

# SRI International

## The DARPA/DMA Image Understanding Testbed SYSTEM MANAGER'S MANUAL

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## Preface

The primary purpose of the Image Understanding (IU) Testbed is to provide a means for transferring technology from the DARPA-sponsored IU research program to DMA and other organizations in the defense community.

The approach taken to achieve this purpose has two components:

- (1) The establishment of a uniform environment that will be as compatible as possible with the environments of research centers at universities participating in the IU program. Thus, organizations obtaining copies of the Testbed can receive a flow of new results derived from ongoing research.
- (2) The acquisition, integration, testing, and evaluation of selected scene analysis techniques that represent mature examples of generic areas of research activity. These contributions from participants in the IU program will allow organizations with Testbed copies to immediately begin investigating potential applications of IU technology to problems in automated cartography and other areas of scene analysis.

The views and conclusions contained in this document are those of the author and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the Defense Advanced Research Projects Agency or the United States government.

This manual contains a selection of information and procedures needed by system managers responsible for the maintenance of the IU Testbed software system.

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## Abstract

This manual is a reference document for system managers who are responsible for maintaining the Image Understanding Testbed software system. It documents procedures for installing the Testbed, customizing the installation to the needs of an individual site, and maintaining the documentation system. Appendices list a variety of sources of maintenance information for the system's hardware and commercial software.

# Table of Contents

Preface .....	i
Abstract .....	ii
1. Introduction .....	1
2. Installing the Testbed System .....	2
2.1. Software Installation .....	2
2.2. /etc Utilities .....	2
3. Site Customization Issues .....	4
3.1. Phototypesetter Characteristics .....	4
3.2. Grinnell Characteristics .....	4
3.3. Documentation .....	4
4. Maintaining UNIX-Style Testbed Documentation .....	6
4.1. <b>man</b> .....	6
4.2. <b>whereis</b> .....	7
4.3. <b>whatis</b> Data Base .....	7
5. Regenerating Testbed Documentation .....	8
6. Maintaining and Creating Documentation .....	9
Appendices	
A. Software Sources and Resources .....	10
A.1. UNIX .....	10
A.2. FRANZ LISP .....	10
A.3. EUNICE .....	11
A.4. TEX .....	11
A.5. EMACS .....	11
A.6. SCRIBE .....	11
A.7. VAX INTERLISP .....	11
A.8. MAINSAIL .....	11
B. Hardware Maintenance Resources .....	13

B.1. DEC .....	13
B.2. Grinnell .....	13
B.3. Optronics .....	13

## Section 1

### Introduction

The Image Understanding (IU) Testbed is a system of hardware and software that is designed to facilitate the integration, testing, and evaluation of implemented research concepts in machine vision. The system was sponsored by the Defense Advanced Research Projects Agency (DARPA) and the Defense Mapping Agency (DMA) and was developed at the Artificial Intelligence Center of SRI International.

This manual is designed as an aid to individuals concerned with managing an IU Testbed system, maintaining its facilities, and acquainting new users with the system. Managers of systems that run the EUNICE/VMS emulation of the UNIX operating system must also be acquainted with a companion manual, "Managing the IU Testbed under EUNICE/VMS." All managers must be thoroughly acquainted with the material contained in "The DARPA/DMA Image Understanding Testbed User's Manual" before attempting to carry out managerial functions.

Section 2 contains information about setting up and installing the initial Testbed software system, while Section 3 deals with site customization issues. Sections 4, 5 and 6 deal with maintaining, formatting, and creating the UNIX-Style Testbed documentation. Appendix A lists sources of information about a selection of software systems that may be included in the Testbed. Appendix B lists hardware repair resources.

The IU Testbed is an evolving system, so readers of this document are warned that some material in this document may be or may soon become obsolete.

## Section 2

### Installing the Testbed System

The Image Understanding Testbed software consists of a set of application programs, utilities, and libraries that may need to be relocated, customized, recompiled, or otherwise altered to suit the needs of an individual installation.

The first step in installing the Testbed is to transfer the Testbed file system from the distribution medium (e.g., a tar tape) to an appropriate disk file system. The Testbed directory tree */iu/tb* and other supporting directories should then look essentially like that described in */iu/tb/man/man7/tbhier.7*.

The special directory */iu/testbed* is a dummy user directory that contains typical user environment initialization files and the Testbed demonstration subdirectories. The contents of this directory may be used to aid in setting up files like *.login* and *.cshrc* for new Testbed users.

#### 2.1. Software Installation

The UNIX<sup>1</sup> **make** command is used to install and maintain the Testbed software systems. Since the process may be time consuming, one may want to run installation as a background process. In order to capture a log of the process, including any possible errors, the following command is recommended:

```
make >& make.log &
```

This generates a file *make.log* in the current directory that can be examined for irregularities and errors.

##### Application Programs

Each of the executable images in */iu/tb/bin* can be installed individually by connecting to the appropriate source directory in */iu/tb/src* and running **make**. To compile and install all of them at one time, run **make** from the */iu/tb/src* directory itself.

##### Libraries

The libraries in */iu/tb/lib* can be individually recompiled and installed by connecting to each individual subdirectory and invoking **make**. The entire library system may be rebuilt by running the **make** in the */iu/tb/lib* directory.

It is possible to run out of processes during the master **make** procedure in some system configurations. If this occurs, one recovers by connecting to the particular subdirectory in question and invoking **make** directly.

#### 2.2. /etc Utilities

The */etc* directory contains a number of programs and files that are needed for maintenance of the system. Some of these files must be initialized by the system manager at system installation time and updated periodically. Below we list a selection of the utilities with which the system manager should be

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<sup>1</sup>UNIX is a trademark of Bell Laboratories.



## Installing the Testbed System

familiar; for more detailed descriptions, refer to the "UNIX Programmer's Manual."

### Selected Standard UNIX Utilities:

**chgrp**

Program to change a user's group assignment.

**chown**

Program to change the owner of a list of files.

**mketcgrp**

Shell file to read the *passwd* file and make a *group* file. Minor editing may be required to get the file into final form.

### UNIX system description files

**group** Text file of group assignments. Generated by hand starting with the file created by **mketcgrp**. One should edit the file to check group names and to consolidate the lists of users in any given group.

**locations**

Text file of user locations needed by **finger**. The manager should update this file whenever any user location changes.

**passwd**

Encrypted UNIX user password file.

**termcap**

Text table listing characteristics of specific terminal types.

**ttys**

Text file of system teletypes and pseudoterminals. The manager must enter the correct data.

**ttytype**

Text file of terminal types associated with system teletypes. The manager must enter the correct data.

**utmp**

Data base of currently logged-on users. *utmp* must be initialized by the rebooting process.

## Section 3

### Site Customization Issues

The Testbed software may be installed on systems differing in various respects from the original SRI Testbed system. Here we list a number of issues that the system manager may confront in adapting the SRI Testbed software to the needs and characteristics of his site.

#### 3.1. Phototypesetter Characteristics

The SRI site currently supports **troff** using a locally-modified version of the **itroff** system to support the printing of **troff** files on the Imagen 8/300 laser printer. Individual sites must consult with the appropriate manufacturer for technical support of laser printer usage under **troff**.

The **troff** phototypesetting facility may run at some sites using a Versatec and the **vtroff** system. One must modify the **vtroff** system to get correct functionality. To customize for other systems, the file *rvcat.c* in the directory */usr/src/cmd/vpr/symbiont* must be altered to make the software page size conform to the hardware page size.

#### Values of variables in *rvcat.c* routine for different Versatec models

Variable	3210 value	V-80 value
FF_LINES	1600	1712
PAGE_LINES	1700	1812

To get a different Versatec working correctly with **vtroff**, the system manager must recompile and relink *rvcat.c* to generate a new print *symbiont*.

#### 3.2. Grinnell Characteristics

The basic graphics software supports a spectrum of Grinnell GMR-27 and GMR-270 series devices. The site-specific parameters must be set in the appropriate *include* files and then the */iu/tb/lib/imagelib/gmrlib* library must be recompiled. The files that must be examined for correspondence with a site's Grinnell configuration are

```
/iu/tb/include/gmrcnf.h  
/iu/tb/include/grinnell.h
```

#### 3.3. Documentation

The system manager will want to edit various documentation files so that the information contained will be correct for the local site. Maintenance of UNIX-style documentation is described in the following chapter. Other text files that may need modification include the following:

## Site Customization Issues

### *System Manager's Manual*

This manual itself can be modified, updated, and expanded by the manager at a given site as required.

### *User's Manual*

The main user-oriented Testbed document contains information that refers specifically to the SRI Testbed site; at other sites, the manager may wish to update and maintain a separate version of the manual for local users.

### *EMACS INFO Files*

Online documentation on the Testbed can be supplied in a very elegant form by the EMACS INFO system. A selection of INFO data files is normally a part of the Testbed system; the system manager may edit and expand the INFO file tree to match local system requirements. [NOTE: the Testbed INFO macro package makes use of a number of enhancements to the Unipress VAX EMACS.. To use INFO with an unenhanced version of EMACS, or with the Stallman VAX EMACS, some modifications of the INFO macro package are necessary.]

## Section 4

### Maintaining UNIX-Style Testbed Documentation

The Testbed system manager will be concerned also with maintaining the integrity of the UNIX programming system and documentation that form the core of the Testbed system. Among the special functions that must be maintained are **man**, **apropos**, **whereis**, and **whatis**.

Several UNIX user aids have now been adapted to search Testbed directories and files before searching the standard UNIX directories. Among the Testbed files used are */iu/tb/man/man\** and */iu/tb/lib/whatis*.

#### **apropos**

Use **apropos foo** to find all routines having anything to do with *fooing*. Testbed routines will be listed first, then any system routines.

#### **whatis**

When you know the name of a routine but not its function, type **whatis foo**. Both the Testbed and system functions will print if both versions exist; normally the Testbed version takes precedence, but you can control this with your search path or by invoking a routine with its full path name.

#### **whereis**

To find the full path to a file, type **whereis foo**. You may specify **-s** for *source*, **-b** for *binary* (executable), or **-m** for a **man** page; if you don't specify, you get all of them. This routine is slow because it has a great many directories to search.

#### **man**

To get the full **man** page, type **man foo**. A system **man** page is printed only if there is no Testbed routine of the same name.

**Apropos**, **whatis**, and **man** all derive their information from the manual pages in */iu/tb/man*. This directory may be incomplete, so don't count on **apropos** being omniscient. Also, ACRONYM, MAIN-SAIL and FRANZ LISP routines are not currently merged into this system.

#### 4.1. **man**

Local documentation in the **man** format is contained in */iu/tb/man/man1* and */iu/tb/man/man3*. Special extensions are used to denote the heritage of a given program:

- .3b** - denotes routines supporting *blklib* object-oriented utility functions;
- .3c** - denotes routines supporting the *ci* and *icp* command driver utilities;
- .3g** - denotes routines dealing with graphics generation;
- .3i** - denotes routines dealing with imagery and belonging to the *imagelib* library;
- .3s** - denotes routines belonging to the *sublib* utility library;
- .3v** - denotes routines belonging to the *vision* utility library.

Some of these extensions are the same as those used by UNIX, but with different meanings. If the manager wishes to change any of these, he must recompile */iu/tb/src/man/man.c*. The extensions are hard-wired into the code.

#### 4.2. whereis

The Testbed version of **whereis** has been modified to search through the Testbed directory system and through most system directories. The search paths may be changed by altering */iu/tb/bin/whereis*.

If one restructures any of the libraries, one may also have to edit **whereis** and/or rename some of the **man** files.

The **whereis** command can be used to flag all programs or subroutines for which there is no documentation, or all documentation for which there is no source code. Use **whereis -smu filelist**, where the *filelist* may be something like *"\*/"* done in either a source or man directory. Beware: this takes a long, long time. Specifying the search directories using the **-S**, **-M**, **-B** flags will speed up the process.

#### 4.3. whatis Data Base

Adding a new routine or subroutine to the documentation system requires one to update the */iu/tb/lib/whatis* data base. This can be done "by hand", or by calling **catman -w** to remake the entire file.

**Catman** has another feature: if you leave off the **-w**, it runs **nroff** on all of the **man** pages and puts the formatted output into */iu/tb/man/cat\*/*. This can be used to generate manual pages suitable for printing on a line-printer.

## Section 5

### Regenerating Testbed Documentation

To print this manual or any other manual in */iu/tb/docsrc* whose file extension is of the form *.me*, invoke the command

```
itroff -me filename.me
```

If the file contains equations or tables, use

```
tbl filename.me | eqn | itroff -me
```

The latter is safest if you are in doubt.

To get a typeset version of any **man** page on the Imagen, invoke

```
itroff -man name.ezt
```

where the file name is one of those in */iu/tb/man/man\**. The entire collection of such manual pages is the "IU Testbed Programmer's Manual," the major quick reference work for the Testbed.

Sites with Versatecs would use **vtroff** instead of **itroff**. **nroff** may be used to get a formatted text file; however, a number of the **man** documents have anomalies when formatted into text files and displayed on a CRT or printed on a line printer.

## Section 6

### Maintaining and Creating Documentation

There are a number of approaches that the system manager may use to generate new documentation. For UNIX *man* pages, a simple technique is to use the *doc* utility. This is a program that interrogates the user for the information needed to construct a manual entry. To use *doc*, the user need not know *troff* syntax or *man* macros.

For those who need to create, edit, or alter major documents such as those in */iu/tb/docsrc/\*.me* under standard UNIX, the only alternative is to learn *troff* and some macro packages like *me* and *ms*.

Sites that have *TeX* or *LaTeX* may prefer to use those systems for locally generated documents.

There are also a number of tools available for maintaining the integrity of program systems and their accompanying documentation. The UNIX Source Code Control system (SCC) is available to sites with a System III license. Similar capabilities are available to sites with 32/V and higher licenses through the Revision Control System (RCS).

## Appendix A

### Software Sources and Resources

In this appendix we list a number of places where the system manager can obtain relevant software, documentation, system updates, and software maintenance information.

#### A.1. UNIX

In order to run the Testbed, a UNIX 32V license or a System III or higher license is required. The primary source for UNIX license information is

Western Electric/ AT&T  
P.O. Box 25000  
Greensboro, North Carolina 27420  
919-697-6530

The individuals to contact are H. Craig Cook or Chuck Green.

The source for the Berkeley UNIX software system is

Computer Systems Research Group  
Computer Science Division  
Department of Electrical Engineering and Computer Science  
University of California  
Berkeley, California 94720  
415-642-7780

Licensing is currently handled by Pauline Schwartz. The UNIX project is currently managed by Professor Robert Fabry.

Additional copies of UNIX documentation may be obtained from

Computing Services Library  
218 Evans Hall  
University of California  
Berkeley, California 94720  
415-642-5205

#### A.2. FRANZ LISP

The FRANZ LISP system is distributed along with the Berkeley UNIX system; full documentation is included in Volume 2C of the UNIX manual. A VAX FRANZ LISP implementation of the MACSYMA symbol-manipulation system called VAXIMA is available; licensing for this system is handled by Symbolics, Inc. For additional information on the FRANZ LISP system, contact

The Berkeley UNIX group mentioned above;  
FRANZ INC, in Berkeley, CA (a private company maintaining FRANZ);  
For VAXIMA, your local Symbolics sales representative.



### A.3. EUNICE

Those systems that run the Testbed under VAX/VMS must use the EUNICE emulation system to emulate UNIX. EUNICE is an SRI-developed software product that is marketed commercially by:

The Woolongong Group  
415-962-7100

### A.4. TEX

TEX is a sophisticated text-formatting and phototypesetting system that may be obtained from

Kellerman & Smith  
503-222-4234

Kellerman & Smith also supply LaTeX and a VAX/VMS spooler for using TeX files with the Imagen laser printer.

UNIX spoolers for TeX are available from

Imagen  
408-986-9400

### A.5. EMACS

VAX EMACS is an editor system available from

UNIPRESS  
201-985-8000

A much different, public domain EMACS that has the same origin (Gosling's CMU VAX EMACS) as UNIPRESS EMACS is available from

Richard Stallman, MIT Artificial Intelligence Laboratory

### A.6. SCRIBE

SCRIBE is a text-formatting system available from

UNLOGIC  
412-621-2277

### A.7. VAX INTERLISP

VAX INTERLISP is a fully compatible INTERLISP system available from

USC-ISI  
213-822-1511

### A.8. MAINSAIL

MAINSAIL is a MACHine-INdependent dialect of the SAIL ALGOL-like language. Information and

maintenance are available from  
XIDAK  
415-324-8745

## Appendix B

### Hardware Maintenance Resources

In this appendix, we list a number of resources to be consulted for hardware maintenance. The following entries pertain specifically to the SRI installation in Menlo Park, California.

#### B.1. DEC

DEC manufactures and maintains the VAX-11/780 computer system, its peripherals, and the VMS operating system. General information is available from

DEC Sales  
408-748-6763

Service calls for hardware maintenance are placed to

DEC Customer Service  
408-748-4004  
SRI VAX system serial number: NI800 14255K

#### B.2. Grinnell

The Grinnell corporation is no longer in business, but its operations have been taken over to some extent by the Comtal Corporation, and by several local engineers who are former Grinnell employees. Assistance in maintaining the Grinnell display system is available from any of the following

Comtal Corporation 818-441-1900  
Harley Hallet 408-293-7410  
Greg Hudak 408-270-8160  
Mark McCloud 408-559-1521

#### B.3. Optronics

General information on the Optronics scanner system is available from

Optronics  
617-256-4511

Maintenance problems should be referred to Alex Klinoff or Allen Treadwell at the above number.