A Computer Vision Introduction
to
The Image Processing Laboratory

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ABSTRACT

This manual describes basic image processing
procedures at the Image Processing Laboratory
(IPL) at Rensselaer Polytechnic Institute.
Covered by this manual are procedures for
digitization of images, storing images,
manipulation and generation of image data.

This manual is for those who are both new to the
IPL and who are interested in Image Processing.

ACKNOWLEDGEMENT

The author is happy to acknowledge the following assistance received during the course of the development of this manual:

To Professor George Nagy whose guidance shaped this manual into its present form.

To Peter Wu who suggested that the IPL would benefit from such a document.

To the students of Computer Vision for providing the motivation for this document and for the anticipated feedback which I hope will change its shape and iron out the bugs.

To all those whom I have forgotten to mention.

Thanks!

D.L.

IPL PERSONNEL

Laboratory Director : Jim Modestino

Laboratory Manager : Ken Walter JEC 2304 x6800

Computer Operator : Doug Lyon JEC 6049 x8229

IPL Secretary : Linda Fischer JEC 6001 x6330

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1 PREREQUISITES

All computer vision students should have received IPL-TR-81-015 [WU 1984] Introductory Users's Manual, IPL Computer Facility by Peter Wu. The following memo is designed to help you through your course assignments and to act as a supplement to IPL-TR-81-015. You should read all parts of IPL-TR-81-015 before continuing with this memo. This memo assumes that computer vision students will have the unsponsored software library abbreviations loaded into their environment [WU 1984].

2 EQUIPMENT USE

Anyone with questions about the operation of equipment at the IPL is encouraged to ask rather than experiment. This is of utmost importance! Users who break equipment because they did not ask are transgressing the boundaries of good taste and may well lose their lab privilege [WU 1984 chapter 4].

2.1 COHU

The Cohu digitizing camera is a television camera used for digitizing pictures in real time into the DeAnza. The camera is rather a delicate piece of equipment and its full operational use is for cleared personnel only. As background information only, the Cohu has several controls on its back panel. These will be aligned and the Cohu will be set up by IPL authorized personnel for the purposes of this course. You, the student, will be involved with just two camera adjustments, focus and aperture. Camera height, target, beam, and electronic focus controls should not be adjusted by unauthorized personnel.

To use the Cohu camera type DIG4 after loading the UNSPSOFT commands (see chapter 18 of WU 1984). For more information type:
DOC DIG4

For continuous digitization of the Cohu camera read:

DOC FEED

All those who missed class on September 9 should see an IPL staff member for the information missed.

2.2 VERSATEC

The Versatec is an electro-static printer/plotter with 200 lines per inch (2112 dots accross its 11" width). Spooling to the Versatec is accomplished using a program called BIPLOT. BIPLOT (an IPL installed PRIMOS command) uses a type 1 (binary) DBS file as input and is described fully in in User Bulletin 107. The following is an example of how to use BIPLOT:

```
OK, BIPLOT
Enter directory name:PICS /*   A   DBS
directory
Enter   input   file   name        or
number:D6.DOUBLET /* A DBS file name.
Input image file:
directory:  PICS
name:  D6.DOUBLET
number:  3
comment:  DITHERED IMAGE.
date:  TUE, 29 MAY 1984 11:14:44
Image  size:    512   lines   by:    512
pixels/line
Enter first scan line:  1
Enter last scan line:  512
Enter first pixel :  1
Enter last pixel :  512
Enter matrix size :  1
Slow Plotting?  Y
OK,
```

This has the effect of plotting a 512x512
binary image. To see that your plot has been
queued for printing use the command:
    SPOOL -LIST
Please remember that these spools can take
awhile when the system is loaded down.

To produce the input to BIPLOT (the DBS type
1 file) read the section on DBS.

3 DBS

A data base system for management of image,
graphical and other data on PR1ME computers is
described.

During the course of your assignments you will
find it necessary to output image data. The
accepted practice in the IPL is to output data to
a file and spool the data to an output device.
There are several graphics output devices at the
IPL but there is one data base system for storing
image data for all these devices, it is called
DBS. You may read about DBS in user bulletin 107
which is located in the racks in the terminal
room. For your first assignment you will generate
a binary image for output on our electro-static
plotter, the Versatec. The Versatec plots binary
data at a 200 lines per inch resolution. You will
perform the following steps in order to complete
your first assignment:

1. Write a program to output binary data to a DBS
file.
2. Use BIPLOT to spool this data out to the
Versatec.

To use BIPLOT see the section on BIPLOT.

About DBS
_____

A DBS directory may contain many separate files.
Each file may store a different type of data.
There are many different types of DBS data.

You will only work with type 1 (binary) and 8
(monochrome) during the course of your class
assignments and only with type 1 during your first
assignment.

A type 1 DBS format stores a compressed binary
image at 1 bit per pixel.
A type 8 DBS format stores a monochrome 8
bit/pixel image.

In the creation of a type 8 DBS file you will have
to use and become familiar with the DBS routines.
For your first assignment use and be familiar
with:
        OPN$DR - opens a DBS directory
        GET$HD - opens a DBS file and gets the header
        LST$FL - lists the files in the DBS directory
        PUT$HD - writes the header to a DBS file
        PUT$DT - writes a line of data to a DBS file
        CLS$UN - closes DBS files and directories by
        unit.

To read about these routines type:

DOC DBS

4 EXAMPLES

Examples of how do perform DBS manipulations
abound, type:

        DOC DBS2NUM
        DOC MDITHER
The source for these and all unsupported software
programs is in UNSPSOFT>SOURCE.

A special example has been developed for class use which produces a type 1 DBS file sutable for BIPLOT use. This is called VERSATEC_EXAMPLE and you type:

VERSATEC_EXAMPLE

to run it and:

DOC VERSATEC_EXAMPLE to read about it.

5 BIBLIOGRAPHY

Wu, P. 1984 Introductory User's Manual, IPL Computer Facility available from Image Processing Laboratory, Rensselaer Polytechnic Institute, Troy, New York 12181 as IPL-TR-81-015.