

The `pspicture` package*

D. P. Carlisle

16 June 1992

1 Introduction

`pspicture` is a re-implementation, and extension of, \LaTeX 's `picture` environment, using PostScript `\special`'s. This has several advantages, mainly that lines of arbitrary slope and thickness may be specified, and there is no limit on the size of the circles that may be drawn¹.

One disadvantage is that the picture can no longer be previewed on a `dvi` previewer, such as `xdvi`. To help with this problem, a companion style option, `texpicture`, may be used while developing a document, this uses the standard picture commands as much as possible, and silently omits any picture objects that can not be drawn with standard \LaTeX .

A second disadvantage, is that a `dvi` file produced with `pspicture` will contain embedded `\special` commands. These commands will only work with the driver program for which they were intended. This makes the `dvi` file less portable. `pspicture` will by default use `\special`'s set up for Rokicki's `dvips` program, although it should be easy to modify the code to work with other PostScript drivers. A `DOCSTRIP` option for a version of `dvi2ps` is included with this distribution.

1.1 Commands Available

<code>\circle</code>	Use as described in the \LaTeX book but with no maximum diameter. The thickness
<code>\circle*</code>	of the circle is altered by the <code>\linethickness</code> command. The size of the circle produced by <code>\circle*</code> is not affected by <code>\linethickness</code> , so it is not the same as 'filling in' the circle drawn by <code>\circle</code> .
<code>\oval</code>	Use as described in the \LaTeX book, but as there is no maximum diameter for the circular arcs, the oval (in the absence of the optional <code>[tr]</code> etc) always consists of two semi-circular arcs joined by a pair of parallel lines. To obtain a 'rectangle

*This file has version number v2.02, last revised 1999/04/11/.

¹There is a certain amount of overlap between this style option and the widely available `eeepic` option. However when I wrote the first version of this, in 1989, I was not aware of `eeepic`, and `pspicture` has been reasonably popular in Manchester, even though `epic` and `eeepic` have been installed.

with rounded corners' the oval command has a second optional argument (given first !).

`\oval[20](100,200)[t]`

Produces the top half of an oval with quarter circles of radius $20 \times \text{unitlength}$. If $\text{unitlength} = 1\text{pt}$ then this is equivalent to the standard oval command. In general `\oval[R](x,y)` uses circular arcs of radius $\min(R, x/2, y/2)$.

`\line` Use as described in the \LaTeX book but with no restriction on the available slopes.
`\vector` The thickness of a sloping line is altered by the `\linethickness` command.

`\Line` New forms of the line and vector commands.
`\Vector` `\put(x1,y1){\Line(x2,y2)}`
 produces a line from $(x1,y1)$ to $(x1+x2,y1+y2)$ and similarly for `\Vector`.

`\Curve` Like `\Line` except that it produce a curve!
`\put(x1,y1){\Curve(x2,y2){m}}`
 produces a curve from $(x1,y1)$ to $(x1+x2,y1+y2)$. the amount of curvature is controlled by m but try 1 or -1 first. m does not have to be an integer. Negative numbers curve the opposite way to positive numbers.

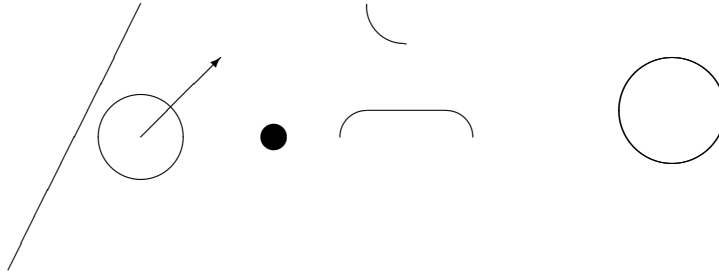
`\thinlines` These commands alter the thickness of **all** lines including slanted lines and circular
`\thicklines` arcs.
`\linethickness`

`\arrowlength` A new command which specifies the size of the arrowhead drawn by the `\vector` and `\Vector` commands. Like `\linethickness` it does not get multiplied by `\unitlength`. At present the arrowhead is triangular. If a head with curved sides more like the standard \LaTeX head is required the definition of `!A` in `pspicture.ps` should be altered.

Other `picture` mode commands are not altered by this style, and so may be used, just as described in the \LaTeX book. These include: `\put`, `\multiput`, `\makebox`, `\framebox`, `dashbox` and `\shortstack`.

2 Examples

A picture built with L^AT_EX's line and circle fonts.



The same picture built with PostScript `\special`'s.

Some extra features not available using the standard picture mode.

3 pspicture.sty

```

1 <*package>

    First we set up the code that is specific to the driver program that is being
    used. If the driver can incorporate a header file, define \PS@header appropriately,
    \PS@special should expand to the format for inline PostScript code. The driver
    should protect this code with a (g)save (g)restore pair. dvips is treated specially
    so that it will be the default driver if this file is used without being stripped. If
    you find definitions of these macros which work for the driver you use, email me,
    and I will include them in the next release.

\PS@header Code to include the PostScript header.
2 <*dvips>
3     \def\PS@header#1{\special{header=#1}}
4 </dvips>
5 <dvi2ps>\def\PS@header#1{\typeout{Print with the option -i #1}}
6 \PS@header{pspicture.ps}

\PS@special The format of the \special command for inline PostScript.
7 <*dvips>
8     \def\PS@special#1{\special{"#1}}
9 </dvips>
10 <dvi2ps>\def\PS@special#1{\special{pstext="#1"}}

\strippt Strip the final 'pt' off the string returned by \the.
11 {\catcode't=12\catcode'p=12\gdef\noPT#1pt{#1}}
12 \def\strippt#1{\expandafter\noPT\the#1\space}

\@circle Internal name for \circle.
13 \def\@circle#1{%
14     \@tempdimb #1\unitlength
15     \PS@special{%
16         \strippt\@wholewidth
17         \strippt\@tempdimb
18         !C}}

\@dot Internal name for \circle*.
19 \def\@dot#1{%
20     \@tempdimb #1\unitlength
21     \PS@special{%
22         \strippt\@tempdimb
23         !D}}

\line Line with a LATEX style slope specification.
24 \def\line(#1,#2)#3{%
25     \@linelen=#3\unitlength
26     \PS@special{%
27         \strippt\@wholewidth
28         #1
29         #2
30         \strippt\@linelen
31         !L}}

```

`\vector` Line and arrow head with a L^AT_EX style slope specification.

```

32 \def\vector(#1,#2)#3{%
33   \@linelen=#3\unitlength
34   \PS@special{%
35     \strippt\@arrowlength
36     \strippt\@wholewidth
37     #1
38     #2
39     \strippt\@linelen
40     !V}}

```

`\oval` If no optional argument appears, use a default of maximum radius of T_EX's maximum length.

```

41 \def\oval{%
42   \@ifnextchar[%
43     {\@ov@l}%
44     {\count@=\maxdimen \divide\count@ by \unitlength \@ov@l[\count@]}}

```

`\@ov@l` Look for an optional t_lbr argument.

```

45 \def\@ov@l[#1](#2,#3){%
46   \@ifnextchar[{\@oval[#1](#2,#3)}{\@oval[#1](#2,#3)[]}}%

```

`\@oval` The PostScript version of the `\oval` command will print each quarter of the oval separately, each quarter will only be printed if the appropriate argument is 1. An optional argument of `t` causes the arguments for the two bottom quarters to be set to 0, similarly, `r` causes the two left quarters to be set to 0. Thus an argument `[tr]` will set the bottom and left quarters to 0, resulting in only the top right quarter being printed.

```

47 \def\@oval[#1](#2,#3)[#4]{\begingroup
48   \@tempdimb #1\unitlength
49   \@ovxx #2\unitlength
50   \@ovyy #3\unitlength
51   \def\r{\def\TL{0 }\def\BL{0 }}%
52   \def\l{\def\TR{0 }\def\BR{0 }}%
53   \def\t{\def\BL{0 }\def\BR{0 }}%
54   \def\b{\def\TL{0 }\def\TR{0 }}%
55   \def\TL{1 }\def\BL{1 }\def\TR{1 }\def\BR{1 }%
56   \@tfor\@tempa :=#4\do{\csname\@tempa\endcsname}%
57   \PS@special{%
58     \BR\BL\TR\TL
59     \strippt\@wholewidth
60     \strippt\@tempdimb
61     \strippt\@ovxx
62     \strippt\@ovyy
63     !O}%
64   \endgroup}

```

`\Line` New style `\Line` command.

```

65 \def\Line(#1,#2){%
66   \@ovxx #1\unitlength
67   \@ovyy #2\unitlength
68   \PS@special{%
69     \strippt\@wholewidth
70     \strippt\@ovxx
71     \strippt\@ovyy
72     !L2}}

\Curve Not particularly good, but it will do for now.
73 \def\Curve(#1,#2)#3{%
74   \@ovxx #1\unitlength
75   \@ovyy #2\unitlength
76   \PS@special{%
77     \strippt\@wholewidth
78     \strippt\@ovxx
79     \strippt\@ovyy
80     #3
81     !C2}}

\Vector New style \Vector command.
82 \def\Vector(#1,#2){%
83   \@ovxx #1\unitlength
84   \@ovyy #2\unitlength
85   \PS@special{%
86     \strippt\@arrowlength
87     \strippt\@wholewidth
88     \strippt\@ovxx
89     \strippt\@ovyy
90     !V2}}

\@arrowlength Length of an arrow head.
91 \newdimen\@arrowlength

\arrowlength Set the length of an arrow head.
92 \def\arrowlength#1{\@arrowlength #1}
93 \arrowlength{8pt}

If this file is used as a .sty file without being stripped, we want to stop here. The
\endinput must not be at the beginning of the line, or DocStrip will stop here as
well!.
94   \endinput
95 </package>

```

4 texpicture.sty

A dummy style file so that documents using `pspicture.sty` can be previewed or printed (as much as possible) using a dvi (not PostScript) previewer or printer driver.

Just change ‘`pspicture`’ to ‘`texpicture`’ in the `\documentstyle` options list.

```

96 <*texsty>
97 \warning{texpicture.sty in operation:^^J\@spaces
98 LaTeX document with pspicture.sty before printing}

\Line Define all these new commands to silently gobble their arguments.
\Vector 99 \def\Line(#1,#2){}
\arrowlength 100 \def\Vector(#1,#2){}
\Curve 101 \def\arrowlength#1{}
102 \def\Curve(#1,#2)#3{}

\@badlinearg If a vector or line is called with a slope specification that is not allowed by standard
LaTeX, \@badlinearg is called to produce the error message. We do not want to
see these errors, so:
103 \def\@badlinearg{}

\oval Give the standard \oval command another optional argument (which will be
\@@v@l ignored), to match the extra argument defined in pspicture.sty.
\@@vv@l 104 \let\@@v@l\oval
105 \def\@@@v@l[#1]{\@@v@l}
106 \def\oval{\@ifnextchar{\@@v@l}{\@@v@l}}

107 </texsty>

```

5 pspicture.ps

The PostScript header file for use with `pspicture.sty`. Probably this should use the PostScript dictionary mechanism, to keep identifiers local to this package, but for now, just give them names beginning with `!`.

```

108 <*ps>

!BP PostScript uses TeX's bp, that is 1/72 of an inch, not TeX's pt, 1/72.27 of an
inch, but it is inconvenient to get TeX to output in bp, so we need to scale the
PostScript.
109 /!BP{
110   72 72.27 div dup scale
111 }def

!A Arrow head:
<arrow length> !A
112 /!A{
113   newpath
114   0 0 moveto
115   dup neg dup .4 mul rlineto
116   .8 mul 0 exch rlineto
117   closepath
118   fill
119 } def

```

```

!V \vector(<x>,<y>)
  <arrow length> <line width> <x> <y> <len*unitlength> !V
120 /!V{
121  !BP
122  /!X exch def
123  /!y exch def
124  /!x exch def
125  newpath
126  0 0 moveto
127  !x 0 eq {0 !y 0 lt {!X neg}{!X} ifelse}
128      {!x 0 lt {!X neg}{!X}ifelse !X !y mul !x abs div} ifelse
129  lineto
130  setlinewidth % @wholewidth
131  currentpoint
132  stroke
133  translate
134  !y !x atan
135  rotate
136  !A          % @arrowlength
137  }def

!L \line(<x>,<y>)
  <arrow length> <line width> <x> <y> <len*unitlength> !L
138 /!L{
139  !BP
140  /!X exch def
141  /!y exch def
142  /!x exch def
143  newpath
144  0 0 moveto
145  !x 0 eq {0 !y 0 lt {!X neg}{!X} ifelse}
146      {!x 0 lt {!X neg}{!X}ifelse !X !y mul !x abs div} ifelse
147  lineto
148  setlinewidth % @wholewidth
149  stroke
150  }def

!C \circle{<diam>}
  <line width> <diam*unitlength> !C
151 /!C{
152  !BP
153  0 0 3 2 roll
154  2 div 0 360 arc
155  setlinewidth % @wholewidth
156  stroke
157  }def

!D \circle*{<diam>}
  <diam*unitlength> !D

```



```

158 /!D{
159   !BP
160   0 0 3 2 roll
161   2 div 0 360 arc fill
162 }def

```

```

!O \oval[ $\langle max-radius \rangle$ ]( $\langle x \rangle$ , $\langle y \rangle$ )[ $\langle tibr \rangle$ ]
 $\langle br \rangle$  $\langle bl \rangle$  $\langle tr \rangle$  $\langle tl \rangle$ 

```

```

 $\langle line\ width \rangle$   $\langle max-radius * unitlength \rangle$   $\langle x * unitlength \rangle$   $\langle y * unitlength \rangle$  !O

```

The first four arguments should be either 0, denoting that that quarter should not be drawn, or 1, to draw a quarter oval.

```

163 /!O{
164   !BP
165   /!y exch 2 div def
166   /!x exch 2 div def
167   /!r exch !x !y

```

Ghostscript appears to have a min operator, so the following 2 lines could be coded as min min, but it's not in the Ref. Manual, and it doesn't work on my printer!

```

168   2 copy gt {exch} if pop
169   2 copy gt {exch} if pop
170   def
171   setlinewidth % @wholewidth
172   1 eq
173   {newpath
174     !x neg 0 moveto
175     !x neg !y 0 !y !r arcto 4 {pop} repeat
176     0 !y lineto
177     stroke}if
178   1 eq
179   {newpath
180     !x 0 moveto
181     !x !y 0 !y !r arcto 4 {pop} repeat
182     0 !y lineto
183     stroke}if
184   1 eq
185   {newpath
186     !x neg 0 moveto
187     !x neg !y neg 0 !y neg !r arcto 4 {pop} repeat
188     0 !y neg lineto
189     stroke}if
190   1 eq
191   {newpath
192     !x 0 moveto
193     !x !y neg 0 !y neg !r arcto 4 {pop} repeat
194     0 !y neg lineto
195     stroke}if
196   }def

```

```

!V2 \Vector( $\langle x \rangle$ , $\langle y \rangle$ )

```

```

    <arrow length> <line width> <x*unitlength> <y*unitlength> !V2
197 /!V2{
198   !BP
199   2 copy exch
200   atan
201   /a exch def
202   2 copy
203   newpath
204   0 0 moveto
205   lineto          % <x*unitlength> <y*unitlength>
206   3 2 roll
207   setlinewidth    % @wholewidth
208   stroke
209   translate        % <x*unitlength> <y*unitlength>
210   a rotate
211   !A                % @arrowlength
212 }def

!L2 \Line(<x>,<y>)
    <line width> <x*unitlength> <y*unitlength> !L2
213 /!L2{
214   !BP
215   newpath
216   0 0 moveto
217   lineto          % <x*unitlength> <y*unitlength>
218   setlinewidth    % @wholewidth
219   stroke
220 }def

!C2 \Curve(<x>,<y>){<±>}
    <line width> <x*unitlength> <y*unitlength> <±> !C2
221 /!C2{
222   !BP
223   /!s exch def
224   /!y exch def
225   /!x exch def
226   newpath
227   0 0 moveto
228   0 0
229   !x 2 div !y 10 div !s mul add
230   !y 2 div !x 10 div !s mul sub
231   !x !y
232   curveto
233   setlinewidth    % @wholewidth
234   stroke
235 }def

236 </ps>

```

Index

Numbers written in *italic* refer to the page where the corresponding entry is described; numbers underlined refer to the code line of the definition; numbers in *roman* refer to the code lines where the entry is used.

Symbols	<code>\catcode</code> 11	O
<code>\@@@v@l</code> 105, 106	<code>\circle</code> <i>1</i>	<code>\!O</code> <u>163</u>
<code>\@v@l</code> <u>104</u>	<code>\circle*</code> <i>1</i>	<code>\oval</code> <i>1</i> , <u>41</u> , <u>104</u>
<code>\@vv@l</code> <u>104</u>	<code>\count@</code> 44	P
<code>\@arrowlength</code>	<code>\csname</code> 56	<code>\PS@header</code> <u>2</u>
..... 35, 86, <u>91</u> , 92	<code>\Curve</code> <i>2</i> , <u>73</u> , <u>99</u>	<code>\PS@special</code>
<code>\@badlinearg</code> <u>103</u>	D	... <u>7</u> , 15, 21, 26,
<code>\@circle</code> <u>13</u>	<code>\!D</code> <u>158</u>	34, 57, 68, 76, 85
<code>\@dot</code> <u>19</u>	<code>\def</code> .. 3, 5, 8, 10, 12,	R
<code>\@ifnextchar</code> 42, 46, 106	13, 19, 24, 32,	<code>\r</code> 51
<code>\@linelen</code> 25, 30, 33, 39	41, 45, 47, 51–	S
<code>\@ov@l</code> 43, 44, <u>45</u>	55, 65, 73, 82,	<code>\space</code> 12
<code>\@oval</code> 46, <u>47</u>	92, 99–103, 105, 106	<code>\special</code> 3, 8, 10
<code>\@ovxx</code> ... 49, 61, 66,	<code>\divide</code> 44	<code>\striptt</code> <u>11</u> , 16, 17, 22,
70, 74, 78, 83, 88	<code>\do</code> 56	27, 30, 35, 36,
<code>\@ovyy</code> ... 50, 62, 67,	E	39, 59–62, 69–
71, 75, 79, 84, 89	<code>\endcsname</code> 56	71, 77–79, 86–89
<code>\@spaces</code> 97	<code>\endgroup</code> 64	T
<code>\@tempa</code> 56	<code>\endinput</code> 94	<code>\t</code> 53
<code>\@tempdimb</code> 14,	<code>\expandafter</code> 12	<code>\the</code> 12
17, 20, 22, 48, 60	G	<code>\thicklines</code> <i>2</i>
<code>\@tfor</code> 56	<code>\gdef</code> 11	<code>\thinlines</code> <i>2</i>
<code>\@warning</code> 97	L	<code>\TL</code> 51, 54, 55, 58
<code>\@wholewidth</code> . 16, 27,	<code>\!L</code> <u>138</u>	<code>\TR</code> 52, 54, 55, 58
36, 59, 69, 77, 87	<code>\l</code> 52	<code>\typeout</code> 5
A	<code>\!L2</code> <u>213</u>	U
<code>\!A</code> <u>112</u>	<code>\let</code> 104	<code>\unitlength</code>
<code>\arrowlength</code> .. <i>2</i> , <u>92</u> , <u>99</u>	<code>\Line</code> <i>2</i> , <u>65</u> , <u>99</u>	. 14, 20, 25, 33,
B	<code>\line</code> <i>2</i> , <u>24</u>	44, 48–50, 66,
<code>\b</code> 54	<code>\linethickness</code> <i>2</i>	67, 74, 75, 83, 84
<code>\begingroup</code> 47	M	V
<code>\BL</code> 51, 53, 55, 58	<code>\maxdimen</code> 44	<code>\!V</code> <u>120</u>
<code>\!BP</code> <u>109</u>	N	<code>\!V2</code> <u>197</u>
<code>\BR</code> 52, 53, 55, 58	<code>\newdimen</code> 91	<code>\Vector</code> <i>2</i> , <u>82</u> , <u>99</u>
C	<code>\noPT</code> 11, 12	<code>\vector</code> <i>2</i> , <u>32</u>
<code>\!C</code> <u>151</u>		
<code>\!C2</code> <u>221</u>		