

A PROGRAM TO OUTPUT STORED PICTURES

VISION FLASH 28

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Abstract

A program called LPTSEE has been written for use with the MIT vision system. LPTSEE makes use of the overprint capability of the line printer to allow the user to output a stored picture image.

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Vision flashes are informal papers intended only for internal use.

O. INTRODUCTION

In order to standardize experiments in machine vision, a facility was introduced whereby pictures could be stored on the disk. Current experiments in vision make extensive use of this stored picture facility.

As an aid to such research, a machine language program called LPTSEE has been written to enable the user to obtain hard copy output from stored picture data.

The overprinting of up to five ASCII characters is used to obtain twenty different levels of print brightness. The vidisector points are then quantized into twenty different values and the image is output accordingly. Coordinate axes are included to assist the user in locating points of interest.

Three modes of output are available. In the first mode, the entire stored picture is output. This mode is most useful as a first look at an image. However, since the scale dimensions of a line printer page are quite restrictive, the resulting picture is often distorted geometrically. (ie. There can be a great disparity between the horizontal and vertical scale.)

In the second mode, the true geometric proportion of the image is preserved. This mode is useful for such things as measuring the angles at vertices and the distances between vertices. The line printer outputs at 10 columns per inch (horizontally) and 6 rows per inch (vertically). To obtain a

distortion free picture, the x-axis scale is set at 3 vidissector points per column and the y-axis scale is set at 5 vidissector points per row.

In the third mode, a selected window of the stored picture is output. This mode is useful for obtaining a very detailed analysis of a particular point of interest such as a vertex or edge. Any window with x-range less than 110 and y-range less than 50 will result in a picture in which each overprinted character corresponds to a single vidissector point.

Finally, the user is able to request that a legend be output giving the actual range of vidissector values which correspond to each of the twenty overprint characters used in the picture.

This document has been written to enable people to begin using LPTSEE. Any comments, criticisms or corrections would be most appreciated.

1. USING LPTSEE

LPTSEE exists as the source file LPTSEE > and the binary file LPTSEE BIN in the disk area of user VIS. This document exists as the TJ6 file FLASH 28 in the disk area of user VIS.

When first started, LPTSEE requests the user to

TYPE IMAGE FILE NAME:

Unless otherwise specified, the default device is DSK, the default user name is VIS and the default filename2 is > .

If the requested file does not exist, LPTSEE responds with

FILE NOT FOUND

Otherwise, a line of the form

XLL = a YLL = b XUR = c YUR = d

is output where (a,b) and (c,d) indicate respectively the lower left point and the upper right point of the stored picture.

We note that only a window of the original picture has been stored on the disk. Requesting (x,y) points outside the range $XLL < x < XUR$, $YLL < y < YUR$ will result in the error message NON-EXISTENT VIDI POINT.

Next, LPTSEE outputs a line of the form

DIM CUT OFF IS n

where n is the dim cut off value computed from DCL and CFL as specified in the stored picture. LPTSEE now outputs the following:

OPTIONS AVAILABLE:

1. OUTPUT ENTIRE PICTURE
 2. OUTPUT—NO GEOMETRIC DISTORTION
 3. OUTPUT SELECTED WINDOW
- OPTION =

At this point, the user selects the desired mode of output.

If option 1. is selected, the most appropriate x and y scale is determined from the known window extrema and LPTSEE proceeds to the next step without further dialogue with the user.

If option 2. is selected, LPTSEE continues by requesting:

CENTRE POINT COORDINATES:

X =

Y =

to which the user responds by typing appropriate x,y coordinates for the center point of the picture. With the line printer outputting at 10 columns per inch and 6 rows per inch, an x-scale of 3 points per column and a y-scale of 5 points per row is the highest resolution possible, with no geometric distortion, that preserves integer coordinates. However, in general, an x-axis scale of 3 vidisector points per column and a y-axis scale of 5 vidisector points per row is not sufficient for obtaining the entire picture on one line printer page. By specifying the coordinates of a center point, the user is able to select that portion of the image which is of interest. (Mutiple outputs can be later pieced together to obtain the entire picture.)

If option 3. is selected, LPTSEE asks for the actual window coordinates by requesting:

WINDOW COORDINATES
XMIN =
XMAX =
YMIN =
YMAX =

to which the user responds by typing the minimum and maximum x and y values for the desired window. LPTSEE will scale, as well as possible, the desired window onto the 110 by 50 output page. Any window with x-range less than 110 and y-range less than 50 will result in a picture in which each overprinted character corresponds to a single vidissector point.

Once LPTSEE has obtained the required information to specify the output window, it continues by asking,

SHALL I OUTPUT A LEGEND ?

If the user responds by typing YES, a legend will be output following the picture giving the actual range of vidissector values which correspond to each of the twenty overprint characters used in the picture.

At this point, LPTSEE scans a diagonal cross-hair of the selected window to obtain a maximum and a minimum vidissector value. These values will be used to determine a range for the quantization of vidissector values into the twenty brightness levels. Once they have been found, LPTSEE reports this fact by typing:

VMAX IS n VMIN IS m
DO YOU WISH TO CHANGE THESE VALUES ?

If the user responds NO, LPTSEE will go ahead and use the quantization it has determined. If the user responds YES, LPTSEE will ask:

VMAX =
VMIN =

Changing VMAX or VMIN will result in a change in the quantization of vidissector values into brightness levels. This is a very useful feature for obtaining a finer discrimination of certain highlights in the picture. Increasing VMAX and VMIN will result in a finer discrimination of dark areas in the picture.

Decreasing VMIN and VMAX will result in a finer discrimination of bright areas in the picture. (Note: This is much like the use of under and over exposure in photographic printing.)

LPTSEE will output the stored picture via the TPL. The length of time required to complete the output of a picture varies according to the x-range and y-range of the selected window. With an x-range less than 512. points, LPTSEE should require no more than 1-2 minutes to output the picture. With an x-range greater than 512. points, multiple disk accesses are required for each line of scanning and performance may degrade considerably.

Once output to the TPL has been completed, LPTSEE will begin again by requesting a new file name for output.