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PICPAC: A PDP-6 Picture Package

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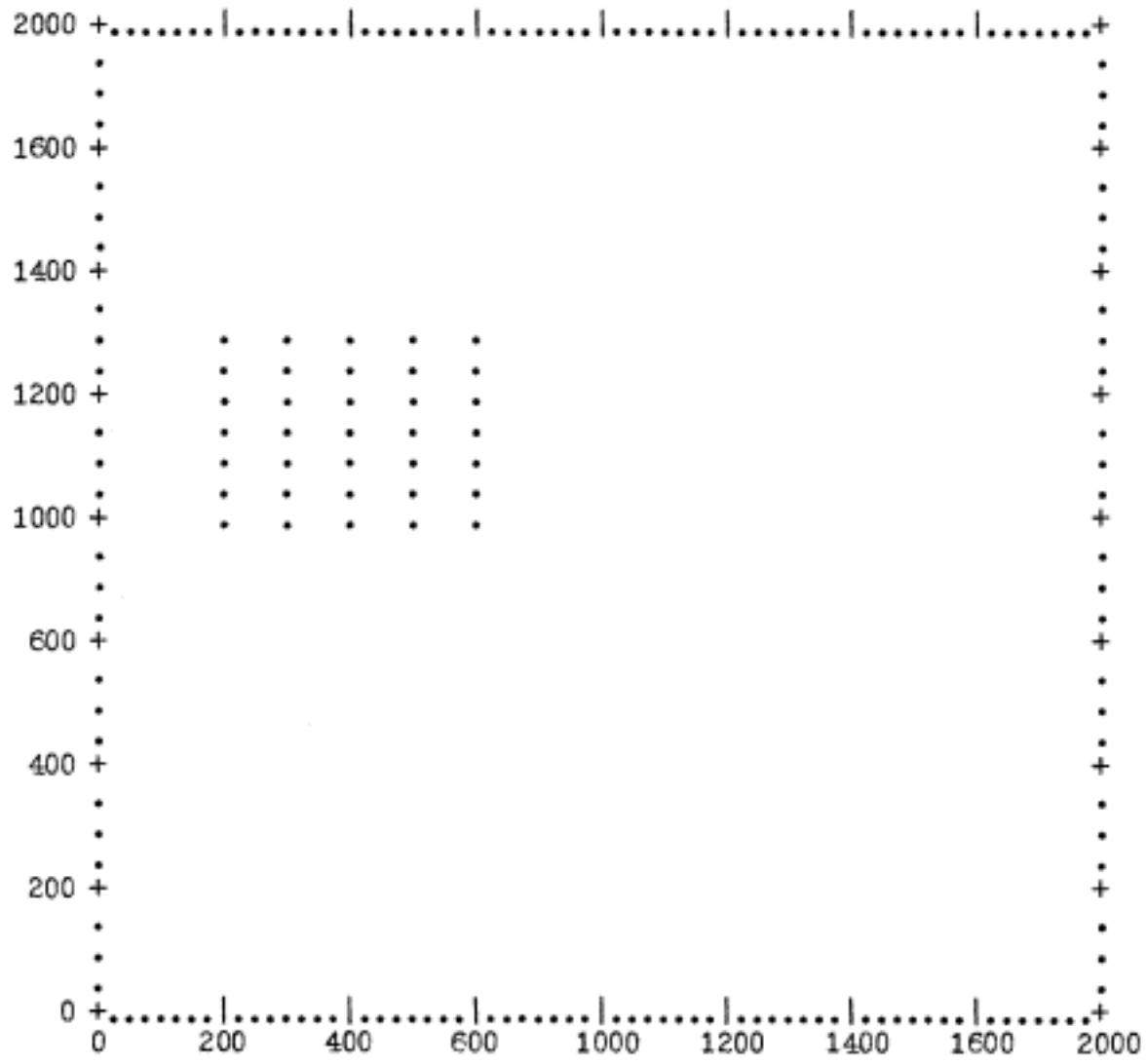
ABSTRACT

PICPAC is a PDP-6 program to be used for manipulating pictures of real-world scenes. It operates under ITS (the Incompatible Time-Sharing System) under control of a simple on-line command language. It includes facilities for reading pictures from either vidissector, for reading and writing them on disk or microtape, and for displaying or plotting them. It also includes focussing and control functions.

PICTURE SPACE

The picture can be thought of as a finite subset of a square. One can consider the square to be either 1.0 x 1.0, using floating-point numbers to refer to coordinates, or a 1024. x 1024. square, using fixed-point numbers. We will use the latter convention in the sequel.

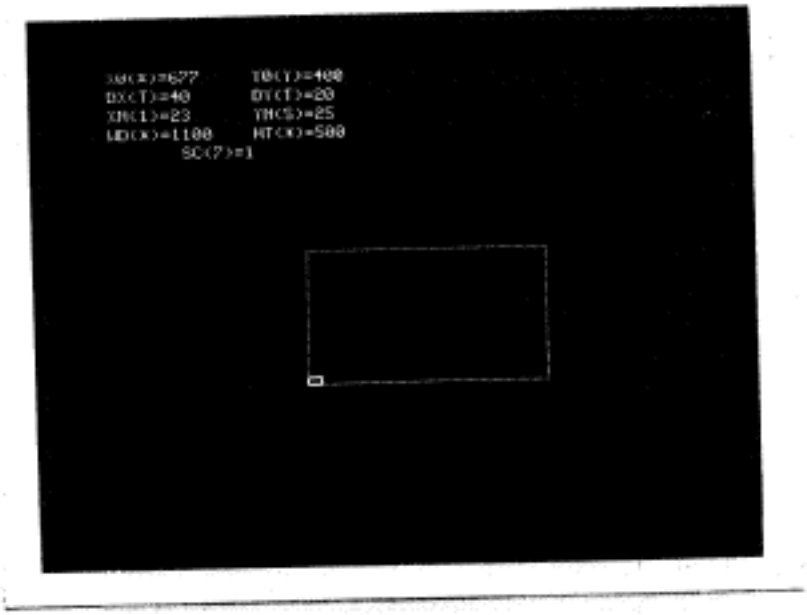
In the diagram below (Figure 1), the picture is a 5x7 array, with its LLHC (lower-left-hand corner) point at (200,1000), and with a separation of 100 between successive points in the x-direction and 40 in the y-direction.



A Picture Array
Figure 1

DISPLAY OF PICTURE FRAME AND PARAMETERS

The outline of the picture, as well as the values of the parameters defining the geometry of the picture, are displayed on the 340 CRT. A typical display is shown in Figure 2:



Picture Frame and Parameter Display
Figure 2

The rectangle shows that the picture frame is 1100x500, with its LLHC at (677,400). The smaller rectangle in the LLHC of the larger shows that the spacing between successive points is 40 in the horizontal direction and 20 in the vertical direction.

The value of each parameter, as well as what controls it, is shown by the text material at the upper left. The general form is "pp(c)=v", where pp is the parameter name, c indicates the variable controlling the parameter, and v is the current value of the parameter.

pp may be: XO or YO (the abscissa and ordinate of the LLHC of the picture frame), DX or DY (the spacing between successive points in the horizontal and vertical directions), XM or YM (the horizontal and vertical dimensions), WD or HT (the width and height of the frame), or SC, the scaling factor for the Holloway plot.

c may be T, *, X, Y, or a digit i between 0 and 7. T means that the parameter is fixed at the last value typed in. * means that it is a dependent variable. X or Y means that the parameter is controlled by the horizontal or vertical joystick pot, while a digit i means that it is controlled by the i-th pot in the pot-box (faintly labeled 140+i).

The value v is octal.

The intensity i and scale s with which these characters are

displayed can be set by typing the commands iPI and sPS, respectively.

In the situation producing Figure 2, XO is under control of the joystick, but it has been moved so far to the right that the rectangle bumps the edge of the screen; thus XO is controlled at the moment not by the joystick, but by an inequality condition. This is indicated by the asterisk.

The LLHC of the frame can be set by the joystick (pots X and Y), or by the TTY. Type mX to set XO to m, ,nX to set YO to n, and m,nX to set both.

DX and DY are set similarly by m,nD, while XM and YM are set by m,nM.

To freeze a variable to its present value, type T as its "value", e.g. ,TM would freeze YM at 25, and the displayed line would change to "YM(T)=25".

Type ↑T (control-T) to unfreeze a parameter.

Numbers may be typed in as decimal, floating, or octal. A number is decimal if it has a terminal period, floating if it it has a non-terminal period; otherwise it is octal. The width of the screen expressed in these three ways is 1024., 2000, and 1.0, respectively. Thus note that integers count points, while floating-point numbers express a fraction of the whole.

POT BOX

The pot box can be used to control the variables XM, YM, DX, DY, and SC. The values of the pots are transformed by taking the logarithm and (in the case of DX and DY) truncating.

If the user finds the parity or sense of pot 140+i annoying, he may invert it by typing the command xPP, where x=2**i.

VIDISSECTING

A picture may be read from one of three devices, designated 0,1,2:

v	Device
0	Old vidissector
1	Old vidissector, new interface
2	New vidissector

For 0 or 1, the two interface switches on the old vidissector must be set properly.

Check that power is on, lens cap off, sufficient light on scene, vidissector focussed properly, log/linear switch in the log position, etc.

Type v,s,dV to read in a picture defined by the parameters from vidissector v. For v = 1 or 2, s defines the signal/noise ratio (0 = smallest ratio & fastest, 3 = largest ratio & slowest), while d defines the dark cutoff (0 = darkest cutoff & most patient, 7 = lightest cutoff & least patient). s and d are irrelevant for v=0. Leaving out any of

these fields will leave the corresponding parameter unchanged.

The picture values read in will be stored in an array in 9-bit bytes. Each byte represents the logarithm of an intensity, 0 being darkest, and 777 being brightest.

If the picture produced by the current vidissector is inverted, either left-right or top-bottom (or both), typing the commands PX or PY, respectively, will correct the condition.

An ongoing vidissector read may be aborted by typing bell (control G).

INTENSITY-MODULATED PLOT

The current picture can be displayed as an intensity-modulated plot on the CRT (See Figure 3). Each of the XM*YM points of the picture is displayed at its proper position on the CRT with an intensity determined as follows: The set of all non-zero vidissector values occurring in the picture is put in increasing order, and divided into eight essentially equal intervals. To a value in the i-th interval (i=0,...,7) is assigned CRT intensity i.

```
X0(X) = 365     Y0(Y) = 410
DX(T) = 4       DY(T) = 4
XN(1) = 220     YN(5) = 207
WD(x) = 1074    HT(x) = 1030
          SC(7) = 13
```

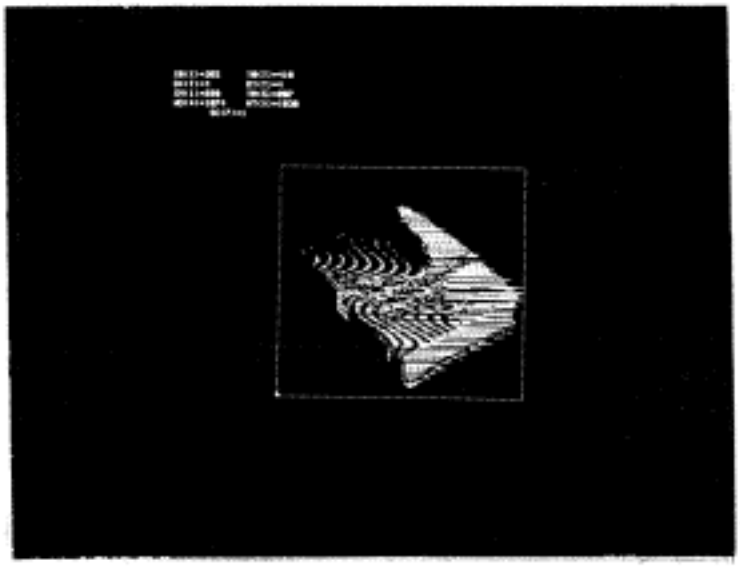
Intensity-Modulated Plot of a Book
Figure 3

Type I to turn this display on, and type ^I (control I) to turn it off. If a new picture is read in while the intensity display is on, the display will be updated automatically.

HOLLOWAY PLOT

The current picture can be displayed as a Holloway plot on the CRT (See Figure 4). The first row of the picture, and every jdel-th row thereafter is plotted on the CRT in the following manner: if the point (x,y) of the picture has vidissector value z, then a point is plotted at (x,y+sc*z), with intensity determined by the PH command, and sc determined by pot 147.

```
X0(X) = 365     Y0(Y) = 410
DX(T) = 4       DY(T) = 4
XN(1) = 220     YN(5) = 207
WD(x) = 1074    HT(x) = 1030
          SC(7) = 1
```



Holloway Plot of a Book
Figure 4

WRITING AND READING PICTURES ON TAPE OR DISK

PICPAC can be used to write pictures as files on microtape or disk, and to read pictures from such files. The format of such files is LISP compatible. Use

nEWname1 name2$

or nERname1 name2$

to write to or read from file name1 name2 on unit n: n>0 means microtape n, while n≤0 means disk -n.

Type bell to abort an ongoing ER or EW.

A current intensity plot or Holloway plot will be updated after an ER.

QUITTING

Typing "Q" will tidy up the core image of PICPAC, and return control to the superior procedure. PICPAC may then be dumped with the current parameter and variable settings intact, and restarted without these quantities being disturbed.

COMMANDS

In the descriptions below:

name1 name2 signify a file name consisting of one or two subnames.

f or g specify a number, floating point or integer. A string of digits containing a non-terminal period is taken to be floating decimal.

m or n specify an integer. A string of digits terminated by period (.) is taken to be decimal, otherwise octal.

t signifies an optional disk or microtape unit number. t≤0 signifies disk -t. If not given, the most recent explicit t is assumed.

v signifies an optional vidissector unit number. If not given, the most recent explicit v is assumed.

A minus-sign (-) may precede an m,n,f, or g.

If an argument is omitted in a D, M, or X, the corresponding parameter is left unchanged.

f,gD Set dx to f and dy to g.

tERname1 name2$
Read in picture and picture parameters from file name1 name2 on unit t.

tEWname1 name2$
Write picture and picture parameters on unit t as file name1 name2.

vF Focus vidissector v, using parameters x0, y0, xdim and dx to control the sample points.

H Display Holloway plot of current picture.

I Display intensity-modulated plot of current picture.

m,nM Set xdim to m and ydim to g.

mPD Set jdel to m.

mPH Set intensity for Holloway plots to m.

mPI Set intensity of window display characters to m.

mPP Invert parity of selected pots (pot box only).

mPS Set scale of window display characters to m.

PX Invert vidissector x parity.

PY Invert vidissector y parity.

Q Quit.

T Pseudo-argument: equivalent to typing "-1" as argument.

v,s,dV Read in picture from vidissector v, with signal/noise ratio s and dark cutoff d.

f,gX Set x0 to f and y0 to g.

|G (bell) Terminate current command.

|H Turn off Holloway display.

|I Turn off intensity-modulated display.

|T Pseudo-argument: equivalent to typing "-2" as argument.