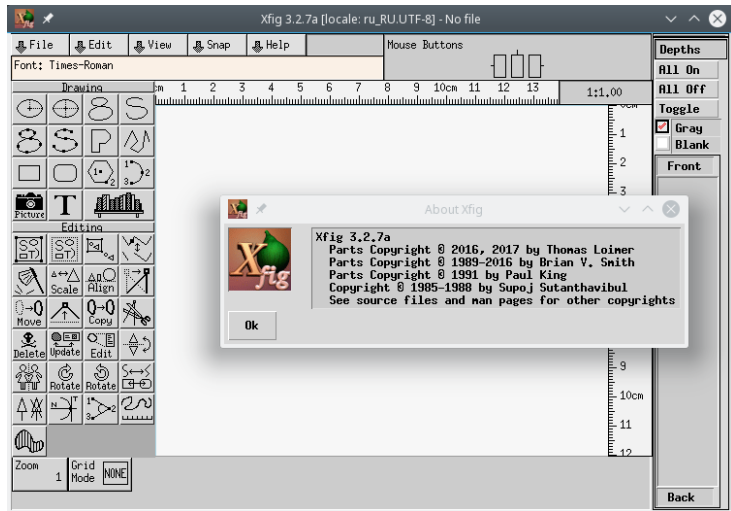
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XFig



PSfrag

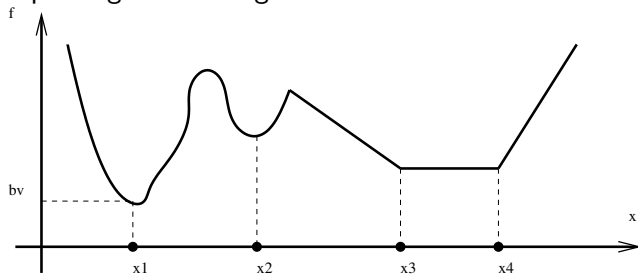
The PSfrag system, version 3

Michael C. Grant and David Carlisle
psfrag@rascals.stanford.edu

11 April 1998

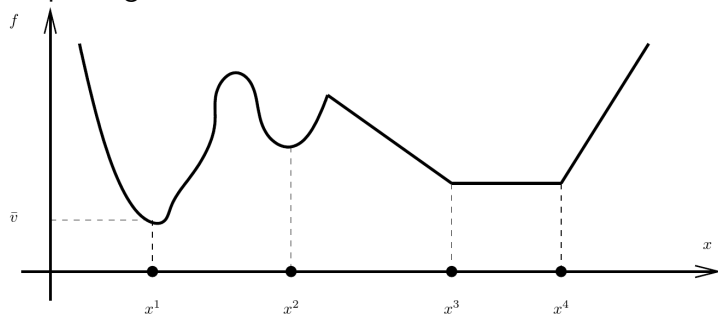
```
\begin{figure}
\begin{psfrags}
\psfrag{x1}[t]{$x^1$}
\psfrag{bv}[t]{$\bar{v}$}
\psfrag{x2}[t]{$x^2$}
\psfrag{x3}[t]{$x^3$}
\psfrag{x4}[t]{$x^4$}
\psfrag{f}[t]{$f$}
\psfrag{x}[t]{$x$}
\includegraphics{minima.eps}%
\end{psfrags}
\end{figure}
```

Input: figure with tags



PSfrag

Output: figure with labels



Motivation

- pdftex, xetex, luatex
- Why PSfrag is bad ?
- tikz, overpic, xy
- pinlabel ?



Modern tools: pinlabel, overpic, tikz, xy

```

\begin{figure}
\labellist
\small
\pinlabel*  $x^1$  [t] at 86.00 2.00
\pinlabel*  $\bar{v}$  [t] at 0.50 56.00
\pinlabel*  $x^2$  [t] at 171.50 2.00
\pinlabel*  $x^3$  [t] at 270.50 2.00
\pinlabel*  $x^4$  [t] at 338.00 2.00
\pinlabel*  $f$  [t] at 0.50 177.50
\pinlabel*  $x$  [t] at 428.00 38.00
\endlabellist
\includegraphics{minima-cleaned}%
\end{figure}

```

```

\begin{figure}
\begin{overpic}[abs,unit=1pt]
{minima-cleaned}
\put(86.00, 2.00){ $x^1$ }
\put(0.50, 56.00){ $\bar{v}$ }
\put(171.50, 2.00){ $x^2$ }
\put(270.50, 2.00){ $x^3$ }
\put(338.00, 2.00){ $x^4$ }
\put(0.50, 177.50){ $f$ }
\put(428.00, 38.00){ $x$ }
\end{overpic}
\end{figure}

```

```

\begin{figure}
\begin{tikzoverlay}[scale=1.0]
{minima-cleaned}[font=\small]
\node[] at (86.00pt, 2.00pt) { $x^1$ };
\node[] at (0.50pt, 56.00pt) { $\bar{v}$ };
\node[] at (171.50pt, 2.00pt) { $x^2$ };
\node[] at (270.50pt, 2.00pt) { $x^3$ };
\node[] at (338.00pt, 2.00pt) { $x^4$ };
\node[] at (0.50pt, 177.50pt) { $f$ };
\node[] at (428.00pt, 38.00pt) { $x$ };
\end{tikzoverlay}
\end{figure}

```

```

\begin{figure}
\begin{xy}
\xyimport(439,186)
{\includegraphics{minima-cleaned}}
,(86.00, 2.00)*\txt{ $x^1$ }
,(0.50, 56.00)*\txt{ $\bar{v}$ }
,(171.50, 2.00)*\txt{ $x^2$ }
,(270.50, 2.00)*\txt{ $x^3$ }
,(338.00, 2.00)*\txt{ $x^4$ }
,(0.50, 177.50)*\txt{ $f$ }
,(428.00, 38.00)*\txt{ $x$ }
\end{xy}
\end{figure}

```



Manual conversion

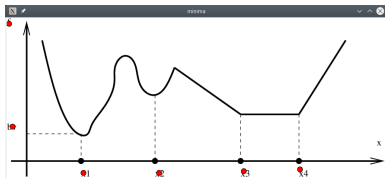
Pinlabeler: <https://www.math.upenn.edu/~pstorm/pinlabeler.html>

Labelpin: <https://faculty.math.illinois.edu/~nmd/software/>

“Point, click and edit labels manually” approach: obviously inappropriate for batch conversion

```
> ../labelpin minima.eps
% Click on the window that appeared to generate the label
% locations. When you're done, close the window and then
% copy everything into your LaTeX file.
```

```
\begin{figure}[htb]
\labellist
\small\hair 2pt
\pinlabel {$a$} [ ] at 5 60
\pinlabel {$b$} [ ] at 92 5
\pinlabel {$c$} [ ] at 174 6
\pinlabel {$d$} [ ] at 271 8
\pinlabel {$e$} [ ] at 341 6
\pinlabel {$f$} [ ] at 427 44
\endlabellist
\centering
\includegraphics[scale=1.0]{minima}
\caption{ }
\label{fig:label}
\end{figure}
```



PostScript

Mathematical Illustrations: A Manual of Geometry and PostScript, by Bill Casselman, Cambridge University Press, 2005, ISBN 0521839211

Chapter 4 - Coordinates and conditionals

<http://www.math.ubc.ca/~cass/graphics/manual/>,

- PostScript is a programming language that describes the appearance of a page;
- Three coordinate systems: physical, page, user
- **Page**: is the one used immediately after start up, the origin is at the lower left of the page, the unit of length is 1pt, **and it matches T_EX coordinate system**;
- **Physical**: is the one naturally adapted to the physical device (display, printer etc);
- **User**: coordinates used in PostScript file;



Matrix

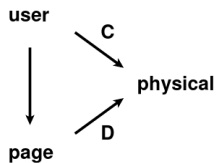
- Affine coordinate transformation:

$$x_{physical} = ax_{user} + cy_{user} + e$$

$$y_{physical} = by_{user} + dy_{user} + f$$
- In terms of a matrix: $[x_{\bullet} \ y_{\bullet}] = [x \ y] \begin{bmatrix} a & b \\ c & d \end{bmatrix} + [e \ f]$
- The data determining an affine coordinate change are stored in PostScript in an array $[a \ b \ c \ d \ e \ f]$ of length six, which it calls a matrix.
- Matrix change if scale, translate or rotate command issued;



User to Page transformation



- C : user to physical (currentmatrix)
- D : page to physical (defaultmatrix)
- CD^{-1} : user to page

```

/user-to-page-matrix {
  matrix currentmatrix
  matrix defaultmatrix
  matrix invertmatrix
  matrix concatmatrix
} def
  
```



Tags in PostScript file

```

%!PS-Adobe-2.0 EPSF-2.0
%%Title: minima.eps
%%Creator: fig2dev Version 3.2 Patchlevel 3c
%%CreationDate: Tue Aug 24 19:29:22 2004
%%BoundingBox: 0 0 439 186
...
/col0 {0.000 0.000 0.000 srgb} bind def
...
-49.0 200.0 translate
1 -1 scale
...
/gr {grestore} bind def
/gsave {gsave} bind def
/m {moveto} bind def
/sh {show} bind def
/rot {rotate} bind def
/sc {scale} bind def
/ff {findfont} bind def
/sf {setfont} bind def
/scf {scalefont} bind def
/tr {translate} bind def
...
0.06000 0.06000 sc
...
/Times-Roman ff 180.00 scf sf
825 2400 m
gs 1 -1 sc (bv) col0 sh gr
...

```

- Hard path: (re)implement PostScript interpreter, catch all matrix-related commands (and their possible aliases);
- Ghostscript already available and can be used to calculate all necessary data;



Tags in PostScript file

Modified PostScript:

```
...
/Times-Roman ff 180.00 scf sf
825 2400 m
(matrix:) = user-to-page-matrix ==
(x:) = (825) =
(y:) = (2400) =
gs 1 -1 sc (bv) col0 sh gr
(tag:) = (bv) =
...
```

Ghostscript output:

```
...
GS<1>GS<1>matrix:
[0.06 0.0 0.0 -0.06 -49.0 200.0]
GS<1>x:
825
GS<1>y:
2400
GS<1>tag:
bv
GS<1>GS<1>
...
```

- Input PostScript file can be modified using (relatively) simple regular expressions to find tags and add “print to console” commands for coordinates, used matrix and tag itself;
- Next step is to parse Ghostscript output and do affine coordinate transformation



Converting PSfrag to tikz

Coordinate transformation:

$$\begin{bmatrix} 825 & 2400 \end{bmatrix} \begin{bmatrix} 0.06 & 0 \\ 0 & -0.06 \end{bmatrix} + \begin{bmatrix} -49 & 200 \end{bmatrix} = \begin{bmatrix} 0.5 & 56 \end{bmatrix}$$

PSfrag code:

```
\psfrag{bv}[t]{$\bar{v}$}
```

Corresponding tikz node:

```
\node [] at (0.50pt, 56.00pt) {$\bar{v}$};
```



Implementation

- Perl programming language (Python could be used too)
- **Regular expressions**
- TODO: better PSfrag syntax handling (scale and rot options)
- TODO: code cleanup and testing

```

#
# XFig label regexp
#
# /Times-Roman ff 180.00 scf sf
# 8550 825 m
# gs 1 -1 sc (K) col0 sh gr
#
my $label_re = qr/
  (?<FONT>\//\S+ \s+ ff \s+ [\d\.]+\s+ scf \s+ sf) \s+
  (?<POS>(?(X)\d+) \s+ (?(Y)\d+) \s+ m) \s+
  (?<LABEL>
    gs \s+ 1 \s+ -1 \s+
    sc \s+ \\\( (?(TAG>.*?) \) \s+
    col\S+ \s+ sh \s+ gr
  )
/xs;

```



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